

Teacher Energized Resource Manual

**Class : 7th
Subject : Science**



CENTRAL BOARD OF SECONDARY EDUCATION

Preface

In consonance with the move towards outcome-based education where focus is on developing competencies in students, the Central Board of Secondary Education is delighted to share the *Teacher Energized Resource Manual* that will aid teachers in aligning their classroom transaction to a competency framework.

Each chapter of the Resource Manual corresponds to the respective chapters in the NCERT textbooks. The chapters have been chunked by concept; these concepts have been linked to the NCERT Learning Outcomes; and an attempt has been made to delineate Learning Objectives for each concept. Every chapter has a set of assessment items, where two items have been provided as examples for each Learning Objective. Teachers can use these to assess if the learner has acquired the related concept. Needless to say, the items are illustrative examples to demonstrate how competency-based items can be prepared to measure Learning Objectives and Outcomes. The variety in item forms is suggestive of the ways in which a particular concept can be assessed to identify if the learner has attained different competencies. We trust and hope that teachers would be able to generate many more similar test items for use in practice.

Your observations, insights and comments as you use this Resource Manual are welcome. Please encourage your students to voice their suggestions as well. These inputs would be helpful to improve this Manual as these are incorporated in the subsequent editions. All possible efforts have been made to remove technical errors and present the Manual in a form that the teachers would find it easy and comfortable to use.

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This Resource Manual utilizes a lot of quality content available in public domain. Citations have been provided at appropriate places within the text of this manual. The creators of these Manuals are appreciated for making it available to a wider audience through the internet. We would be happy to incorporate citations if any of the content used does not already have it.

HOW TO USE THIS MANUAL

The goal of the Teacher Energized Resource Manual (TERM) is to provide teachers with competency-based education resources aligned to NCERT textbooks that would support them in the attainment of desired Learning Outcomes and development of requisite competencies of the learner. The TERM has equal number of corresponding chapters as NCERT Textbooks with listing of concepts, Learning Outcomes developed by NCERT and Learning Objectives. Competency based test items for each corresponding Learning Objective and sample activities for enrichment have been provided.

Learning Objectives:

Each chapter begins has a *Learning Objectives* table. The table lists the concept covered in the chapter. Learning Objectives are broken down competencies that a learner would have acquired by the end of the chapter. They are a combination of skills and what the learner would use this skill for. For example, the first Learning Objective in the table below relates to the skill of *analysis* and the students will use this competency to identify ingredients in different food items. Teachers can use these specific Learning Objectives to identify if a student has acquired the associated skills and understands how that skill can be used.

Content area/ Concepts	Learning Objectives
Food variety	Analyse common food items in order to identify various ingredients for their preparation
Food material and sources	Identify the sources of ingredients used to prepare food items

Content Area/ Concepts:

The important concepts and sub-concepts covered in a particular chapter are listed in the first section. Most often, they follow a logical order and present a sequence in which these are likely to be covered while teaching. In case, your teaching strategy is different and presents them in a different order, you need

not worry. Teach the way, you consider the best. You only need to ensure their understanding and the attainment of desired Learning Objectives.

Learning Outcomes (NCERT):

NCERT Learning Outcomes are in each chapter along with delineated Learning Objectives. As shown below, each Learning Objective is mapped to NCERT Learning Outcomes and helps teachers to easily identify the larger outcome that a child must be able to demonstrate at the end of the class/chapter.

As the NCERT LOs are generic, they may relate to many content areas / concepts together. However in the mapped table, they have been reproduced ad verbatim for easy identification.

Learning Objectives	Learning Outcomes
Compare the advantages of three major tools used for tilling and ploughing to justify the variety of agricultural practices	Differentiates materials and organisms, such as, natural and human made fibres; contact and non-contact forces; liquids as electrical conductors and insulators; plant and animal cells; viviparous and oviparous animals, on the basis of their properties, structure and functions.
Analyse the quality of seeds with respect to their germinability	
Compare the advantages of two major tools used for sowing to justify the variety of agricultural practices used in the country	
Distinguish between manure and fertilisers to identify ways in which nutrients in soil is replenished	
Evaluate how weeds adversely affects the growth of the plants in order to justify their removal and control	

Test items:

For each Learning Objective, at least two competency-based test items have been provided. Although, the items in this resource manual are multiple choice questions, which assess developed competencies of a child rather than only knowledge, it must be kept in mind that there can be different kinds of test items that can easily align with competency-based education. Teachers can use these items to assess if a child has achieved a particular learning objective and can take necessary supportive actions. Teachers are also encouraged to form similar questions which assess skills of students.

LOB: Recall details/definitions specific to autotrophic mode of nutrition in plants/photosynthesis/detection of photosynthetic activity of plants/nutrients other than carbohydrates, in plants

1) Which option correctly lists the nutrients other than carbohydrates, in plants?

- (a) Water, fibres, minerals
- (b) Fat, proteins, vitamins
- (c) Fibres, vitamins, water
- (d) Flavouring agents, water, vitamins

Correct Answer:(b)

Suggested Teacher Resources

At the end of each chapter, certain activities have been suggested which can be carried out by the teachers with learners to explain a concept. These are only samples and teachers can use, adapt, as well as, create activities that align to a given concept.

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1. Nutrition in Plants

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Learning Objectives:

Content area/concept	Learning Objectives
Nutrients	Recall details/definitions specific to autotrophic mode of nutrition in plants/photosynthesis/detection of photosynthetic activity of plants/nutrients other than carbohydrates, in plants
Nutrition	Define Nutrition & its importance to living organisms
	Examine different methods of nutrition in order to differentiate between autotrophic and heterotrophic nutrition
Autotrophic Nutrition	Draw a schematic diagram of a section through a leaf in order to pictorially represent photosynthesis
	Elaborate the photosynthetic process in plants
	Evaluate if leaves that are red, purple/colours other than green might show lesser photosynthetic activity than green leaves
	Describe the process of photosynthesis with the help of word/chemical equation
	List the nutrients and sunlight requirements in plants in order to explain how these are fulfilled through enquiry activity
Heterotrophic Nutrition	Relate the nutritional requirements of different organisms (plants & animals) to the environment or surroundings for survival
	Evaluate other plants in their surroundings & classify them as autotrophs, heterotrophs, saprotrophs, parasitic or symbiotic based on their nutritional requirements
	Categorize features of insectivores, saprophytes and symbionts, based on their similarities.
Replenishment of Nutrients	Construct the cause & effect model of plant rotation done by farmers
	Establish the relationship between Rhizobium bacteria & leguminous plants

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Examine different methods of nutrition in order to differentiate between autotrophic and heterotrophic nutrition	Differentiates materials and organisms such as, digestion in different organisms; unisexual and bisexual flowers; conductors and insulators of heat; acidic, basic and neutral substances; images formed by mirrors and lenses, etc., on the basis of their properties, structure and function
Evaluate other plants in their surroundings & classify them as autotrophs, heterotrophs, saprotrophs, parasitic or symbiotic based on their nutritional requirements	Classifies materials and organisms based on properties /characteristics, e.g., plant and animal fibres; physical and chemical changes
Categorize features of insectivores, saprophytes and symbionts, based on their similarities.	Conducts simple investigations on his/her own in order to seek answers to queries: (such as, can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?)
Evaluate if leaves that are red, purple/colours other than green might show lesser photosynthetic activity than green leaves	Conducts simple investigations on his/her own in order to seek answers to queries: (such as, can extract of colored flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?)
Construct the cause & effect model of plant rotation done by farmers	Relates processes and phenomena with causes, e.g., wind speed with air pressure; crops grown with types of soil; depletion of water table with human activities, etc.
Recall details/definitions specific to autotrophic mode of nutrition in plants / photosynthesis / detection of photosynthetic activity of plants/nutrients other than carbohydrates, in plants	Explains processes and phenomena in order to relate to science behind the phenomena/processes and develop scientific thinking skills: (such as, processing of animal fibers; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.)
Define Nutrition & its importance to living organisms	
Elaborate the photosynthetic process in plants	

List the nutrients and sunlight requirements in plants in order to explain how these are fulfilled through enquiry activity	
Relate the nutritional requirements of different organisms (plants & animals) to the environment or surroundings for survival	
Describe the process of photosynthesis with the help of word/chemical equation	Writes word equation in order to express chemical reactions: (such as, acid-base reactions; corrosion; photosynthesis; respiration, etc.)
Draw a schematic diagram of a section through a leaf in order to pictorially represent photosynthesis	Draws labelled diagrams/flow charts of organisms/structures/processes in order to demonstrate knowledge of structure/processes/relationships: (such as, of organ systems in human and plants; electric circuits; experimental set ups; life cycle of silk moth, etc.)
Establish the relationship between Rhizobium bacteria & leguminous plants	

Test items

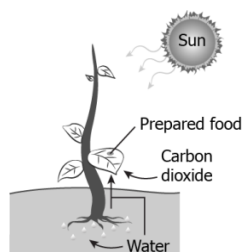


LOB: Recall details/definitions specific to autotrophic mode of nutrition in plants/photosynthesis/detection of photosynthetic activity of plants/nutrients other than carbohydrates, in plants

- 1) Which option correctly lists the nutrients other than carbohydrates, in plants?
- (a) Water, fibres, minerals
 - (b) Fat, proteins, vitamins
 - (c) Fibres, vitamins, water
 - (d) Flavouring agents, water, vitamins

Correct Answer:(b)

2) The image shows how plants obtain carbon dioxide and water from the surroundings.



Based on the image, what is the mode of nutrition in plants?

- (a) Autotrophic, as plant obtains food in the form of sunlight.
- (b) Heterotrophic, as plant consumes food prepared by other organisms
- (c) Autotrophic, as the plant prepares its own food using water and carbon dioxide
- (d) Heterotrophic, as plant obtain prepared food in the form of water and carbon dioxide

Correct Answer:(c)

LOB: Define Nutrition & its importance to living organisms

3) Which statement defines the term “nutrition”?

- (a) It is the amount of food present in the body.
- (b) It is the components of food required by the body.
- (c) It is the mode of eliminating food by the individual.
- (d) It is the mode of obtaining food by the individual.

Correct Answer: (d)

2) A teacher asks the students to list the points about the importance of nutrition in living organisms. The table shows the list prepared by the students.

- A. It supports the normal growth and development.
- B. It allows each organism to prepare its own food.
- C. It promotes overall health of the organism.
- D. It allows organism to reduce its body weight.

Based on the table, which statements are correct?

- (a) A and C
- (b) B and D
- (c) A and B
- (d) C and D

Correct Answer: (a)

LOB: Examine different methods of nutrition in order to differentiate between autotrophic and heterotrophic nutrition

1) The table shows the mode of nutrition in two different organisms.

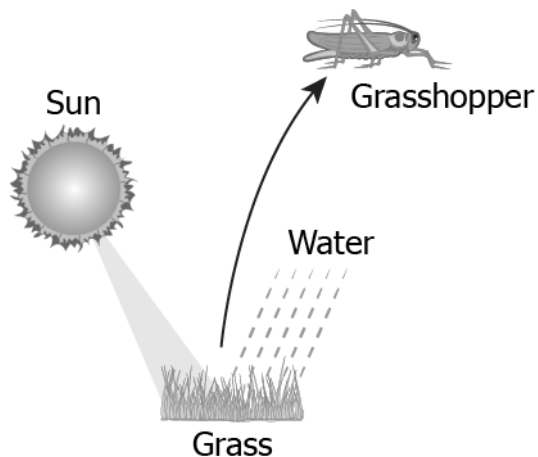
Organism 1	Utilizes raw material from surroundings to prepare its own food.
Organism 2	Consumes food prepared by organism 1.

What is the likely mode of nutrition of the two organisms?

- (a) Organism 1= autotrophic, Organism 2= autotrophic
- (b) Organism 1= autotrophic, Organism 2= heterotrophic
- (c) Organism 1= heterotrophic, Organism 2= autotrophic
- (d) Organism 1= heterotrophic, Organism 2= heterotrophic

Correct Answer: (b)

2) The image shows a part of the food chain.



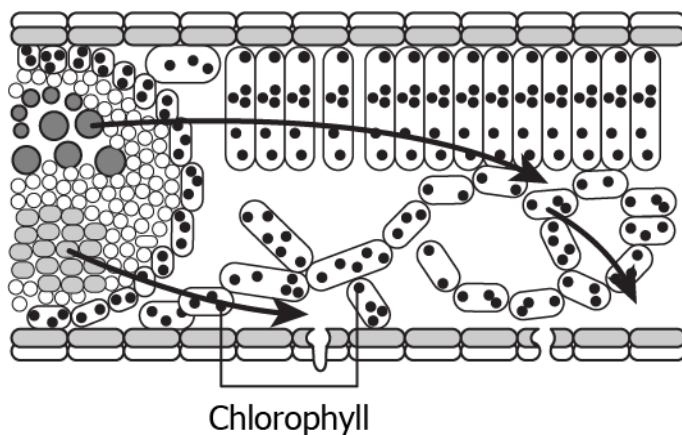
A student claimed that grasshopper has a heterotrophic mode of nutrition. Is the claim made by the student correct?

- (a) No, as the grasshopper prepare its own food.
- (b) No, as the grasshopper provide food to the plants.
- (c) Yes, as the grasshopper takes in food prepared by the grass.
- (d) Yes, as the grasshopper takes in food prepared by other grasshoppers.

Correct Answer: (c)

LOB: Draw a schematic diagram of a section through a leaf in order to pictorially represent photosynthesis

1) The image shows the section of a leaf.

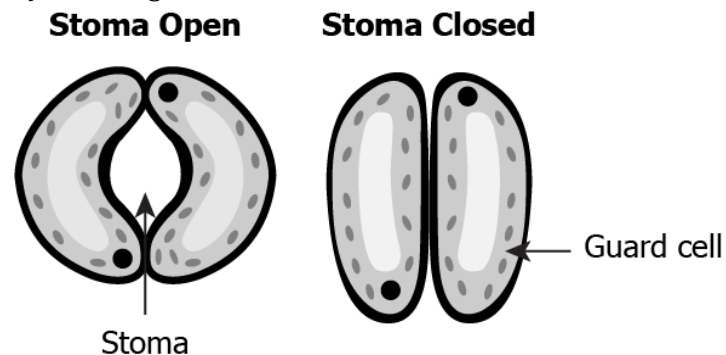


What is the likely role of the labelled part in the leaf?

- (a) It helps in the absorption of water from the roots.
- (b) It helps in capturing the energy of the sunlight.
- (c) It helps in consuming carbon dioxide from the air.
- (d) It helps in the absorption of food from the surroundings.

Correct Answer: (b)

2) The image shows the structure of stoma on the leaf.



What will be the likely effect on the plant, if stoma remains closed for a prolonged period of time?

- (a) It will allow the plant to store more food in the leaves.
- (b) It will allow the plant to absorb more minerals from the roots.
- (c) It will prevent the entry of water in the plant for photosynthesis.
- (d) It will prevent the entry of carbon dioxide in the plant for photosynthesis.

Correct Answer: (d)

LOB: Elaborate the photosynthetic process in plants

1) A student takes a green leaf from the plant and boils it in an alcohol bath for removal of chlorophyll. After this treatment, the student adds a few drops of iodine to the boiled leaf using a syringe dropper. After some time, the student observes that the leaf turns blue-black in colour. What can be evaluated from this?

- (a) The iodine reacts with the starch present in the leaf that indicates the occurrence of photosynthesis.
- (b) The iodine reacts with water present in the leaf that indicates the occurrence of photosynthesis.
- (c) The iodine reacts with the oxygen present in the leaf that indicates the occurrence of photosynthesis.
- (d) The iodine reacts with carbon dioxide present in the leaf that indicates the occurrence of photosynthesis.

Correct Answer: (a)

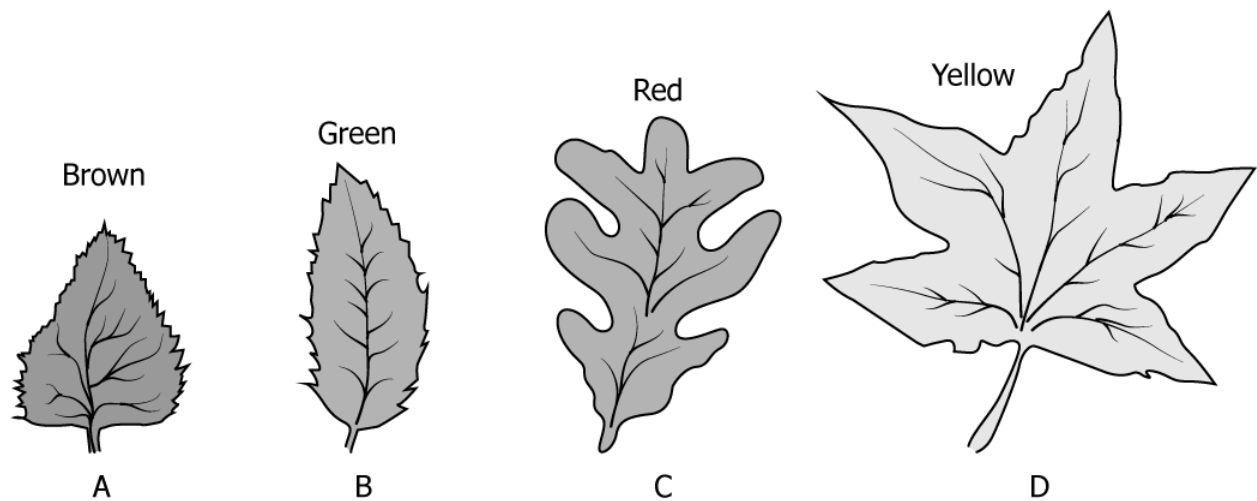
2) A student sets up an experiment using two potted plants in the same type of soil. The student kept one plant in the garden while the other in a darkroom and watered both the plants equally. After five days, the student observed that the plant in the darkroom died while the other plant in the garden appeared healthy. What is the likely reason for this observation?

- (a) Lack of water for the growth
- (b) Lack of minerals for the growth
- (c) Lack of sunlight for photosynthesis
- (d) Lack of carbon dioxide for respiration

Correct Answer: (c)

LOB: Evaluate if leaves that are red, purple/colours other than green might show lesser photosynthetic activity than green leaves

1) A student collected different coloured leaves from his garden.

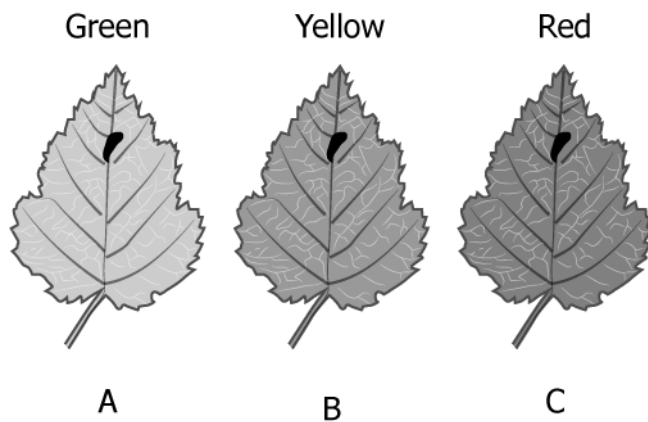


Which of these leaves performs photosynthesis?

- (a) A and B
- (b) B and C
- (c) C and D
- (d) A, B, C and D

Correct Answer: (d)

2) The image shows the different coloured leaves.



A student claimed that leaves other than green show less photosynthetic activity. Is the claim made by the student right?

- (a) No, as other leaves also have chlorophyll to perform the same level of photosynthesis.
- (b) Yes, as only green coloured leaves have chlorophyll to perform more photosynthesis.
- (c) No, as other leaves can also perform photosynthesis even in the absence of chlorophyll.
- (d) Yes, as only green coloured leaves can absorb energy from the sunlight to perform photosynthesis.

Correct Answer: (a)

LOB: Describe the process of photosynthesis with the help of word/chemical equation

1) Which statement correctly explains the process of photosynthesis in plants?

- (a) In the presence of sunlight, chlorophyll uses water and oxygen to produce carbohydrate.
- (b) In the presence of sunlight, chlorophyll uses oxygen and carbon dioxide to produce carbohydrate.
- (c) In the presence of sunlight, chlorophyll uses water and carbon dioxide to produce carbohydrate.
- (d) In the presence of sunlight, chlorophyll uses water, oxygen, and carbon dioxide to produce carbohydrates.

Correct Answer: (c)

2) Which equation correctly describes the process of photosynthesis?

- (a)
$$\text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2 \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \text{CO}_2 + \text{H}_2\text{O}$$
- (b)
$$\text{CO}_2 + \text{H}_2\text{O} \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$$
- (c)
$$\text{CO}_2 + \text{O}_2 \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \text{C}_6\text{H}_{12}\text{O}_6 + \text{H}_2\text{O}$$
- (d)
$$\text{C}_6\text{H}_{12}\text{O}_6 + \text{H}_2\text{O} \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \text{CO}_2 + \text{O}_2$$

Correct Answer: (b)

LOB: : List the nutrients and sunlight requirements in plants in order to explain how these are fulfilled through enquiry activity

1) How plants obtain other components of food?

- (a) Plants obtain other nutrients from the animals.
- (b) Plants absorb other nutrients directly from the soil.
- (c) Plants utilise carbohydrate to synthesise other nutrients.
- (d) Plants depend on larger plants for the synthesis of other nutrients.

Correct Answer: (c)

2) Plants prepare carbohydrates during photosynthesis. What other nutrient is likely to be synthesised in plants when the soil is rich in bacteria that fix gaseous nitrogen?

- (a) Minerals
- (b) Proteins
- (c) Vitamins
- (d) Water

Correct Answer: (b)

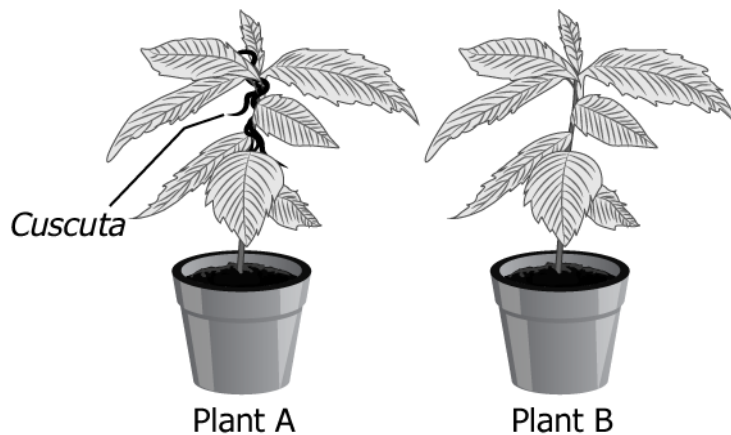
LOB: Relate the nutritional requirements of different organisms (plants & animals) to the environment or surroundings for survival

1) How do plants that lack chlorophyll to perform photosynthesis prepare its food?

- (a) They obtain simple food from animals.
- (b) They obtain raw materials from their surroundings.
- (c) They obtain food in the form of energy from sunlight.
- (d) They obtain readymade food from photosynthetic plants.

Correct Answer: (d)

2) *Cuscuta* is a yellow wiry branched structure climbs on other plants as it lacks chlorophyll. A student sets up an experiment using two potted plants, one with *Cuscuta* and others without it as shown.



Which of these plants will show more growth?

- (a) Plant A, as *Cuscuta* provides valuable nutrients to host plants for photosynthesis.
- (b) Plant B, as *Cuscuta* shares chlorophyll of the host plants to synthesis its own food.
- (c) Plant B, as *Cuscuta* uses readymade food of the plant A that weakens the host plant.
- (d) Plant A, as *Cuscuta* shares its readymade food with host plants to increase their combined growth.

Correct Answer: (c)

LOB: Evaluate other plants in their surroundings & classify them as autotrophs, heterotrophs, saprotrophs, parasitic or symbiotic based on their nutritional requirements

1) The table lists the characteristic of an insectivorous plant.

- A. It is green in colour.
- B. The body of the plant consists of a lid and pitcher.
- C. It traps the insects and digests them by secreting digestive juices.

Based on these characteristics, what is the likely mode of nutrition of this plant?

- (a) Autotrophic
- (b) Autotrophic and Heterotrophic
- (c) Both autotrophic and saprotrophic
- (d) Both heterotrophic and saprotrophic

Correct Answer: (b)

2) The table lists some examples of plants.

- A. Mushroom
- B. Cuscuta
- C. Money plant

Which option correctly classifies the plant-based on their nutritional requirement?

(a)

Autotrophic	Heterotrophic	Saprotrophic
Money plant	Cuscuta	Mushroom

(b)

Autotrophic	Heterotrophic	Saprotrophic
Mushroom	Cuscuta	Money plant

(c)

Autotrophic	Heterotrophic	Saprotrophic
Cuscuta	Mushroom	Money plant

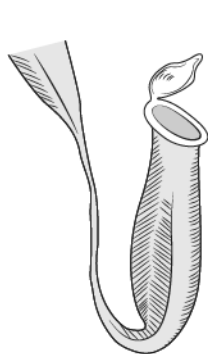
(d)

Autotrophic	Heterotrophic	Saprotrophic
Mushroom	Money plant	Pitcher plant

Correct Answer: (a)

LOB: Categorize features of insectivores, saprophytes and symbionts, based on their similarities

1) The image shows two different organisms.



Pitcher Plant



Mushroom

Which of these characters is shared by both?

- (a) Both are plants
- (b) Both depend on food prepared by others
- (c) Both have a saprotrophic mode of nutrition
- (d) Both have chlorophyll to perform photosynthesis

Correct Answer: (b)

2) Listed below are some of the characteristics of saprophytes and symbionts.

- A:** They absorb nutrients from dead and decay.
- B:** They depend on plants and animals for nutrition.
- C:** They live together with other organisms to share space and food.

Which option correctly classifies these characteristics?

(a)

A	B	C
Symbionts	Both saprophytes and symbionts	Saprophytes

(b)

A	B	C
Saprophytes	Both saprophytes and symbionts	Symbionts

(c)

A	B	C
Both saprophytes and symbionts	Saprophytes	Symbionts



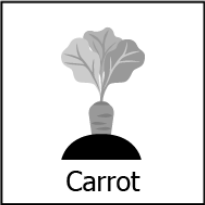
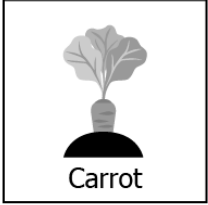



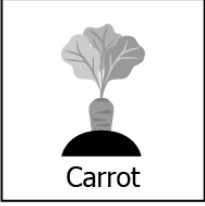

(d)

A	B	C
Symbionts	Saprophytes	Both saprophytes and symbionts

Correct Answer: (b)

LOB: Construct the cause & effect model of plant rotation done by farmers

1) The model shows how a farmer plants the crop in different beds in three consecutive years.

Year 1	 Tomato Bed 1	 Lequme Bed 2	 Carrot Bed 3
Year 2	 Carrot Bed 1	 Tomato Bed 2	 Lequme Bed 3
Year 3	 Lequme Bed 1	 Carrot Bed 2	 Tomato Bed 3

What is the likely benefit of this pattern of planting crops?

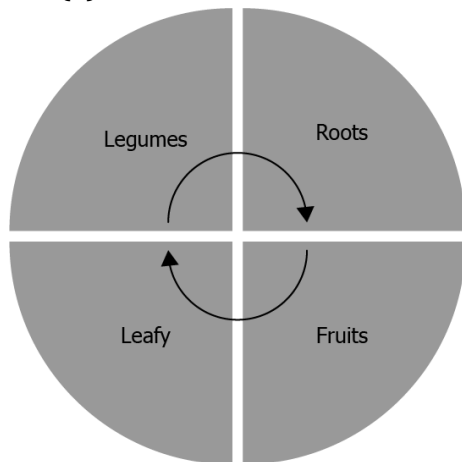
(a) It increases the height of the crops.

- (b) It increases the fertility of the soil.
- (c) It reduces the water requirement of crops.
- (d) It increases the same type of nutrients in the soil.

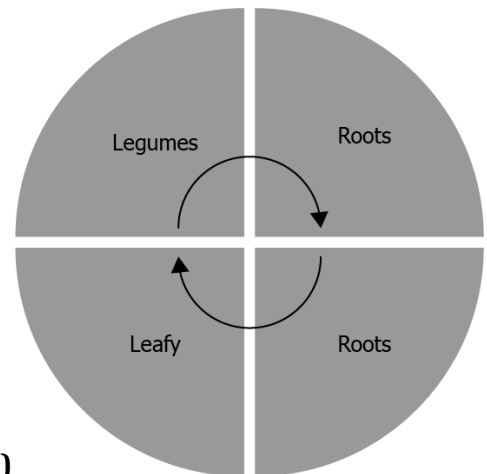
Correct Answer: (b)

2) Which of these models of planting crops can help a farmer restore the soil nutrients without investing in chemical fertilisers?

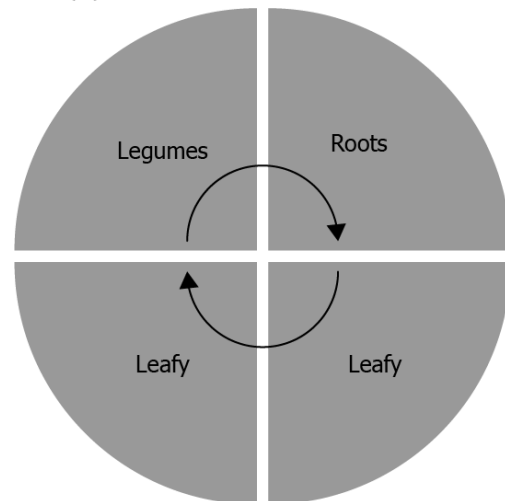
(a)



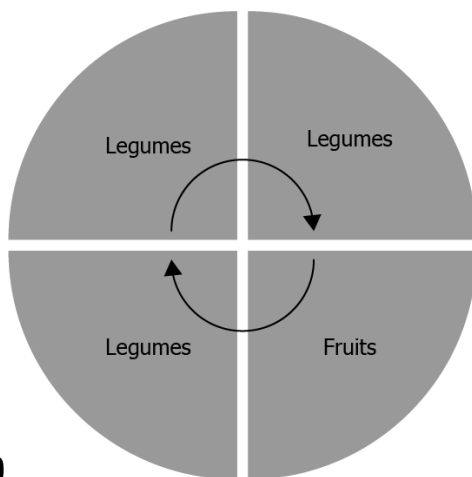
(c)



(d)



(b)



Correct Answer: (a)

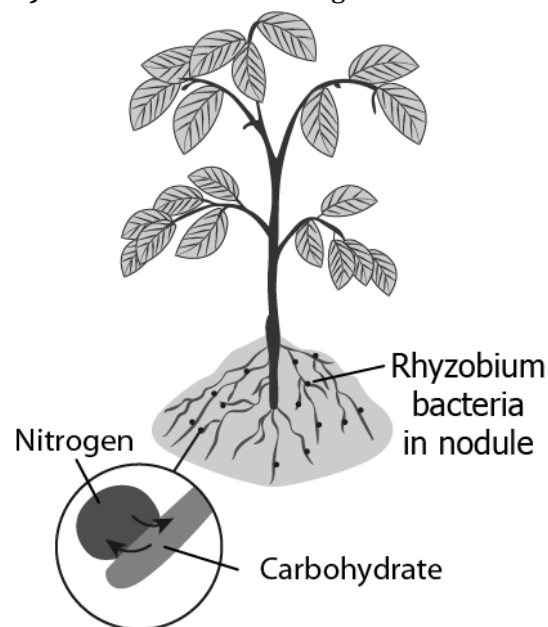
LOB: Establish the relationship between Rhizobium bacteria & leguminous plants

1) In legumes, *Rhizobium* bacteria are commonly observed in the roots. The *Rhizobium* provides usable nitrogen while the plant in return provides shelter and food to the bacteria. What is the type of relationship between these both?

- (a) Symbiotic, as both benefit each other for food.
- (b) Competition, as both compete for atmospheric nitrogen.
- (c) Parasitic, as *Rhizobium* consumes food prepared by plants.
- (d) Saprophytic, as *Rhizobium* decomposes the roots of the plant and feed on them.

Correct Answer: (a)

2) A farmer observes the growth of *Rhizobium* on the roots of its plants as shown.



How will this likely benefit the farmer?

- (a) It will increase the growth of unwanted plants.
- (b) It will increase the use of manures in the field.
- (c) It will reduce the need of nitrogenous fertilisers in the field.
- (d) It will reduce the need for raw material by the plants to prepare their own food.

Correct Answer: (c)



Activity

Activity	Understanding Food Labels
Materials required	Labelled products or clean, empty product packages
Procedure	<ol style="list-style-type: none"> 1. Get students in groups of four to analyse 8 to 10 product labels. 2. Ask the following questions: <ol style="list-style-type: none"> a. Which packaging appeals to them the most? Why? b. Which all nutrients can you identify from each of the food labels? c. Which of the items has the maximum amount of carbohydrates, fibers, proteins and energy? d. Which of more nutrients makes the food item tastier? Which makes it healthier? 3. Design a food nutritional label for a product. What information will you retain from the existing label? What additional information would you include?
Let's think	<ol style="list-style-type: none"> 1. What marketing strategies do companies employ to attract consumers towards their eatable products?

Activity	Plant Adaptations in Carnivorous Plants (Creating Own Species)
Materials required	Internet access or books with pictures of carnivorous plants, craft materials such as paper, markers, balls, paper clips, glue etc.
Procedure	<ol style="list-style-type: none"> 1. Share knowledge of carnivorous plants with the students; mechanisms that they use for their functioning and specific features. (Reading resource: https://kidsgardening.org/lesson-plan-plant-adaptations-carnivorous-plants.com) 2. Get students in groups of four and create their own 3-D models of carnivorous plants. Ask them to first decide what prey their plant will attract and then answer the following questions: <ol style="list-style-type: none"> a. How does your plant attract its prey? b. How does your plant trap its prey? c. What happens to the prey after it is trapped? d. Name your plant. e. Describe the living conditions (habitat) of your plant and how will those conditions help in its nutrition. 3. Ask students to present their creation to the class and open space for some questions from other groups.
Let's think	<ol style="list-style-type: none"> 1. How are carnivorous plants different from other plants? How are they similar? 2. Why do you think carnivorous plants fall under the category of plants? Which other organisms do they show similarity to?

2. Nutrition in Animals

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Animal Nutrition and Digestion	Recall details pertaining to different modes of acquiring food.
Human Digestive System	Classifies animals based on their modes of feeding.
	Summarize the functions of Human digestive system.
	Illustrate human digestive system with the help of a well labelled diagram & elaborate the process & function of each part
	Perform the starch test on raw and chewed food in order to infer the role of saliva.
Digestion in grass-eating animals	Compare & contrast the features of digestive system of grass-eating animals with those of humans.
Feeding and digestion in amoeba	Recall details pertaining to nutrition in amoeba

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Illustrate human digestive system with the help of a well labelled diagram & elaborate the process & function of each part	Identifies materials and organisms, such as, animal fibres; types of teeth; mirrors and lenses, on the basis of observable features, i.e., appearance, texture, functions, etc.

Compare & contrast the features of digestive system of grass-eating animals with those of humans.	Differentiates materials and organisms such as, digestion in different organisms; unisexual and bisexual flowers; conductors and insulators of heat; acidic, basic and neutral substances; images formed by mirrors and lenses, etc., on the basis of their properties, structure and function
Classifies animals based on their modes of feeding.	Classifies materials and organisms based on properties /characteristics, e.g., plant and animal fibres; physical and chemical changes
Perform the starch test on raw and chewed food in order to infer the role of saliva.	Conducts simple investigations on his/her own in order to seek answers to queries: (such as, can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?)
Recall details pertaining to different modes of acquiring food.	Explains processes and phenomena in order to relate to science behind the phenomena/processes and develop scientific thinking skills: (such as, processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.)
Summarize the functions of Human digestive system.	Draws labelled diagrams/flow charts of organisms/structures/processes in order to demonstrate knowledge of structure/processes/relationships: (such as, of organ systems in human and plants; electric circuits; experimental set ups; life cycle of silk moth, etc.)
Recall details pertaining to nutrition in amoeba	
Illustrate human digestive system with the help of a well labelled diagram & elaborate the process & function of each part	



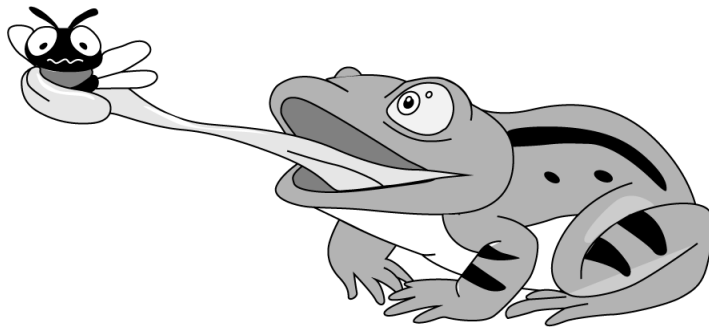
LOB: Recall details pertaining different modes of acquiring food.

1) Bees pull the nectar from the flowers into their mouth. What mode of feeding is this?

- (a) Brewing
- (b) Chewing
- (c) Sucking
- (d) Swallowing

Correct Answer: (c)

2) The image shows a frog acquiring its food with the help of his tongue.



A student observed the image and claimed that the frog takes its food by sucking. Is the claim made by the student correct?

- (a) No; the frog is eating food as a whole, so its mode of feeding is swallowing.
- (b) No; the frog is using teeth to break its food, so its mode of feeding is chewing.
- (c) Yes; the frog is pulling in the insect as is done for liquids, so its mode of feeding is sucking.
- (d) Yes; the frog is using its body to grind up the insect, so its mode of feeding is sucking.

Correct Answer: (a)

LOB: Classifies animals based on their modes of feeding.

1) The table shows some animals that acquire their food with different modes of feeding.

- | |
|---|
| <ul style="list-style-type: none">• Lice• Humans• Snail• Snakes• Butterfly• Ants |
|---|

What two animals will have the same mode of feeding?

- (a) Lice and ants
- (b) Humans and snail
- (c) Snails and snakes
- (d) Butterfly and ants

Correct Answer: (b)

2) The table shows some animals classified into two groups, 1 and 2, based on their mode of feeding.

Group 1	Group 2
Human infants	Snakes
Butterfly	Frogs
Lice	Earthworm

Which other animals can be included in group 1 and group 2?

- (a) Group 1-Ants; Group 2-Snails
- (b) Group 1-Bees; Group 2-Lizards
- (c) Group 1-Snails; Group 2-Sucking
- (d) Group 1-Spiders; Group 2- Housefly

Correct Answer: (b)

LOB: Summarize the functions of Human digestive system.

1) The food that humans eat contains lots of nutrition. These nutrients cannot be directly absorbed by the body. It must have to be breakdown into smaller particles, and after that, these molecules get absorbed by the blood. Which life process helps humans to breakdown the food?

- (a) Digestive system
- (b) Nervous system
- (c) Excretory system
- (d) Respiratory system

Correct Answer: (a)

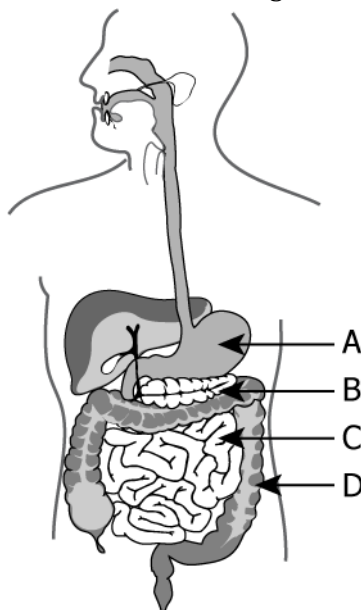
2) Food that human beings take might have some components that cannot be digested by the human body. The accumulation of these undigested food particles in the body may lead to several diseases in humans. What role does the human digestive system play in this?

- (a) It helps the blood to absorb all these undigested particles.
- (b) It helps to remove these undigested wastes from the body.
- (c) It helps the enzymes to degrade these substances inside the body.
- (d) It helps the microorganisms present in our body to feed on these undigested waste.

Correct Answer: (b)

LOB: Illustrate human digestive system with the help of a well labelled diagram & elaborate the process & function of each part

1) The image shows an unlabeled sketch of the human digestive system.



Which of the following correctly describes the functions of the parts marked as A, B C and D?

(a)

	A	B	C	D
Function	Secretion of pancreatic juice	Secretion of acids and enzymes	Digestion and absorption of food	Absorption of water

(b)

	A	B	C	D
Function	Secretion of acids and enzymes	Secretion of pancreatic juice	Absorption of water	Digestion and absorption of food

(c)

	A	B	C	D
Function	Digestion and absorption of food	Secretion of pancreatic juice	Secretion of acids and enzymes	Absorption of water

(d)

	A	B	C	D
Function	Secretion of acids and enzymes	Secretion of pancreatic juice	Digestion and absorption of food	Absorption of water

Correct Answer: (d)

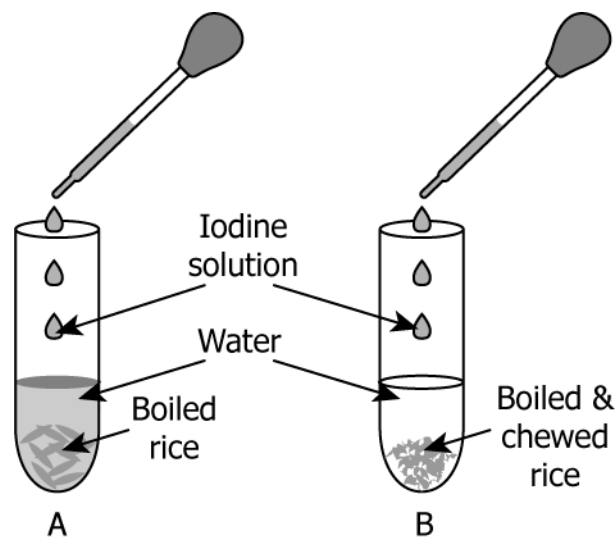
2) A doctor examined the improper digestion of fat in the body of a patient. According to the doctor, the organ that secretes bile has been damaged due to consumption of excessive alcohol by the patient. What organ of the patient has been damaged?

- (a) Kidney
- (b) Liver
- (c) Lungs
- (d) Pancreas

Correct Answer: (b)

LOB: Perform the starch test on raw and chewed food in order to infer the role of saliva.

1) The image shows an experiment set up in which boiled rice was taken in test tube A and boiled, and chewed rice was taken in test tube B.



When the iodine solution is dropped into both the test tubes, the colour of water in test tube A changed to blue black, but the colour in test tube B remained unchanged. Which of the statement describes the correct reason for this observation?

- (a) Chewing adds saliva in the food, which converts the starch into sugars.
- (b) Chewing adds starch in the food, which converts the amino acids into proteins.
- (c) Chewing adds saliva in the food, which converts the sugar into starch.
- (d) Chewing adds starch in the food, which converts the proteins into amino acids.

Correct Answer: (a)

2) The table shows the constituents of four different solutions.

Solution	Water (ml)	Raw material added
A	5	Crushed boiled potato
B	5	Boiled potato that was chewed for 2 seconds
C	5	Boiled potato that was chewed for 4 seconds
D	5	Boiled potato that was chewed for 6 seconds

What solution is likely to have the highest amount of starch?

- (a) Solution A
- (b) Solution B
- (c) Solution C
- (d) Solution D

Correct Answer: (a)

LOB: Compare & contrast the features of digestive system of grass-eating animals with those of humans.

1) Humans chew the food only when they have food in their mouths, but buffaloes chew continuously even when they are not eating grass. What could be the reason behind this fact?

- (a) Buffaloes chew continuously because they store undigested grass in their mouth.
- (b) Buffaloes chew continuously to remove the stuck food particles from their mouthparts.
- (c) Buffaloes chew continuously because cud, the partially digested food, returns to their mouth in small lumps.
- (d) Buffaloes chew continuously to collect saliva in their mouth so that more bacteria can be formed in their mouth.

Correct Answer: (c)

2) A sac-like structure between the oesophagus and small intestine is present in some grass-eating animals such as horses and rabbits. This helps these animals to digest the cellulose. It is absent in humans, so cellulose cannot be digested by humans. What is the name of this structure, and what makes this to digest cellulose?

- (a) Rumen; the presence of certain bacteria that are absent in humans
- (b) Rumen; the presence of certain proteins that are absent in humans
- (c) Caecum; the presence of certain bacteria that are absent in humans
- (d) Caecum; the presence of certain proteins that are absent in humans

Correct Answer: (c)

LOB: Recall details pertaining to nutrition in amoeba.

1) The table shows some steps involved in the food intake by amoeba.

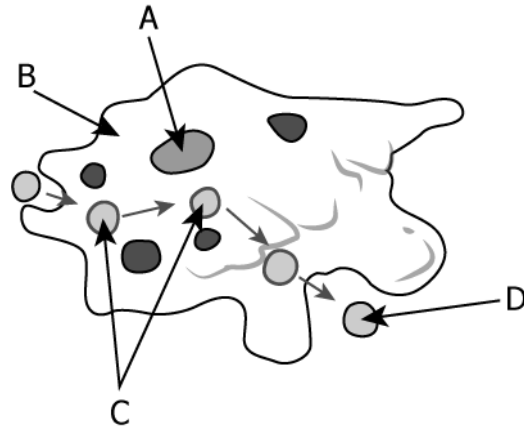
Step number	Description
A	Sensing of food
B	Engulfing of food particles
C	Pushing out pseudopodia
D	Trapping of food in food vacuoles

Which of the following is the correct sequence of steps?

- (a) A; B; C; D
- (b) A; C; B; D
- (c) B; A; C; D
- (d) B; C; A; D

Correct Answer: (b)

2) The image shows an unlabelled amoeba.



A researcher wants to work on that component of the amoeba in which secretion of digestive juices takes place. Which label in the image represents that component?

- (a) A
- (b) B
- (c) C
- (d) D

Correct Answer: (c)

Suggested Teacher Resources



I

Activity



Activity 1	Chew, Bite, Chomp (Understanding the Structure of Teeth)
Materials required	3 different types of food (One should be something typically chewed with incisors (celery, carrots, or apples), one should be chewed with canines (dried fruit, jerky, or dry baguette), and one should be chewed with molars (popcorn, pretzels, or nuts).
Procedure	<ol style="list-style-type: none">1. Share the position of incisors, canines and molars with the students.2. Ask students to write down the names of food items provided to them.3. Ask students to eat the food as naturally as possible, and to pay close attention to which teeth they used.4. Ask students to record which teeth they use to eat each type of food.
Reflection questions	<ol style="list-style-type: none">1. Why did you use different teeth to chew each different type of food?2. How does the shape of the tooth determine its function?3. Predict and prepare a list of at least 10 items each which you will use to incisors, canines and molars for.



Activity 2	Digestion Prediction and Demonstration
Materials required	Ziplock bags, biscuits, orange juice, oatmeal, two sheets of paper
Procedure	<ol style="list-style-type: none"> 1. Carry out a class discussion centered around the following questions: <ol style="list-style-type: none"> a. Have you ever thought about what happens to food in your body after you put it in your mouth? How does the Vitamin A in carrots travel to your eyes? b. Name some of the important organs (or parts of the body) that are involved in digesting food? 2. (You may carry out the demonstration on your own or have students perform the procedure in groups of four). <ol style="list-style-type: none"> a. (Mouth) Place 2-3 biscuits inside a Ziplock bag and mash with your fingers. b. (Stomach) Place this bag inside another Ziplock bag with orange juice in it and continue kneading the bag until the mixture is all liquid to represent the muscular action of the stomach. c. (Small Intestine) Demonstrate absorption of the liquid by a long piece of long paper as against a long sheet of paper folded in a square to compare the absorption capacity of both. d. (Large Intestine) Place some oatmeal in the package and absorb all liquid at this stage and then the solid waste left is removed from the system.
Reflection questions	<ol style="list-style-type: none"> 1. What is the importance of water in the process of digestion? 2. Why is the order of the processes in digestion as such in Nature? How different would the system look if the order of these processes is reversed?

3. Fibre to Fabric

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Wool	Relate the air trapped inside the hair of animals for its insulation
	Examine selective breeding process for obtaining special characters in the offspring, e.g. soft under hair in sheep
	Compare coarse beard hair & soft under hair of animals based on their utility
	Outline the steps involved in processing of fibres into wool.
	Critique the risk factors associated with wool industry & appreciate the efforts of people involved in it
Silk	Explain the significance of silk in textile industry
	Describe and illustrate diagrammatically the life cycle of silk moth
	Outline the steps involved in obtaining silk from cocoon
	Evaluate the contribution of silk in Indian Economy and appreciate our weavers for the intricate & dedicated efforts

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Examine selective breeding process for obtaining special characters in the offspring, e.g. soft under hair in sheep	Classifies materials and organisms based on properties /characteristics, e.g., plant and animal fibres; physical and chemical changes
Compare coarse beard hair & soft under hair of animals based on their utility	

Examine selective breeding process for obtaining special characters in the offspring, e.g. soft under hair in sheep	Explains processes and phenomena, e.g., processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.
Outline the steps involved in processing of fibres into wool	Explains processes and phenomena in order to relate to science behind the phenomena/processes and develop scientific thinking skills: (such as, processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.)
Outline the steps involved in obtaining silk from cocoon	
Describe and illustrate diagrammatically the life cycle of silk moth	Draws labelled diagrams/flow charts of organisms/structures/processes in order to demonstrate knowledge of structure/processes/relationships: (such as, of organ systems in human and plants; electric circuits; experimental set ups; life cycle of silk moth, etc.)
Critique the risk factors associated with wool industry & appreciate the efforts of people involved in it	Applies learning of scientific concepts in daily life/real life situations in order to solve problems/give solutions/take preventive measures/etc.: (such as, dealing with acidity; testing and treating soil; taking measures to prevent corrosion; cultivation by vegetative propagation; connecting two or more electric cells in proper order in devices; taking measures during and after disasters; suggesting methods for treatment of polluted water for reuse, etc.)
Explain the significance of silk in textile industry	
Evaluate the contribution of silk in Indian Economy and appreciate our weavers for the intricate & dedicated efforts	



LOB: Relate the air trapped inside the hair of animals for its insulation

1) The image represents an organism living in Polar Regions.



Which of the body organs of the bear is likely to help to keep it warm in the colder region?

- (a) Ears
- (b) Hair
- (c) Legs
- (d) Nose

Correct Answer: (b)

2) A student studies that the hair in a sheep helps it to survive the cold. Which of these explains how the hair keeps the animal warm?

- (a) They trap a lot of air which is a poor conductor of heat
- (b) They trap dust particles which is a good conductor of heat
- (c) They trap a lot of bacteria which is a poor conductor of heat
- (d) They trap water molecules which is a good conductor of heat

Correct Answer: (a)

LOB: Paraphrase definition of selective breeding as the process of selecting parents for obtaining special characters in their offspring, such as soft under hair in sheep.

1) A student studies that selective breeding is helpful and is practiced in wool industries. Which of these mentions the importance of selective breeding in sheep?

- (a) Makes the sheep increase in height
- (b) Produce more and better-quality wool
- (c) Increase the ability to give birth more often
- (d) Makes them feel warmer even after removing wool

Correct Answer: (b)

2) Which of these explains the process of selective breeding?

- (a) Specially chosen parents to give birth to young ones

- (b) Medical treatment to young ones for better adaption
- (c) Producing organisms exactly similar to existing organisms
- (d) Extracting different types of materials from a single organism

Correct Answer: (a)

LOB: Compare coarse beard hair & soft under hair of animals based on their utility.

1) Which of these would be the best material for the production of woollen cloth?

- (a) Soft under hair as they can be dyed easily
- (b) Soft under hair as they have a soft texture
- (c) Coarse beard hair as they can be sorted easily
- (d) Coarse beard hair as they are available in larger quantity

Correct Answer: (b)

2) Which of these explains the reason for choosing fine under hair over coarse beard hair for wool?

- (a) They are heavier
- (b) They are soft and better
- (c) They are darker in colour
- (d) They are more in quantity

Correct Answer: (b)

LOB: Outline / Enlist the steps involved in processing of fibres into wool.

1) Which of these explains the process of scouring?

- (a) Straightening of the woollen fibres
- (b) Picking out of small fluffy fibres
- (c) Separating the hair of different texture
- (d) Washing wool to remove dust and dirt

Correct Answer: (d)

2) Which of these arrangements explains the correct order of processing fibres into wool?

- (a) Rolling → Shearing → Dyeing → Scouring → Sorting → Cleaning of burrs
- (b) Scouring → Shearing → Cleaning of burrs → Rolling → Dyeing → Sorting
- (c) Shearing → Scouring → Sorting → Cleaning of burrs → Dyeing → Rolling
- (d) Cleaning of burrs → Rolling → Dyeing → Shearing → Scouring → Sorting

Correct Answer: (c)

LOB: Critique the risk factors associated with wool industry & appreciate the efforts of people involved in it

1) A student studies that some people working in wool industries are more likely to have a disease called anthrax. It is most likely to occur to the persons who separate the hair of different textures. Which of these job roles in the wool industry is at most risk?

- (a)** Scouring
- (b)** Sorting
- (c)** Shearing
- (d)** Rolling

Correct Answer: (b)

2) Which of these explains an occupational hazard experienced by certain workers in the woollen industry?

- (a)** Severe pain when biting down or chewing food
- (b)** Infection by a bacterium causing fatal blood disease
- (c)** Fatal disease caused by parasite such as mosquitoes
- (d)** Damaged areas in the hard surface of teeth developing tiny openings

Correct Answer: (b)

LOB: Explain the significance of silk in textile industry.

1) Which of these requires silk as a raw material?

- (a)** Blankets
- (b)** Jackets
- (c)** Saris
- (d)** Shoes

Correct Answer: (c)

2) A manufacturer wants to weave some fabric for an upcoming festival in the summer using one of the materials given below. Which among the following materials would be most appropriate for the fabric?

- (a)** Leather
- (b)** Jute
- (c)** Silk
- (d)** Wool

Correct Answer: (c)

LOB: Illustrate the life cycle of silk moth

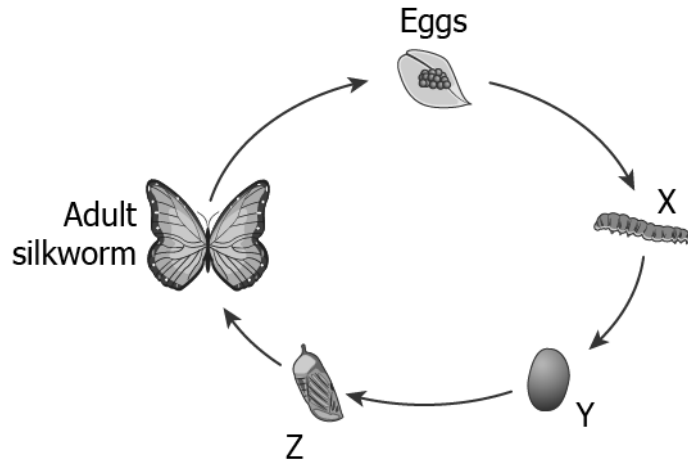
1) What is the silk moth known as just after hatched from the egg?

- (a)** Caterpillars
- (b)** Cocoon

- (c) Moth
- (d) Pupa

Correct Answer: (a)

2) The figure represents the stages of the life cycle in a silk moth.



Which of these explains the stages indicated by X, Y, and Z in the cycle?

- (a) X→ Silkworm, Y→ Cocoon with developing moth, Z→ Cocoon
- (b) X→ Cocoon, Y→ Silkworm, Z→ Cocoon with developing moth
- (c) X→ Silkworm, Y→ Cocoon, Z→ Cocoon with developing moth
- (d) X→ Cocoon, Y→ Cocoon with developing moth, Z→ Silkworm

Correct Answer: (c)

LOB:Outline the steps involved in obtaining silk from cocoon.

1) Which step includes boiling while processing silk from the cocoon?

- (a) Scouring
- (b) Shearing
- (c) Rearing
- (d) Reeling

Correct Answer: (d)

2) The table lists a few steps involved in the process of obtaining silk from the cocoon.

- | |
|--|
| <ol style="list-style-type: none"> 1. Boil 2. Twist 3. Unwind 4. Weave |
|--|

Which option correctly arranges the steps in the proper order to obtain the silk?

- (a) Boil → Unwind → Twist → Weave
- (b) Twist → Boil → Unwind → Weave
- (c) Unwind → Boil → Twist → Weave
- (d) Weave → Twist → Unwind → Boil

Correct Answer: (a)

LOB: Evaluate the contribution of silk in the Indian Economy and appreciate our weavers for the intricate & dedicated efforts.

1) Which of these people are responsible for turning silk fibre into a silk cloth?

- (a) Dyer
- (b) Farmer
- (c) Sorter
- (d) Weaver

Correct Answer: (d)

2) A student studies that the production of silk contributes towards the development of Indian economy. Which of these explains the contribution provided by silk production?

- (a) Better quality materials for clothing
- (b) Construction of schools and colleges
- (c) Employment to women in the country
- (d) Production of more cocoons in the country

Correct Answer: (c)

Suggested Teacher Resources



Activity



Activity	Selective Breeding
Materials required	Case study prints
Procedure	<ol style="list-style-type: none">1. Students to read the following case study in pairs and answer the following guiding questions: Source: Selective Breeding (Reading Resource) <p>Charles Darwin, a British naturalist who lived in the 19th century, is best known for his book <i>On the Origin of Species</i>. In it, Darwin established the idea of evolution that is widely accepted today. He proposed that all species alive have evolved through adaptation to their surroundings. Natural selection, the process by which varied traits that increase survival and enable reproduction are passed down from generation to generation, is probably the most famous principle from the book. Darwin's book also addresses the perhaps less well-known concept of artificial selection. Today artificial selection is more often called "selective breeding." Selective breeding involves breeding animals or plants for a specific, typically desirable trait. By doing so, the desired genes from the plant or animal will be passed on to its offspring.</p> <p>Dog breeding is one of the most common examples of artificial selection. You need only to tune into a dog show on TV to see the power of selective breeding at work. Crossbreeds, for example, are dogs born from parents of two different breeds. Mixed breeds are born from parents of more than two breeds, and pure breeds are born from a single breed. All three varieties are featured in most dog shows. Many of these dogs were bred to achieve certain desirable physical or behavioral traits.</p>

Beyond the context of dog shows, dogs are a particularly interesting example of selective breeding. After all, we call dogs “man’s best friend” for a reason. Dogs originally evolved from wolves. Eventually, humans were breeding different types of dogs to accomplish certain jobs. For example, some dogs were bred to hunt well. Others were bred with desired traits to herd cattle. But it was a trait known as “tamability,” or a dog’s ability to be tamed and live among people, that resulted in humans keeping dogs as pets. Now that many people live relatively quiet, domestic lives, how well a dog can herd sheep is not of huge importance. What matters most is whether a dog makes a good companion.

Charles Darwin may have been the first to describe the process of selective breeding, but the practice may be more than 2,000 years old. The Romans are said to have practiced selective breeding among their livestock, favoring cows that produced a lot of milk. But it wasn’t until the 18th century that farmers began practicing it on a large, industrial scale.

Today, farmers breed chickens to have extra-large breasts and to lay a lot of eggs. A wild fowl—a chicken that lives in the woods—lays between 20 and 30 eggs per year. In contrast, a chicken born out of selective breeding can lay as many as 300 eggs per year.

In the same way that chickens are selectively bred for having more meat and laying a greater amount of eggs compared to wild chickens, cattle are often selectively bred either for more meat or for more abundant milk production compared to cattle in the wild. Over the course of the 1700s, the size of bulls sold for slaughter increased dramatically—from around 300 pounds (about 140 kilograms) to nearly 800 pounds (about 360 kilograms)—as a result of selective breeding. Also, as a result of selective breeding, the dairy cow, which does not display a lot of girth or muscle, can produce enough milk for 10 calves. One can identify a dairy cow by its udders, which can hold over 5 gallons (over 19 liters) of milk.

Even though people selectively breed to yield animals with desired traits, there are dangers to selective breeding. Temple Grandin, an animal welfare advocate, notes that breeding animals for size and strength interferes with natural animal processes. Breeding roosters


	<p>for muscle, for example, can make them top-heavy and unsteady on their feet, interfering with their courtship dances. This, in turn, can alienate them from hens.</p> <p>Speaking of hens, what about those that were bred to lay 300 eggs per year? Laying one egg a day makes a hen's bones brittle, since the eggs soak up the bird's calcium supply. And what about so-called broiler chickens—the ones that are bred for their large breasts? Often, their bodies grow so fast that their skinny legs can't support them.</p> <p>Cows required to produce enough milk for 10 calves tend to burn out quickly. Cows not subject to selective breeding can live up to 30 years without burning out. But prolific dairy cows tend to make it just four or five years before they are considered worthless, and then they are sent to be slaughtered.</p> <p>Selective breeding comes with both benefits and drawbacks. Think of all the joy that dogs have offered humans in the form of companionship over the last 100 years. Selective breeding is to thank man's best friends. And yet, the pain and suffering that livestock endure makes us think twice. It is important to keep in mind that, in some cases, the negative consequences of selective breeding may outweigh the positive.</p> <p>2. Guiding Questions:</p> <ol style="list-style-type: none"> What is selective breeding? Give two examples of animals for which it is practiced. What are some positive and negative impacts of selective breeding? Which traits will the wool industry wish to keep when breeding sheep, goats and other animals for wool production?
Let's think	<p>1. How can the author's view of selective breeding best be described? Use information from the text to support your answer.</p>

2. Can selective breeding in humans be carried out? Which traits would you choose to keep or enhance and which would you choose to remove?

2

Activity



Activity	Life Cycle of a Silkworm - Creating a storyline
Materials required	Shells (or any small cylindrical object to wrap wool on), cotton wool, leaves, sticks and marshmallows (or white modelling clay)
Procedure	<ol style="list-style-type: none"> 1. Recall the life cycle of a silkworm theoretically. 2. Divide students in groups of four and provide them with the materials required. 3. Ask students to represent the different stages of the life cycle using the materials and then create a storyline for the same (they can name the characters, attach emotions to each of the stages, draw morals and values they learnt in the process). <div style="text-align: center;">  </div> <p>(Source: https://www.funlittles.com/life-cycle-of-a-silkworm-and-a-book-review/)</p>

Reflection questions	<ol style="list-style-type: none">1. Enact your story in front of the class highlighting what you learnt from the life of a silkworm and in the process of this activity.
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4. Heat

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Temperature	Categorize a given substance as hot & cold by a reliable measure (using temperature without touching).
Measuring Temperature (Clinical and Laboratory Thermometers)	Distinguish the Clinical thermometer from Laboratory thermometer (range, least count, units of measurement).
	Examine the need for Laboratory thermometer while doing experiments in the laboratories.
	List precautions while using a clinical and laboratory thermometer in order to identify the role of a kink.
Transfer of Heat	Observe the heating and cooling of objects in order to describe conduction.
	Devise an activity or elaborate a situation to show the rate of thermal conduction, convection & radiation.
	Apply the concept of convection to heating of land and water in order to predict the description of land and sea breeze.
	Explain why a substance remains in the same temperature in a Thermos flask or vacuum bottle
Clothes We Wear	Correlate the modes of transfer of heat to the usage of different clothes in different parts of the world (Polar, temperate, tropical, etc.)
	Devise an activity to show that woollen clothes are insulators/poor conductors of heat.

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Distinguish the Clinical thermometer from Laboratory thermometer (range, least count, units of measurement)	Differentiates materials and organisms such as, digestion in different organisms; unisexual and bisexual flowers; conductors and insulators of heat; acidic, basic and neutral substances; images formed by mirrors and lenses, etc., on the basis of their properties, structure and function
List precautions while using a clinical and laboratory thermometer in order to identify the role of a kink.	Conducts simple investigations on his/her own in order to seek answers to queries: (such as, can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?)
Devise an activity or elaborate a situation to show the rate of thermal conduction, convection & radiation	
Devise an activity to show that woollen clothes are insulators/ poor conductors of heat	
Critique the need for Laboratory thermometer while doing experiments in the laboratories	Explains processes and phenomena, e.g., processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.
Explain why a substance remains in the same temperature in a Thermos flask or vacuum bottle	
Correlate the modes of transfer of heat to the usage of different clothes in different parts of the world (Polar, temperate, tropical, etc.)	
Observe the heating and cooling of objects in order to describe conduction	Explains processes and phenomena in order to relate to science behind the phenomena/processes and develop scientific thinking skills: (such as, processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.)
Apply the concept of convection to heating of land and water in order to predict the description of land and sea breeze	
Categorize a given substance as hot & cold by a reliable measure (using temperature without touching)	Measures and calculates in order to demonstrate understanding of measurability of various scientific processes/phenomena: (such as, measurement and calculation of temperature; pulse rate; speed of moving objects; time period of a simple pendulum, etc.)
Distinguish the Clinical thermometer from Laboratory thermometer (range, least count, units of measurement)	



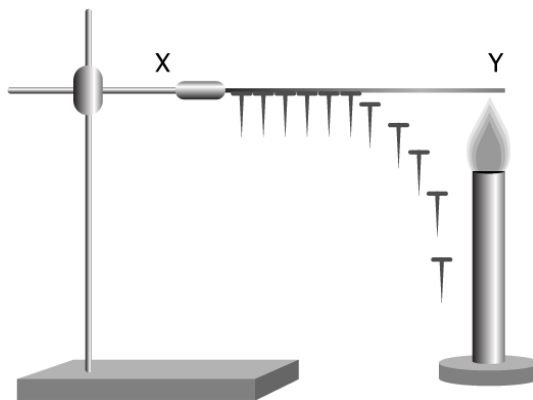
LOB: Categorize a given substance as hot & cold by a reliable measure (using temperature without touching)

1) What acts as an indication of the weather outside being very cold, with temperatures in the range of -2°C to 8°C ?

- (a) Mild sunlight
- (b) Fogged window panes
- (c) Leaves rustling in the wind
- (d) Heavy clouds and grey skies

Correct Answer: (b)

2) Several nails were attached to a metallic rod, through its length by using drops of wax as adhesive. This rod was placed horizontally with one end subjected to the flame of a burner, as depicted, below.



Nails closer to point Y begin to fall. If the burner is removed after a short while, nails closer to point X, remained affixed.

Which end of the rod is hotter, and why?

- (a) X is hotter as the wax and nails both remained stuck to the rod
- (b) X is hotter because heat moved from Y and was transferred to X
- (c) Y is hotter as the wax melted quicker due to the heat of the rod
- (d) Y is hotter as the gravity acted faster near Y, dropping the nails

Correct Answer: (c)

LOB: Distinguish the Clinical thermometer from Laboratory thermometer (range, least count, units of measurement)

1) What is the average range of a laboratory thermometer and how does it compare to the range of a clinical thermometer?

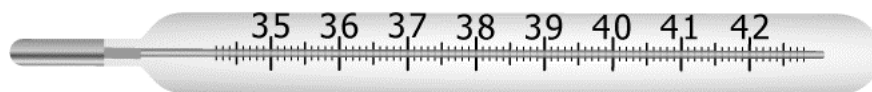
- (a) -10 to 110°C; much greater than the range of clinical thermometers
- (b) -100 to 100°C; much greater than the range of clinical thermometers
- (c) 10 to 50°C; much lesser than the range of clinical thermometers
- (d) 37 to 40°C; much lesser than the range of clinical thermometers

Correct Answer: (a)

2) From the pictures given below, find the least count of both the thermometers.



Laboratory thermometer



Clinical thermometer

How does the least count of the laboratory thermometer compare to that of the clinical thermometer's least count?

- (a) It is 0.3°C greater than least count of a clinical thermometer
- (b) It is 0.9°C greater than least count of a clinical thermometer
- (c) It is 0.5°C lower than least count of a clinical thermometer
- (d) It is 0.1°C lower than least count of a clinical thermometer

Correct Answer: (b)

LOB: Examine the need for Laboratory thermometer while doing experiments in the laboratories

1) Which instrument should be used to measure the boiling point of a liquid and why?

- (a) Clinical thermometer; it is easier to read.
- (b) Clinical thermometer; it has a greater range.
- (c) Laboratory thermometer; it is easier to read.
- (d) Laboratory thermometer; it has a greater range.

Correct Answer: (d)

2) Refer to the following statements:

- A. To study the behaviour of substances at different temperatures
- B. To measure boiling point and freezing point during a science experiment
- C. To measure human body temperature

Which of these statements justify the need of laboratory thermometers?

- (a) Only A
- (c) Only C
- (b) Both A and C
- (d) Both A and B

Correct Answer: (d)

LOB: List precautions while using a clinical and laboratory thermometer in order to identify the role of a kink

1) What role does the kink play in making the process of reading temperatures easier, and in which kind of thermometer does it help?

- (a) Kink inside the clinical thermometer prevents the mercury thread from falling.
- (b) Kink inside the laboratory thermometer lowers the mercury thread, faster.
- (c) Kink inside the laboratory thermometer requires it to be held still.
- (d) Kink inside the clinical thermometer requires it to be held upright.

Correct Answer: (a)

2) Student A, takes the temperature reading of Student B and holds the thermometer horizontally while moving it to correctly note the temperature. Student B argues that the reading is inaccurate

since Student A took too much time to read it and moved the thermometer a lot. Student A insists that the reading is accurate. What makes Student A so sure about the temperature reading?

- (a) Laboratory thermometers are always held horizontally to prevent fluctuations.
- (b) Clinical thermometers are held horizontally to prevent fluctuations.
- (c) Readings on a laboratory thermometer remain unchanged.
- (d) Readings on a clinical thermometer remain unchanged.

Correct Answer: (d)

LOB: Observe the heating and cooling of objects in order to describe conduction

1) Which of the following materials can be called a good conductor of heat?

- (a) Plastic
- (b) Wood
- (c) Metal
- (d) Air

Correct Answer: (c)

2) A child observes the process of ironing clothes. The base of the iron is very hot. The clothes are warm; however, the top handle of the iron is not warm at all. Which of the following is an *incorrect* conclusion, based on his observations?

- (a) Heat is trapped inside the iron's handle.
- (b) Heat is conducted by the iron on to the clothes.
- (c) The material of the iron's handle is an insulator.
- (d) The handle will not radiate any heat to bare hands.

Correct Answer: (a)

LOB: Devise an activity or elaborate a situation to show the rate of thermal conduction, convection & radiation

1) A student boils water in a pan, on an electric stove. Three incidents thus, occur.

1. The top of electric stove remains cold, yet heat reaches the pan
2. Water in the pan is boiled and produces steam

3. The handle of the pan becomes hot and requires a mitten to lift it

Which three processes do the three steps represent, in terms of heat transfer?

- (a) 1: Radiation, 2: Conduction and 3: Convection
- (b) 1: Convection, 2: Radiation and 3: Conduction
- (c) 1: Radiation, 2: Convection and 3: Conduction
- (d) 1: Convection, 2: Conduction and 3: Radiation

Correct Answer: (c)

2) An object and a source of heat are placed in two different experimental setups.

Setup 1: Vacuum is present between the object and the source in a confined tube.

Setup 2: Metallic fibres are stuffed into the space between the source and object, in a confined tube.

To achieve successful heating of the object, which modes of heat transfer must occur in the two setups?

- (a) Setup 1: Radiation, Setup 2: Convection
- (b) Setup 1: Radiation, Setup 2: Conduction
- (c) Setup 1: Insulation, Setup 2: Conduction
- (d) Setup 1: Insulation, Setup 2: Convection

Correct Answer: (b)

LOB: Apply the concept of convection to heating of land and water in order to predict the description of land and sea breeze

1) In coastal regions, when warm air from either land or sea rises, the cold air that replaces it creates a breeze. Which of the following is a correct description of such a breeze?

- (a) Land breeze is received by land during the daytime.
- (b) Sea breeze is received by sea from the land, at night.
- (c) Land gets heated quicker in the day and causes a sea breeze.

(d) Sea gets heated quicker during the day and causes a sea breeze.

Correct Answer: (c)

2) In coastal areas, in the day-time, the air circulation between unevenly heated land and sea, causes a sea breeze. Which natural processes are responsible for such air movements?

(a) Warm air from sea is radiated upwards and cold air rushes in, creating sea breeze.

(b) Warm air from land rises up by convection and cold air fills its place, as sea breeze.

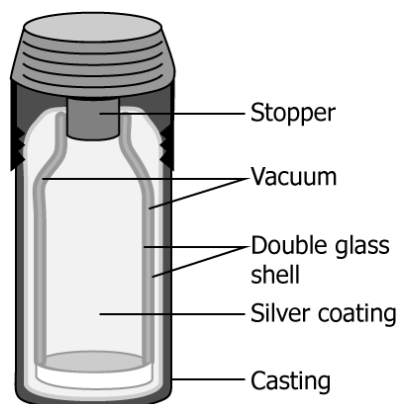
(c) Warm air from sea is conducted to air and cold air rushes in, creating land breeze.

(d) Warm air from land and warm air from sea, both rise and are cooled by insulation.

Correct Answer: (b)

LOB: Explain why a substance remains in the same temperature in a Thermos flask or vacuum bottle

1) Observe the following diagram of a thermos flask.



What purpose does the vacuum compartment in the thermos flask serve?

(a) It prevents insulation of heat by the bottle's surface.

(b) It prevents conduction of heat to the bottle's surface.

(c) It contains the heat by convection from the liquid.

(d) It provides radiation of heat within the liquid.

Correct Answer: (b)

2) A thermos flask provides insulation in order to maintain temperatures of hot and cold liquids for longer durations. The inner-most layer of a thermos flask is made of glass and is coated by silver paint on the outside. Which property of silver is made use in a flask?

- (a) Silver is highly malleable
- (b) Silver reflects thermal radiation
- (c) Silver is a good conductor of heat
- (d) Silver is not reactive at room temperature

Correct Answer: (b)

LOB: Corelate the modes of transfer of heat to the usage of different clothes in different parts of the world (Polar, temperate, tropical, etc.)

1) In a tropical country, during summers, which of the following materials is likely to absorb the least heat?

- (a) Yellow, rayon cloth
- (b) White cotton cloth
- (c) Blue denim cloth
- (d) Maroon silk cloth

Correct Answer: (b)

2) In cold climatic areas that receive a lot of snow, people wear thick coats with woollen inner linings and snow-resistant synthetic outer layer. Which is a property of the materials contributes most to protecting them from the cold?

- (a) Inner layer reflects the thermal radiation of the human body
- (b) Outer layer allows the conduction of heat throughout the coat
- (c) Outer layer restricts the conduction of cold winds inside the coat
- (d) Inner layer lets warmth from the body to be trapped within the coat

Correct Answer: (d)

LOB: Devise an activity to show that woollen clothes are insulators/ poor conductors of heat

1) A teacher describes a woollen cloth as a bad conductor of heat. A student tries to test this by trying to wear a woollen coat in the summer. He feels very hot and has to take it off. What explanation can be offered to the student to explain why wool is a bad conductor?

- (a) The wool conducts heat in the summers and insulates the body in the winters
- (b) The heat entered the coat because room temperature is higher in summers
- (c) The body heat was contained within the coat, as wool did not let it escape

(c) The property of the wool is relative to the outside temperature

Correct Answer: (c)

2) A student observes that when a folded sweater is pressed down and released, it easily gets pressed and then, instantly bounces back in shape. The student concludes that thick woollen fibres can trap a lot of air within their strands. Which option explains the how woollen sweaters protect us from cold weather?

(a) Convection provided by the wool fibres and insulation by air

(b) Insulation provided by the wool and conduction of body heat

(c) Insulation provided by the wool fibers and air trapped in them


(d) Convection of heat by the human body and reflection by wool

Correct Answer: (c)



I

Activity

Activity	Make Your Own Thermometer
Materials required	<p>Clear plastic drinking straw, ruler, permanent marker, small bottle with lid, 70 % rubbing alcohol, liquid food coloring, tissue papers, modelling clay, dropper, water, small bowl, ice cubes</p>  <p>(Source: www.sciencebuddies.org)</p>
Procedure	<ol style="list-style-type: none"> 1. Make $\frac{1}{2}$ cm markings on the straw. 2. Make a flattened ball of clay and push the straw through it. Remove any clay clogging the straw. 3. Pour alcohol in the bottle up to half its capacity. Add two drops of food colour and mix well. 4. Fill a dropper with this solution and set aside. 5. Place the clay on the mouth of the bottle and seal airtight such that the straw does not touch the bottom of the bottle. 6. Drop liquid in the dropper into the straw. 7. Take some ice in a small bowl and place the bottle in the bowl. What do you think will happen? Why?

	<ol style="list-style-type: none"> 8. Let the assembly stay for some time and then mark the level of liquid in the straw as 0 degree Celsius. 9. Hold the bottom of the bottle to warm it up and notice the liquid in the straw rising. 10. Now place the bottle in liquids at different temperatures and note the level of liquid inside the straw change.
Let's think	<ol style="list-style-type: none"> 1. What do you notice about the thermometer for the different water bowls? 2. Based on your observations, can you rank these bowls from coldest to warmest just by looking at the liquid level in the thermometer(s)? 3. Why does the liquid inside the tube fall when we put the thermometer in cold water and rise when we put it in warm water? 4. We would need to be able to measure the temperature of the air around us. Do you think we can also use this thermometer to do that? Why or why not?

Activity	<p>Investigate the Properties of Wool</p> <p>Objective: Investigate a raw wool fiber and draw out questions about how the physical (observable) features of greasy (raw) wool make it useful for a range of everyday products.</p>
Materials required	Laptop (or personal computer), projector, raw wool fibers, magnifying glass
Procedure	<ol style="list-style-type: none"> 1. Play the video, Sam the Lamb - What is Wool? and ask students the following guiding questions: <ol style="list-style-type: none"> a. How does wool protect sheep from cold weather? b. How does wool protect sheep from wet weather? 2. Get students in groups of 3-4 to make a list of properties that they think woolen clothes possess from watching the video. 3. Give each group a strand of raw wool fiber and a magnifying glass to closely investigate how the wool fiber looks like and note down their observations and draw what they observe. 4. Discuss how the features of wool they have been investigating in this activity might relate to the woolen clothes they have observed and used (for example, if wool helps to keep sheep warm when it is cold and cool when it is hot, wool clothing can do the same for people).
Let's think	<ol style="list-style-type: none"> 1. Watch The Innovator video and ask students to think about the types of weather conditions and activities in which they might choose to wear wool.

5. Acids, Bases and Salts

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Acids and Bases	Examine the common substance used at home based on taste and touch and classify them as acidic or basic
Natural and Synthetic Indicators	Summarizes observations with respect to behaviour of indicators in acidic and basic solutions.
Neutralisation	Identify neutralization reactions and its characteristics
Neutralisation in Everyday Life	Illustrates neutralization reactions seen in everyday life.
	Evaluate the effectiveness of certain neutralization reactions employed in everyday life, based on observed data.

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Examine the common substance used at home based on taste and touch and classify them as acidic or basic	Differentiates materials and organisms such as, digestion in different organisms; unisexual and bisexual flowers; conductors and insulators of heat; acidic, basic and neutral substances; images formed by mirrors and lenses, etc., on the basis of their properties, structure and function
Summarizes observations with respect to behavior of indicators in acidic and basic solutions	
Identify neutralization reactions and its characteristics	Conducts simple investigations on his/her own in order to seek answers to queries: (such as, can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?)
Summarizes observations with respect to behavior of indicators in acidic and basic solutions	

Identify neutralization reactions and its characteristics	Writes word equation in order to express chemical reactions: (such as, acid-base reactions; corrosion; photosynthesis; respiration, etc.)
Illustrates neutralization reactions seen in everyday life	
Evaluate the effectiveness of certain neutralization reactions employed in everyday life, based on observed data	Applies learning of scientific concepts in daily life/real life situations in order to solve problems/give solutions/take preventive measures/etc.: (such as, dealing with acidity; testing and treating soil; taking measures to prevent corrosion; cultivation by vegetative propagation; connecting two or more electric cells in proper order in devices; taking measures during and after disasters; suggesting methods for treatment of polluted water for reuse, etc.)

Test items



LOB: Examine the common substance used at home based on taste and touch and classify them as acidic or basic

1) Which of these substances is basic in nature?

- (a)**Baking soda
- (b)**Curd
- (c)**Lemon
- (d)**Orange

Correct Answer: (a)

2) A student studies that substance that tastes sour is generally acidic in nature. The table list a few substances found in the kitchen.

- | |
|---|
| <ol style="list-style-type: none">1. Curd2. Banana3. Amla4. Corn5. Orange |
|---|

Which of these substances are acidic in nature?

- (a) Apple and Corn
- (b) Curd and Amla
- (c) Banana and Corn
- (d) Orange and Banana

Correct Answer: (b)

LOB: Summarizes observations with respect to behaviour of indicators in acidic and basic solutions

1) A student understands that litmus solution has purple colour in distilled water. What colour is likely to be observed when it is placed in an acidic solution?

- (a) Blue
- (b) Green
- (c) Purple
- (d) Red

Correct Answer: (d)

2) A student has four solutions among which one is acidic in nature. She wants to identify the acidic solution using a litmus paper. Which of these observations would help identify the acidic solution?

- (a) Place blue litmus in the solution and see if it turns white
- (b) Place red litmus in the solution and see if it turns white
- (c) Place blue litmus in the solution and see if it turns red
- (d) Place red litmus in the solution and see if it turns blue

Correct Answer: (c)

LOB: Identify neutralization reactions and its characteristics

1) Which of these mixtures represents a neutralization reaction?

- (a) Acid + Acid
- (b) Acid + Base
- (c) Acid + Water

(d)Base +Water

Correct Answer: (b)

2) A student took a half-filled test tube with dilute hydrochloric acid and a few drops of phenolphthalein in the solution. As he put a few drops of sodium hydroxide into the solution, it turns to light pink. Further, he put a few extra drops of the acid and observes that the colour disappears. What caused the colour to disappear from the solution?

- (a)The volume of the solution increased
- (b)Turning of the mixture into a neutral solution
- (c)Decrease in the amount of acid in the solution
- (d)An increase in the amount of base in the solution

Correct Answer: (b)

LOB: Illustrates neutralization reactions seen in everyday life

1) Which of these activities represents a neutralization reaction in everyday life?

- (a)Meditation before going to bed
- (b)Drinking of water after consumption of food
- (c)Exercise in the morning with an empty stomach
- (d)Consumption of milk of magnesia during indigestion

Correct Answer: (d)

2) A student is stung by an ant while playing. An elderly person suggests rubbing moist baking soda in the region to get quick relief. What does moist soda do to the sting of an ant?

- (a) Increases the strength of the acid
- (b)Neutralizes the acidic from the sting
- (c)Preserves the acid for a longer time
- (d)Condenses the acid so that it does not spread

Correct Answer: (b)

LOB: Evaluate the effectiveness of certain neutralization reactions employed in everyday life, based on observed data

1) A scientist tests a soil sample from an uncultivated field and concludes that the soil is highly basic in nature. She suggests that adding organic matter in the soil could improve the quality of the soil. How does organic matter improve the quality of the soil?

- (a)** It releases acids which neutralises the soil
- (b)** It traps water vapor and increases the moisture content
- (c)** It makes the soil lighter so that it can be easily transported
- (d)** It acts as food for the organisms already present in the soil

Correct Answer: (a)

1) A researcher does some experiments on wastewater from a factory. He put a drop of the wastewater on a litmus paper. The litmus paper turned red. He mixed a certain solution into the water sample and retested it with a litmus paper. This time the colour did not change. The solution was added to the wastewater before releasing it into a nearby water body. What is the importance of the solution in the process?

- (a)** To increase the speed of water flow
- (b)** To identify the path of flowing water
- (c)** To change the colour of the wastewater
- (d)** To neutralize the acidity in the wastewater

Correct Answer: (d)

Suggested Teacher Resources



1

Activity

Activity	The Jet-Powered Boat
Materials required	Plastic bottle, straw, modelling clay, water, vinegar, baking soda, large water tub or pool
Procedure	<ol style="list-style-type: none">1. Take a plastic water bottle and drill a hole in its cap.2. Now, fill the bottle with half water and half vinegar slightly short of the top of the bottle.3. Keep a large pool or tub of water ready to run the boat.4. Put a straw through the hole of the cap and seal it with modelling clay.5. Add a spoonful of baking soda to the bottle.6. Cover the tip of the straw and quickly close the lid of the bottle.7. Release the tip of the bottle and propel it into the tub of water.
Let's think	<ol style="list-style-type: none">1. What caused the boat to move?2. Did you see any gas being released in the reaction?

2

Activity

Activity	The Chemistry of Hair Care
Materials required	Litmus paper, detergent powder, bathing soap, three shampoo samples, test tubes

Procedure	<div><div><div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div>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6. Physical and Chemical Changes

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Change	Differentiates physical changes from other changes (periodic changes etc) in order to characterize the common feature of physical changes
Physical Changes	Infer the effects which help you to identify a physical change.
Chemical Changes	Summarize various features accompanying chemical change
	Extrapolate the understanding of chemical change to new term Chemical Reaction & Chemical Bonding.
	Illustrates chemical change with specific examples
	Evaluate a given set of changes (in everyday life) on attributes of physical or chemical changes to distinguish between them
Rusting of Iron	Defend why rusting of iron is a chemical change
	Design an experiment to prevent rusting by eliminating/controlling a particular condition for rusting.
Crystallisation	Illustrate the usage of crystallization in purification of various salts.
	Judge why better crystallization occurs at lower temperatures.

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Infer the effects which help you to identify a physical change	Identifies materials and organisms, such as, animal fibres; types of teeth; mirrors and lenses, on the basis of observable features, i.e., appearance, texture, functions, etc.
Summarize various features accompanying chemical change	
Evaluate a given set of changes (in everyday life) on attributes of physical	

or chemical changes to distinguish between them	
Defend why rusting of iron is a chemical change	
Differentiates physical changes from other changes (periodic changes etc) in order to characterize the common feature of physical changes	Classifies materials and organisms based on properties /characteristics, e.g., plant and animal fibres; physical and chemical changes
Design an experiment to prevent rusting by eliminating/ controlling a particular condition for rusting	Conducts simple investigations on his/her own in order to seek answers to queries: (such as, can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?)
Illustrate the usage of crystallization in purification of various salts	
Judge why better crystallization occurs at lower temperatures	Relates processes and phenomena with causes, e.g., wind speed with air pressure; crops grown with types of soil; depletion of water table with human activities, etc.
Extrapolate the understanding of chemical change to new term Chemical Reaction & Chemical Bonding	Writes word equation in order to express chemical reactions: (such as, acid-base reactions; corrosion; photosynthesis; respiration, etc.)
Illustrates chemical change with specific examples	



LOB: Differentiates physical changes from other changes (periodic changes etc) in order to characterize the common feature of physical changes

1) Which of the following does not classify as a physical change?

- (a) Stretching of a rubber band
- (b) Dissolving sugar in water
- (c) Setting curd from milk
- (d) Melting of an ice cube

Correct Answer: (c)

2) A cube of ice, 2cm in length, is left out in a cup and it turns to water. The cup is then kept in the freezer. The ice formed has the diameter of the cup. What kind of change occurs in the ice and why?

- (a) Physical change with a change in state
- (b) A periodic change and naturally reforms over time
- (c) A direct change in shape from cube to thick a circle
- (d) A chemical change with formation of a new substance on melting

Correct Answer: (a)

LOB: Infer the effects which help you to identify a physical change

2) A student collects wax from a burning candle. He melts it and then adds a new wick to it and leaves it to cool. Can a new and functional candle be created by this process? Why or why not?

- (a) Yes; it is a reversible physical change in state of wax.
- (b) No; it is a physical change that cannot be reversed.
- (c) No; it is an irreversible chemical change with the formation of a new substance.
- (d) Yes; it a chemical change causing the wax to change from one state to another.

Correct Answer: (a)

2) A woman mixes flour, milk, eggs and water to create a batter, for baking a cake. The steps in the process are:

Step 1: Mix flour, water, eggs, sugar and milk in a bowl.

Step 2: Place the batter in a baking tray and bake a cake in the oven.

Which types of changes do each of these steps represent?

- (a) 1: Physical change, 2: Chemical change
- (b) 1: Physical change, 2: Physical change
- (c) 1: Chemical change 2: Chemical change
- (d) 1: Chemical change, 2: Physical change

Correct Answer: (a)

LOB: Summarize various features accompanying chemical change

1) Which of the following is an example of a chemical change?

- (a) A ripened fruit producing a smell
- (b) Changing state when an ice cube melts
- (c) A cake becoming smaller being cut into chunks
- (d) A change in shape when a ball of dough is pressed

Correct Answer: (a)

2) Which of the following are indicators that a chemical change has occurred in a substance?

- (a) Irreversibility of a substance after heating
- (b) A substance breaking into smaller pieces of itself
- (c) The expansion in size of a material upon being heated
- (d) A substance not resuming its original shape, after being pressed

Correct Answer: (a)

LOB: Extrapolate the understanding of chemical change to new term Chemical Reaction & Chemical Bonding

1) How is Ozone protecting earth from harmful ultraviolet radiation considered a chemical change?

- (a) Change in state of Ozone results in Oxygen
- (b) The reactants and products have the same properties
- (c) Ozone absorbs radiation and breaks down into Oxygen
- (d) Oxygen combines with radiation to form Ozone molecule

Correct Answer: (c)

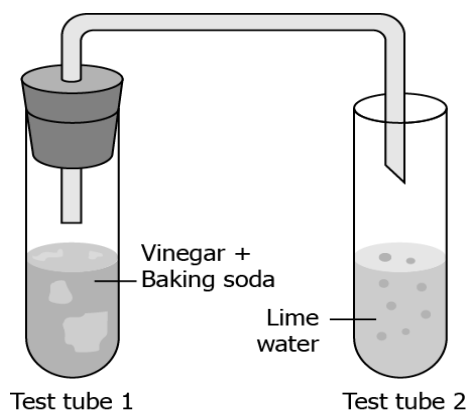
2) When a bit of magnesium ribbon is burnt, it glows to give off a bright white flame and some gases before it turns to ash. Which of the following statements about this process is correct?

- (a) Magnesium ribbon heats up and disintegrates into smaller particles
- (b) Pure Magnesium bonds with oxygen from air to form a new substance
- (c) Magnesium changes state from solid to gaseous and then to solid again
- (d) The ash so formed can be converted to pure Magnesium just by heating

Correct Answer: (b)

LOB: Illustrates chemical change with specific examples

1) When a bit of baking soda is added to vinegar in a test-tube, a hissing sound is heard and several bubbles occur. The test tube is closed and attached by a glass tube to another test tube containing lime water. The limewater slowly turns milky in the process. This is shown in the following experimental setup.

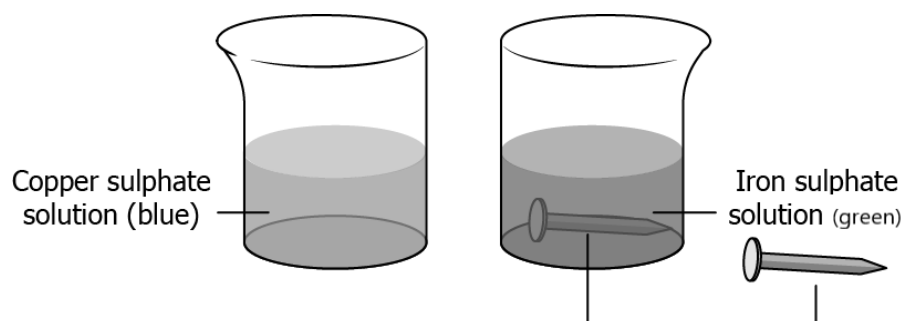


Which of the following cannot be considered indicators of a chemical reaction in this experiment?

- (a) Occurrence of a hissing sound
- (b) The formation of several bubbles
- (c) The change in color of liquid in tube 2
- (d) The movement of gas between the test tubes

Correct Answer: (d)

2) When an iron nail is dropped into a beaker containing a solution of copper sulphate, after a while, both the solution and the iron nail change colour. The nail gets a brownish coating and the solution turns green. The nail has a coating of Copper on its surface and the solution is detected to have the presence of an iron containing compound.



Change of colour can indicate both, a chemical or a physical change. Which kind of change does this experiment signify and why?

- (a) Physical change, because the nail only changes color on the surface not the whole.
- (b) Chemical change, due to deposit of a new substance on the nail.
- (c) Physical change, due to deposit of a different substance on the nail's surface.
- (d) Chemical change, because both, solution and solvent have a change

Correct Answer: (b)

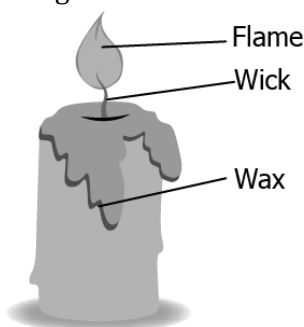
LOB: Evaluate a given set of changes (in everyday life) on attributes of physical or chemical changes to distinguish between them

1) In a bowl of ripe fruits a few fresh fruits were placed. The next day it was observed that the fresh fruits had ripened, and ripe fruits had rotted. What kind of change occurred within the fresh fruits?

- (a) Chemical change as the change cannot be reversed.
- (b) Chemical change as the shape of the fruit changes
- (c) Physical change as the color of fruit changes
- (d) Physical change fruits the appearance of the fruit alone changes

Correct Answer: (a)

2) When a candle is lit, what kinds of changes occur in the wax and the wick?



- (a) Chemical change in the wick, physical change in the wax
- (b) Physical change in the wax; chemical change in the wick
- (c) Chemical change in both the wick and wax; physical change in some wax
- (d) Physical change in both the wick and the wax; chemical change in the wick

Correct Answer: (c)

LOB: Defend why rusting of iron is a chemical change

1) What is a conclusive evidence that points towards rusted iron being a product of chemical change?

- (a) A change in state occurs
- (b) A new substance is formed
- (c) A change in colour is observed
- (d) Length of the iron object decreases

Correct Answer: (b)

2) What happens when an iron nail is exposed to air and water?

- (a) Iron undergoes oxidation to form ferrous oxide (FeO)
- (b) Air and moisture convert iron to form rust (Fe_2O_3)
- (c) Reaction of Iron with air to form Magnetite (Fe_3O_4)
- (d) Iron reacts with hydroxides to form iron (III) hydroxide ($\text{Fe}(\text{OH})_3$)

Correct Answer: (b)

LOB: Design an experiment to prevent rusting by eliminating/ controlling a particular condition for rusting

1) A student plans to conduct an experiment to study the formation of rust on iron. The absence of which of the following will not change the result?

- (a) Metallic iron
- (b) Water vapor
- (c) Gaseous Oxygen
- (d) Gaseous Hydrogen

Correct Answer: (d)

2) A student finds that a small iron pipe left outdoors in the sand gets rusted. Which of the following could be an aspect that could prevent rusting?

- (a) Burying the pipe in moist soil
- (b) Painting the surfaces of the pipe
- (c) Placing the pipe in a salt solution
- (d) Placing the pipe in a trough of water

Correct Answer: (b)

LOB: Illustrate the usage of crystallization in purification of various salts

1) Which of the following can be obtained by the process of crystallization, when a solution is left undisturbed for a long period of time and then allowed to evaporate to obtain pure crystals?

- (a) Pure iron oxide
- (b) Pure glassware
- (c) Crude table salt
- (d) Crushed coffee powder

Correct Answer: (c)

2) When solid copper sulphate is mixed to form a hot saturated solution with water and a small amount of acid, it leads to the formation of crystals of the same compound (copper sulphate).

Chemically, what is the purpose of this procedure?

- (a) To obtain a non-powdered form of the compound
- (b) To observe both, solid and liquid forms of the compound
- (c) Crystal form is easier to store and use than powdered copper sulphate
- (d) To get rid of impurities in the copper sulphate and obtain pure compound

Correct Answer: (d)

LOB: Judge why better crystallization occurs at lower temperatures

1) In the process of crystallization, a hot saturated solution of a substance is required. This solution is then cooled down to room temperature. Chemically, why is the solution made to lower its temperature?

- (a) To dissolve the impurities in the solution
- (b) To make it easier to pick up the beaker later
- (c) To enable the formation of crystals
- (d) To allow impurities to solidify in the solution

Correct Answer: (c)

2) In the process of forming crystals of Copper sulphate, it is added to boiling water with a few drops of sulphuric acid and stirred continuously. This solution on cooling down yields pure crystals.

Why are the crystals not formed when the solution is hot?

- (a) Impurities would persist at higher temperatures
- (b) The crystals can solidify only at room temperatures
- (c) Salt molecules can only precipitate at the cooler temperature
- (d) Impurities prohibit crystal formation above room temperature

Correct Answer: (c)



I

Activity

Activity	Crystal Snowflakes
Materials required	String, Wide mouth jar. White pipe cleaners, Blue food coloring (optional), Boiling water, Borax, Small wooden rod or pencil
Procedure	<ol style="list-style-type: none"> 1. Take a white pipe cleaner and cut it into three sections of the same size. Twist these sections together in the center so that you now have a shape of a six-sided star. 2. Take the top of one of the pipe cleaners and attach a piece of string to it. Tie the opposite end to your small wooden rod or pencil. 3. Carefully fill the jar with boiling water. 4. For each cup of water add three tablespoons of borax, adding one tablespoon at a time. Stir until the mixture is dissolved. 5. Add some of the optional blue food coloring to the mixture. 6. Put the pipe cleaner snowflake into the jar so that the small wooden rod or pencil is resting on the edge of the jar and the snowflake is sitting freely in the borax solution. 7. Leave the snowflake overnight and when you return in the morning you will find the snowflake covered in crystals!
Let's think	<ol style="list-style-type: none"> 1. Do all the tiny crystals look the same? Why? 2. What is the purpose of the pipe cleaner? 3. Why was the assembly left overnight and not cooled instantly? What difference would that have made?

7. Weather, Climate and Adaptations of Animals in Climate

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Weather	Recall details pertaining to weather & factors influencing its change.
	Generalizes observations from illustrations of weather related data.
	Infer patterns of weather, in connection with repeated behaviour of physical factors, etc.
	Speculate the reasons for unpredictability of weather, as an extension of physical factors and influence of the Sun.
	Analyse internet data for temperature variations in a day in order to identify the time periods in which maximum and minimum temperatures occur during a day and explain the utility of maximum minimum thermometers.
Climate	Infer patterns of weather that lead to the deduction of a particular type of climate by considering repetitive elements.
	Explains the advantage of technology in weather prediction in order to explain how it reduces the damage caused by cyclones
Adaptations	Recall details pertaining to characteristic features of climate, and animals and birds in the polar regions.
	Predict effects of absence of certain physical features of animals and birds in the polar regions, in connection with their survival in that climate
	On an outline map of the world mark the polar regions and the tropical regions and list the animals living in both these conditions.

	List the average weather conditions that contribute towards the polar climate in order to explain the adaptations in polar bears, penguins and migratory birds.
	Apply classification criteria use to categorize animals in tropical rainforest based on their physical features to categorize other animals with similar features
	Apply the understanding of adaptations to the requirement of common garden plants- ex. Care of succulents, common garden ferns, native species etc.
	Critique the idea that all animals and birds in tropical rainforests might not necessarily have features that will help in camouflaging them.

Learning Objectives and Learning Outcomes:

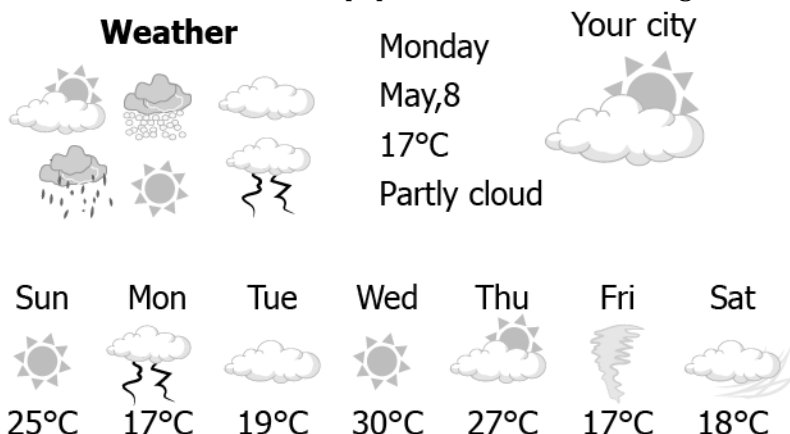
Learning Objectives	Learning Outcomes
Apply classification criteria use to categorize animals in tropical rainforest based on their physical features to categorize other animals with similar features	Classifies materials and organisms based on properties /characteristics, e.g., plant and animal fibres; physical and chemical changes
Recall details pertaining to characteristic features of climate, and animals and birds in the polar regions	Relates processes and phenomena with causes, e.g., wind speed with air pressure; crops grown with types of soil; depletion of water table with human activities, etc.
Predict effects of absence of certain physical features of animals and birds in the polar regions, in connection with their survival in that climate	
List the average weather conditions that contribute towards the polar climate in order to explain the adaptations in polar bears, penguins and migratory birds	
Apply the understanding of adaptations to the requirement of common garden plants- ex. Care of succulents, common garden ferns, native species etc.	
Critique the idea that all animals and birds in tropical rainforests might not necessarily have features that will help in camouflaging them	
Apply classification criteria use to categorize animals in tropical rainforest based on their physical features to categorize other animals with similar features	

Recall details pertaining to weather & factors influencing its change	Explains processes and phenomena in order to relate to science behind the phenomena/processes and develop scientific thinking skills: (such as, processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.)
Speculate the reasons for unpredictability of weather, as an extension of physical factors and influence of the Sun.	
Infer patterns of weather that lead to the deduction of a particular type of climate by considering repetitive elements	
On an outline map of the world mark the polar regions and the tropical regions and list the animals living in both these conditions	Explains processes and phenomena in order to relate to science behind the phenomena/processes and develop scientific thinking skills: (such as, processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.)
Generalizes observations from illustrations of weather related data	Plots graphs on the basis of given data, in order to interpret it: e.g., distance-time graph
Infer patterns of weather, in connection with repeated behaviour of physical factors, etc.	
Analyse internet data for temperature variations in a day in order to identify the time periods in which maximum and minimum temperatures occur during a day and explain the utility of maximum minimum thermometers	
Explains the advantage of technology in weather prediction in order to explain how it reduces the damage caused by cyclones	Applies learning of scientific concepts in daily life/real life situations in order to solve problems/give solutions/take preventive measures/etc.: (such as, dealing with acidity; testing and treating soil; taking measures to prevent corrosion; cultivation by vegetative propagation; connecting two or more electric cells in proper order in devices; taking measures during and after disasters; suggesting methods for treatment of polluted water for reuse, etc.)



LOB: Recall details pertaining to weather & factors influencing its change.

- 1) A student noticed a forecast in a newspaper, as shown in the image.

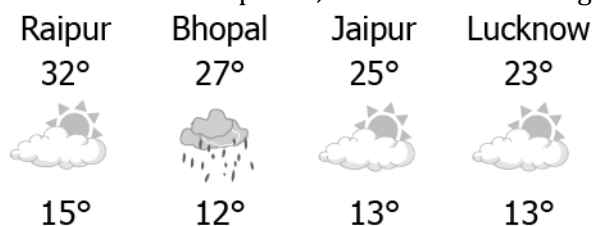


The student claimed that it is a weather forecast. Which best likely describes the reason for defining it as weather forecast?

- a) It is representing the temperature of a place
- b) It is representing the climatic conditions of a place
- c) It is representing the occurrence of rain in a place
- d) It is representing the day-to-day atmospheric conditions of a place

Correct Answer: (d)

- 2) A child was watching the news on television with his family members. The news was about the weather forecast of four different places, as shown in the image.



The child noticed that the weather condition in Bhopal is going to be different from the weather conditions of the other three places. What factor is affecting the weather in Bhopal?

- a) Humidity
- b) Rainfall
- c) Temperature
- d) Wind-speed

Correct Answer: (b)

LOB: Generalizes observations from illustrations of weather related data.

1) The table shows the weather data for a week of a north-western Indian state.

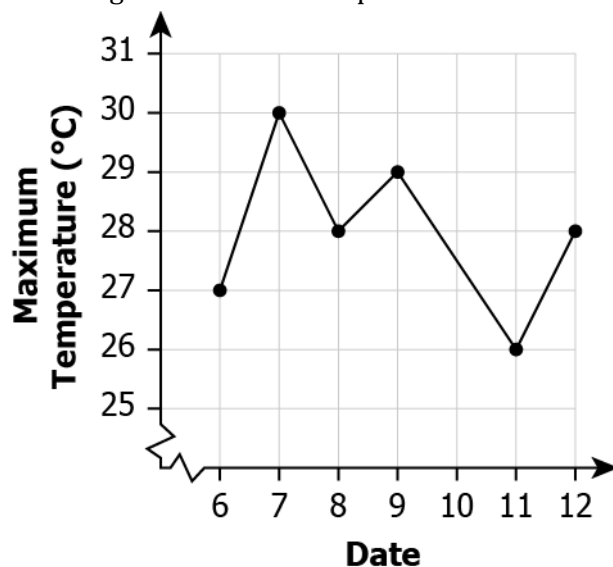
Day	Maximum Temperature (°C)	Minimum Temperature (°C)	Minimum Humidity (%)	Maximum Humidity (%)	Rainfall (mm)
1	39.1	28.2	45	60	-
2	36.2	29.3	51	73	-
3	32.5	24.4	61	80	23
4	36.3	25.5	48	75	-
5	35.5	22.3	49	77	-
6	37.4	29.1	44	63	-

What can be interpreted from this weather data?

- a) It is a winter season.
- b) It is a spring season.
- c) It is a rainy season.
- d) It is a summer season.

Correct Answer: (d)

2) The graph shows the change in maximum temperature from 06 to 12 September of a year.



On what date, the weather is less warm in comparison to other days?

- a) 06 September
- b) 07 September

- c) 09 September
- d) 11 September

Correct Answer: (d)

LOB: Infer patterns of weather, in connection with repeated behaviour of physical factors, etc.

- 1) A teacher planned a tour of class 7th students for a state X. The tour was for a week. The weather forecast predicted that there would be no rainfall and the temperature would be very high. What likely is the pattern of weather expected in state X?
- a) Hot and dry
 - b) Cold and sunny
 - c) Warm and humid
 - d) Cold and cloudy

Correct Answer: (a)

- 2) A student noticed that the average maximum temperature in the past week was 34.5 °C, and the average range of rainfall was 3.1 mm. The student watched the forecast report for the upcoming 6 days, as shown in the table.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Temperature (°C)	28	27	25	24	24	25
Rainfall (mm)	15.2	14.4	13.5	11.5	11.0	14.5

What change in the weather pattern is likely to be observed by the student in the upcoming week?

- a) The humidity in the air will increase, and weather will be warmer
- b) The humidity in the air will decrease, and weather will be warmer
- c) The humidity in the air will increase, and weather will be cooler
- d) The humidity in the air will decrease, and weather will be cooler

Correct Answer: (c)

LOB: Speculate the reasons for unpredictability of weather, as an extension of physical factors and influence of the Sun.

- 1) The table shows water vapour content in the air and temperature of four different areas.

Area	Water Vapour Content in the Air (%)	Temperature (°C)
A	30	10
B	30	25
C	30	20
D	30	31

What area would likely to have less relative humidity and why?

- a) Area A, as a decrease in temperature decreases the humidity.
- b) Area B, as an increase in temperature decreases the humidity.
- c) Area C, as a decrease in temperature decreases the humidity.
- d) Area D, as an increase in temperature decreases the humidity.

Correct Answer: (d)

- 2) A student made a table for the sunrise and sunset times for two different seasons, as shown in the table.

Month 1			Month 2		
Date	Sunrise	Sunset	Date	Sunrise	Sunset
17	5:40 AM	7:20 PM	17	7:05 AM	6:35 PM
19	5:39 AM	7:19 PM	19	7:07 AM	6:36 PM

The student knows that the revolution of the earth around the Sun alters the seasons. What can be concluded by the student about the seasons belongs to month 1 and month 2?

- a) Month 1 – Winter; Month 2 – Winter
- b) Month 1 – Summer; Month 2 – Winter
- c) Month 1 – Winter; Month 2 – Summer
- d) Month 1 – Summer; Month 2 – Summer

Correct Answer: (b)

LOB: Analyse internet data for temperature variations in a day in order to identify the time periods in which maximum and minimum temperatures occur during a day and explain the utility of maximum minimum thermometers.

- 1) A farmer wants to harvest his crops during the time of the day at which temperature remains minimum. The table shows the temperature at 4 different times of the day.

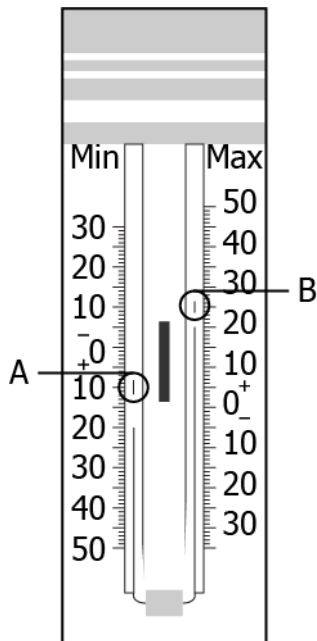
Time of the Day	Temperature (°C)
6:00 AM	20
11:00 AM	25
3:00 PM	32
7:00 PM	24

Which of these would be the most suitable time of the day to begin the harvest?

- a) 6:00 AM
- b) 11:00 AM
- c) 3:00 PM
- d) 7:00 PM

Correct Answer: (a)

- 2) The image shows a maximum-minimum thermometer.



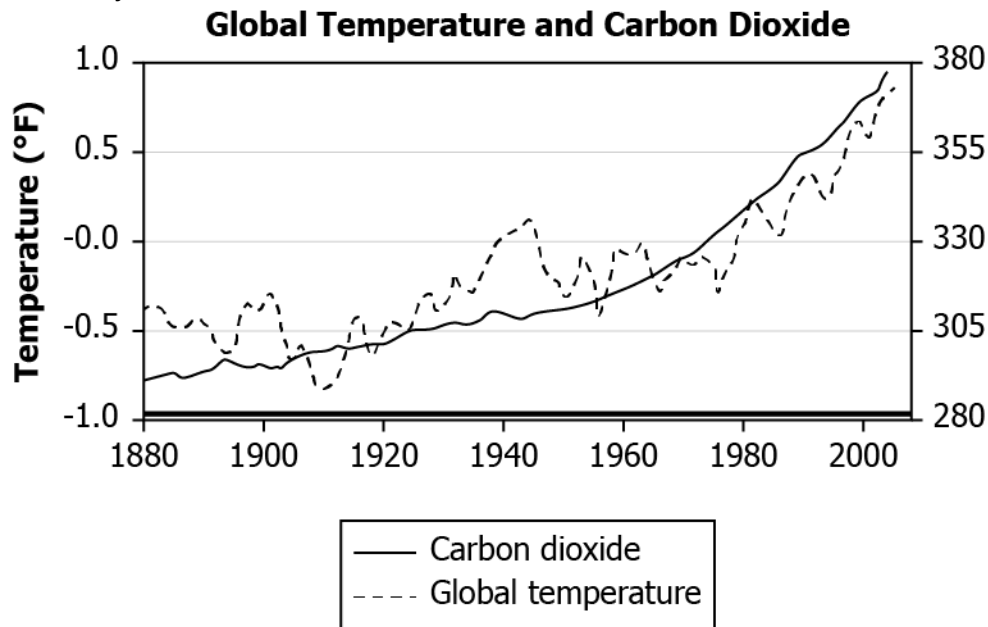
The thermometer shows the readings of minimum temperature, labelled as “A”, and maximum temperature, labelled as “B”. The temperature of what time period of the day has been indicated as reading “B”.

- a) Night
- b) Afternoon
- c) Late evening
- d) Early morning

Correct Answer: (b)

LOB: Infer patterns of weather that lead to the deduction of a particular type of climate by considering repetitive elements.

- 1) The increase in the concentration of carbon dioxide in the atmosphere increases the atmospheric temperature. The data shows the increase in global temperature from the year 1880 to the year 2000.

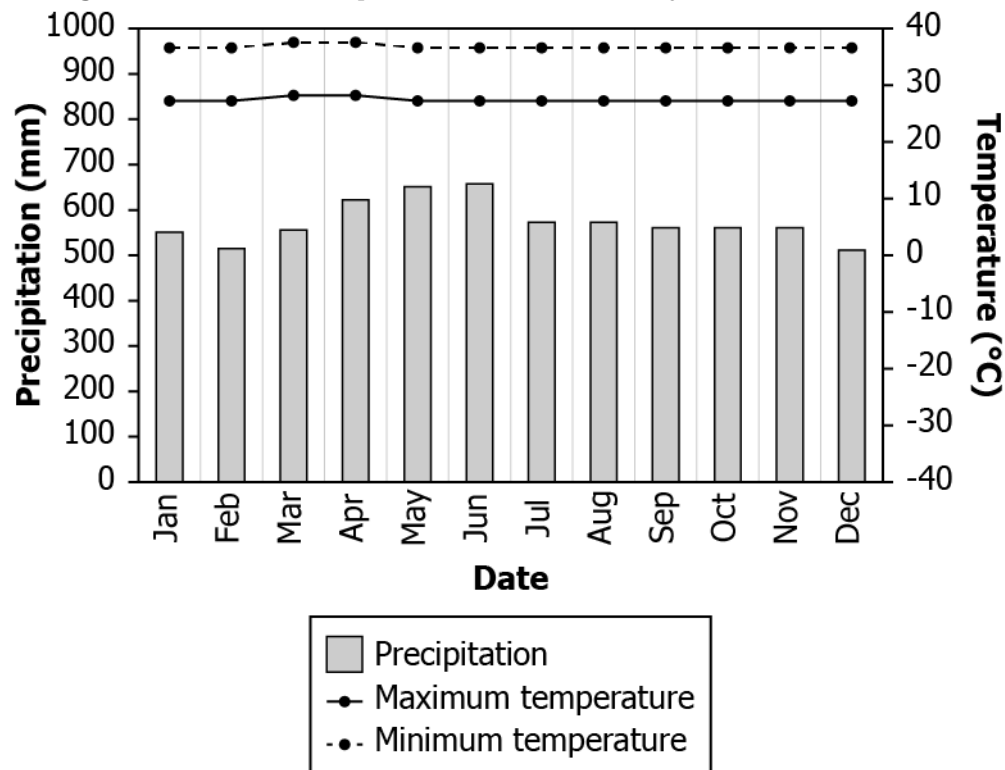


What can be evaluated from the graph?

- a) The increase in temperature will only affect the weather pattern of an area.
- b) The increase in temperature will only affect a season of a year of that area.
- c) The increase in temperature will affect the global climatic conditions.
- d) The increase in temperature will have no effect on the global climate and weather.

Correct Answer: (c)

2) The image shows the weather pattern of an area over a year.



What can *most likely* be concluded about the climate of the area?

- a) Hot and dry climate
- b) Hot and wet climate
- c) Cold and sunny climate
- d) Cold and cloudy climate

Correct Answer: (b)

LOB: Explains the advantage of technology in weather prediction in order to explain how it reduces the damage caused by cyclones

- 1) A meteorologist predicted the number and intensity of cyclones in an area that might occur. Which of these describes the advantage of this prediction?
 - a) It reduces the chances of a cyclone.
 - b) It reduces the strength of the cyclone.
 - c) It alerts the people about the expected weather dangers.
 - d) It protects the people by changing the direction of developing cyclone.

Correct Answer: (c)

- 2) Cyclones occurred in two regions, region A and region B. The cyclone was not predicted in region A, but region B had the prediction of the cyclone two weeks prior to it. Which region is likely to face more damage by the cyclone?

- a) Region A
- b) Region B
- c) Neither region A nor region B
- d) Damage in both the regions, A and B would be equivalent

Correct Answer: (a)

LOB: Recall details pertaining to characteristic features of climate, and animals and birds in the polar regions.

- 1) The table shows some characteristic features of animals.

- | |
|---|
| <ul style="list-style-type: none">• Large ears• Webbed feet• Red eyes• Giant body size• White fur |
|---|

Which of these characteristic features are an adaptation for animals and birds that live in the polar region?

- a) : Red eyes and white fur
- b) : Large ears and red eyes
- c) : Webbed feet and white fur
- d) : Large ears and webbed feet

Correct Answer: (c)

- 2) A researcher wants to do research on penguins. For this, the researcher has to provide favourable conditions to penguins for their survival as they are usually found in polar conditions. What kind of seasonal conditions should be maintained by the researcher in the lab for keeping penguins?
- a) : Cold summers and cold winters
 - b) : Warm summers and cold winters
 - c) : Wold summers and humid winters
 - d) : Very warm summers and warm winters

Correct Answer: (a)

LOB: Predict effects of absence of certain physical features of animals and birds in the polar regions, in connection with their survival in that climate

- 1) The table list some animal species with the presence and absence of some physical features in them.

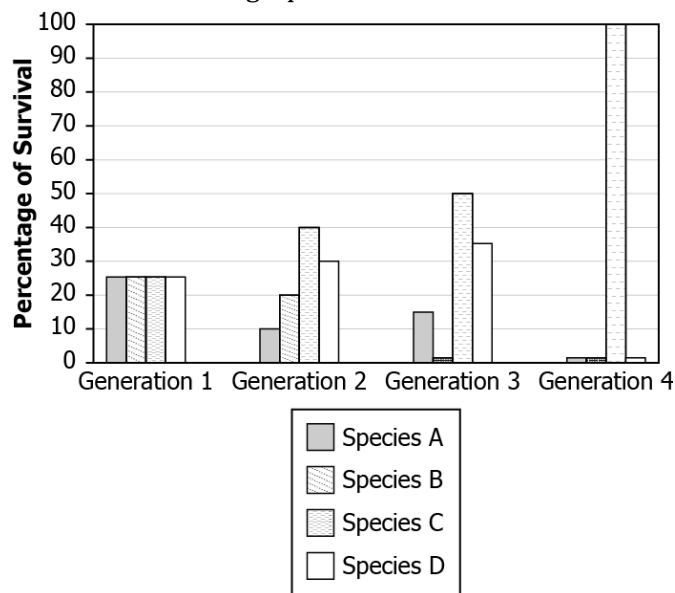
Species	Presence of a Thick Layer of Fat Under its Skin	Presence of White Furs	Maximum Humidity (%)
A	No	No	No
B	No	Yes	Yes
C	Yes	No	Yes
D	Yes	Yes	Yes

What of these species will NOT be able to survive in a polar region?

- a) Species A
- b) Species B
- c) Species C
- d) Species D

Correct Answer: (a)

- 2) A researcher introduced four different types of species in a polar area. The physical characteristics of all these species were different. The survivorship of these species was noticed over time, as shown in the graph.



What can be evaluated from the graph?

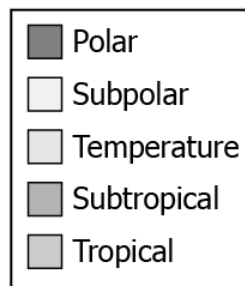
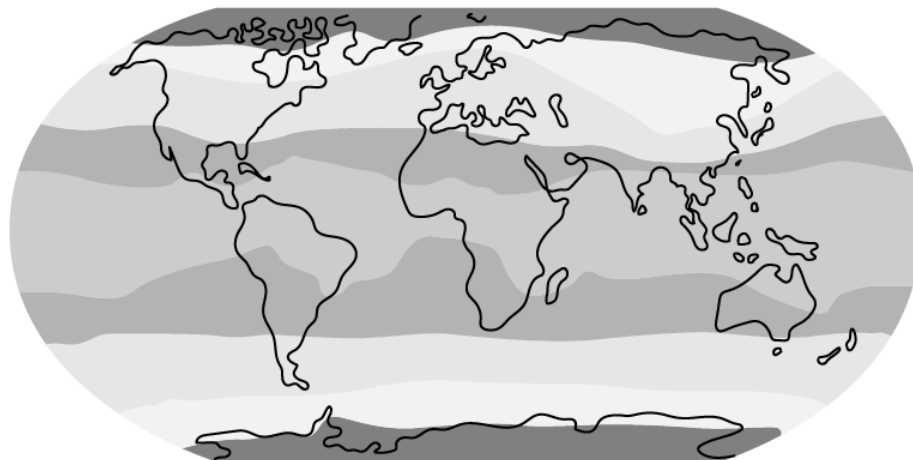
- a) The physical features present in species A make it more adapted to survive in the polar region than species B, C, and D.
- b) The physical feature present in species B makes it more adapted to survive in the polar region than the species A, C, and D.
- c) The physical feature present in species C makes it more adapted to survive in the polar region than the species A, B, and D.
- d) The physical feature present in species D makes it more adapted to survive in the polar region than the species A, B, and C.

Correct Answer: (c)

LOB: On an outline map of the world mark the polar regions and the tropical regions and list the animals living in both these conditions.

- 1) The image represents the outline map of the world and the various regions..

World Climates



Which of these animals can be found in the region located near the equator?

- a) Elephant
- b) Penguin
- c) Polar bear
- d) Seals

Correct Answer: (a)

- 2) The table shows some countries grouped as group 1 and group 2 based on the polar regions and tropical rainforests.

Group 1	Group 2
<ul style="list-style-type: none">• Greenland• Norway• Sweden	<ul style="list-style-type: none">• Brazil• Indonesia• Kenya

Which option correctly lists the animals that can tolerate the climatic conditions of countries in group 1 and group 2?

- a) Group A-Apes; Group B-Monkey
- b) Group A-Seals; Group B-Penguins
- c) Group A-Monkey; Group B-Polar bears
- d) Group A-Penguins; Group B-Monkey

Correct Answer: (d)

LOB: List the average weather conditions that contribute towards the polar climate in order to explain the adaptations in polar bears, penguins and migratory birds.

- 1) The table lists the physical characteristic features of a polar bear.

- | |
|--|
| <ul style="list-style-type: none">• White fur• A thick layer of fur• Large and wide paws• Long curved and sharp claws• A thick layer of fat under their skin |
|--|

Polar bears are good swimmers. What physical characteristic features of a polar bear helps it to swim well?

- a) A thick layer of fur
- b) Large and wide paws
- c) Long curved and sharp claws
- d) A thick layer of fat under their skin

Correct Answer: (b)

- 2) A student visited Sultanpur Bird Sanctuary in July and revisited it in January. The student noticed some new variety of birds in January, as listed in the table.

- Siberian cranes
- Greater flamingo
- Bar-headed goose
- Amur falcon

What could be the reason behind this?

- a) These birds hide in summer and seek out in winters
- b) A favourable breeding season for these birds is winters
- c) The death of these birds in June due to extremely hot summers
- d) Migration of these birds from other countries to escape the extreme cold conditions

Correct Answer: (d)

LOB: Apply classification criteria use to categorize animals in tropical rainforest based on their physical features to categorize other animals with similar features

- 1) Tigers that live in tropical rainforest usually possess long teeth so that they can kill their prey easily. An elephant is also adapted with a similar kind of physical characteristic that makes it able to handle the competition for food. How are elephants adapted for this?
- a) Larger body size
 - b) The presence of tusks
 - c) Knee caps in back legs
 - d) The presence of large ears

Correct Answer: (b)

- 2) The image shows the bird toucan that possesses a long and large beak.



A student thought about the adaptation of curved beak in parrots, which allows them to crack nuts easily. A student claimed that beak in toucans is also a beneficial adaptation. Is the claim made by the student correct?

- a) No; Long beak does not allow toucan to fly faster.
- b) Yes; Long beak allows toucan to bore into trees to make their homes.
- c) No; Long beak does not allow toucan to preserve body heat during winters.
- d) Yes; Long beak allows toucan to reach for fruits on branches that cannot support its weight.

Correct Answer: (d)

LOB: Apply the understanding of adaptations to the requirement of common garden plants-ex. Care of succulents, common garden ferns, native species etc.

- 1) Aloe Vera is a plant kept by people inside their houses as it can clean air. Aloe Vera is adapted to survive in low light conditions. What likely is the adaptation of Aloe Vera to survive in low-light conditions?
- a) The curved shape of its leaves
 - b) The presence of spines on its leaves
 - c) The presence of gel present inside the leaves
 - d) The presence of chlorophyll in excess amount in its leaves

Correct Answer: (d)

- 2) A student observed some succulents in his garden and noticed the presence of some spiny structures on their body. The image shows the succulents observed by the student.



The student claimed that the presence of spines on their body is an adaptation for them. Which statement supports this claim?

- a) The presence of spines makes the succulents more beautiful.
- b) The presence of spines allows the succulents to absorb more sunlight.
- c) The presence of spines in succulents allows them to lose less water from their body.
- d) The presence of spines in succulents allows them to catch pollen grains dispersed in the air.

Correct Answer: (c)

LOB: Critique the idea that all animals and birds in tropical rainforests might not necessarily have features that will help in camouflaging them.

- 1) The image shows a herd of zebras.

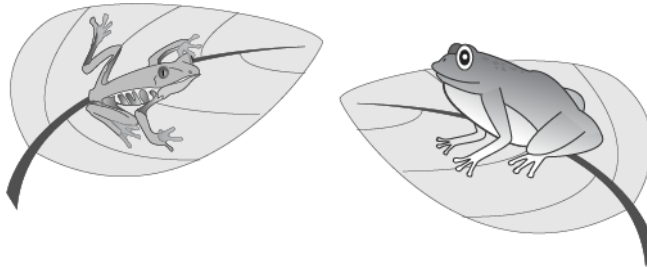


The stripes on the zebra body do not allow them to blend in with the surrounding. So, they move in clusters to get protected by predators. How the clustering together of zebras helps them to prevent predators?

- a) Predator gets frightened when they see herds of zebras.
- b) Clusters help zebras to camouflage in long wavy grasses.
- c) It becomes difficult for predators to stalk an individual zebra.
- d) The herd of zebras appears like a rocky surface to the predators.

Correct Answer: (c)

- 2) The image shows a green frog and a poison dart frog.



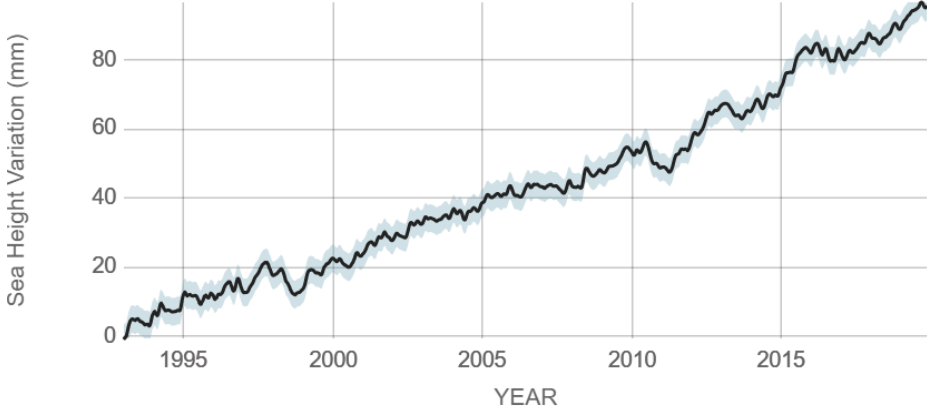
What conclusion likely to be made from the image?

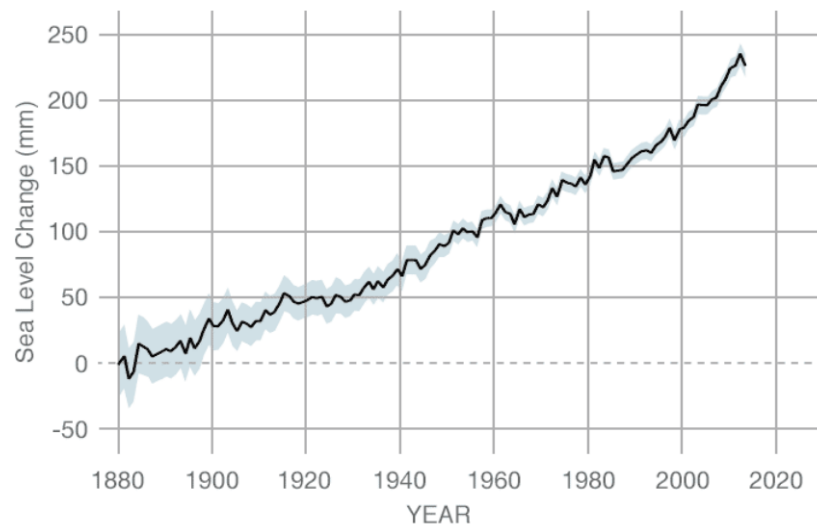
- a) Only green frog has the features that will help it to camouflage.
- b) Only poison dart frog has the features that will help it to camouflage.
- c) Green frog and dart frog both have the features that will help them to camouflage.
- d) Green frog and dart frog, both cannot camouflage because of the absence of specific features.

Correct Answer: (a)



Activity

Activity	Flood Maps
Materials required	Access to the internet, laptop (or personal computer), projector, data prints
Procedure	<p>1. Students analyse the given data in small groups and answer the reflection questions.</p> <p>Sea level rise is caused primarily by two factors related to global warming: the added water from melting ice sheets and glaciers and the expansion of seawater as it warms. The first graph tracks the change in sea level since 1993 as observed by satellites.</p> <p>The second graph, derived from coastal tide gauge data, shows how much sea level changed from about 1870 to 2000.</p> <p>(Source: https://climate.nasa.gov/vital-signs/sea-level/)</p>  <p>Source: climate.nasa.gov</p>



2. Zoom into your region (or country) on the [Flood Maps](#) and look at the impact of the rising water levels on the landmass.

Let's think

SEA LEVEL DATA - NASA VITAL SIGNS

1. What does the given data represent?
2. What inferences can you draw from the given data?
3. What could be the possible reasons for the increase in sea levels across the globe?
4. How do you think this impacts the life of people, plants, animals and other living organisms on land and in water?

FLOOD MAPS

1. What effect will the rising sea level have on your region (or country)?
2. How will it impact the life of people, plants, animals and other living organisms on land and in water in your country?

8. Winds, Storms and Cyclones

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Wind and Properties of Air	Recall details pertaining to air & effects of air pressure.
	Apply the knowledge that air exerts pressure in order to explain phenomenon of cyclones.
	Demonstrate an experiment in order to conclude that high speed winds are accompanied by low air pressure by the method of scientific inquiry.
	Demonstrate an experiment in order to conclude that air moves from a region of high pressure to a region of low pressure.
	Demonstrate an experiment in order to conclude that air expands on heating.
Generation of Wind	Attribute the direction of movement of wind currents to the uneven heating of atmosphere at various regions of earth & rotation of earth.
	Recall the concept of land breeze and sea breeze in order to describe monsoon winds.
Thunderstorms and Cyclones	Suggest the possible reasons for absence of cyclones/thunderstorms in certain areas where as their abundance in others.
	Describe the structure of a cyclone in order to list factors that contribute to its development and explain the damage it causes.
	Recall details about safety measure & precautions against Cyclones, Thunderstorms & Tornadoes
	Implement knowledge of storms/cyclones/tornados and safety measure and precautions against them in order to devise new safety measures and precautions.
	Summarize the consequences of absence of precautionary measures against storms/cyclones/tornados, etc.

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Demonstrate an experiment in order to conclude that high speed winds are accompanied by low air pressure by the method of scientific inquiry.	Conducts simple investigations on his/her own in order to seek answers to queries: (such as, can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?)
Demonstrate an experiment in order to conclude that air moves from a region of high pressure to a region of low pressure.	
Demonstrate an experiment in order to conclude that air expands on heating.	
Apply the knowledge that air exerts pressure in order to explain phenomenon of cyclones.	Relates processes and phenomena with causes, e.g., wind speed with air pressure; crops grown with types of soil; depletion of water table with human activities, etc.
Attribute the direction of movement of wind currents to the uneven heating of atmosphere at various regions of earth & rotation of earth.	
Recall the concept of land breeze and sea breeze in order to describe monsoon winds.	
Suggest the possible reasons for absence of cyclones/thunderstorms in certain areas where as their abundance in others.	
Describe the structure of a cyclone in order to list factors that contribute to its development and explain the damage it causes.	
Recall details pertaining to air & effects of air pressure.	Explains processes and phenomena in order to relate to science behind the phenomena/processes and develop scientific thinking skills: (such as, processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.)

Recall details about safety measure & precautions against Cyclones, Thunderstorms & Tornadoes	Applies learning of scientific concepts in daily life/real life situations in order to solve problems/give solutions/take preventive measures/etc.: (such as, dealing with acidity; testing and treating soil; taking measures to prevent corrosion; cultivation by vegetative propagation; connecting two or more electric cells in proper order in devices; taking measures during and after disasters; suggesting methods for treatment of polluted water for reuse, etc.)
Implement knowledge of storms/cyclones/tornados and safety measure and precautions against them in order to devise new safety measures and precautions.	
Summarize the consequences of absence of precautionary measures against storms/cyclones/tornados, etc.	

Test items



LOB: Recall details pertaining to air & effects of air pressure.

1) Which of the following is a known property of air?

- (a) Air sinks down on heating
- (b) Air expands on cooling
- (c) Air exerts pressure
- (d) Air is weightless

Correct Answer: (c)

2) Which of the following denotes the correct relation of air with pressure?

- | | |
|---|--|
| (a) Higher the speed of wind, lower is the air pressure. | (c) Lower the speed of wind, lower is the mass of air. |
| (b) Lower the pressure of air, lower is the speed of air. | (d) Higher the mass of air, higher is the air pressure |

Correct Answer: (a)

LOB: Apply the knowledge that air exerts pressure in order to explain phenomenon of cyclones.

1) During a cyclone formation, warm air suddenly rises and is replaced by cooler air, near the ground. What effect does the warmer air's movement cause?

- (a) Air pressure gradually increases
- (b) Air pressure suddenly increases
- (c) Air pressure suddenly decreases
- (d) Air pressure increases then decreases

Correct Answer: (c)

2) Which of the following, best describes a cyclone?

- (a) Very low air pressure system with very high-speed winds.
- (b) Very high air pressure system with very high-speed winds.
- (c) Very low air pressure system with a long, funnel-like cloud.
- (d) Very high air pressure system with a long, funnel-like cloud.

Correct Answer: (a)

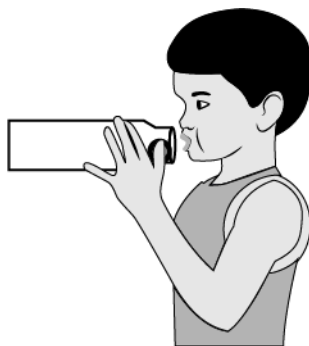
LOB: Demonstrate an experiment in order to conclude that high speed winds are accompanied by low air pressure by the method of scientific inquiry.

1) A teacher hypothesises that high speed winds lead to reduced air pressure. To demonstrate this, he cuts a long strip of paper, holds one end of it firmly and blows over it, from that end. Which of the following results would support his hypothesis?

- | | |
|--|---|
| (a) The strip of paper moves sharply upwards | (c) The strip of paper lets wind pass, undisturbed |
| (b) The strip of paper moves sharply downwards | (d) The strip of paper wriggles violently in all directions |

Correct Answer: (a)

1) As a demonstration in class, a student was asked to blow into a bottle that had a small paper ball placed just inside its mouth. The paper ball did not move into the bottle, during this exercise.



Why does the paper ball remain at the mouth?

- (a) The wind speed was not enough to push the ball inwards
- (b) Air pressure was higher at the mouth than inside the bottle
- (c) The ball exerted pressure that resisted the wind at the mouth
- (d) Air pressure was lower at the mouth and higher inside the bottle

Correct Answer: (d)

LOB: Demonstrate an experiment in order to conclude that air moves from a region of high pressure to a region of low pressure.

1) Two balloons were suspended from a string, with a gap of 30 centimetres, between them. A child blows air between the balloons to make them move. He notices that the balloons instead of moving apart moved closer together. Which of the following contributed to this occurrence?

- (a) Blowing air created a low air pressure zone.
- (b) The material of the balloons attracted each other, naturally.
- (c) The air on opposite sides of the balloons had lower air pressure.
- (d) The string on which the balloons were suspended faced high pressure.

Correct Answer: (a)

2) A small piece of paper was lit and dropped into a glass jar. A balloon was gently placed over the mouth of the jar, as the paper burned. It was then observed that part of the balloon moved into the jar on its own and wedged itself in.



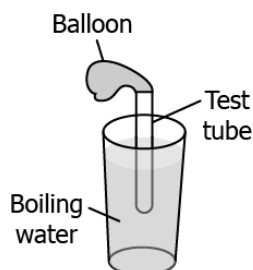
Given that the flame consumes oxygen from the jar, explain why the balloon moves inwards.

- (a) The hot flame caused the balloon's material to suddenly expand.
- (b) The flame from the burning paper attracted the material of the balloon.
- (c) The consumption of oxygen made more room for the balloon inside the jar.
- (d) High air pressure outside the jar pushed balloon into the lower pressure zone.

Correct Answer: (d)

LOB: Demonstrate an experiment in order to conclude that air expands on heating.

1) When a deflated balloon is attached to the mouth of an empty test tube, and the tube is immersed in a glass filled with boiling water, which of the following would be observed?

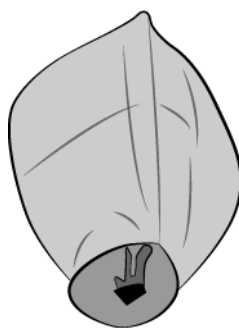


- (a) The test tube breaks.
- (b) The balloon gets inflated.
- (c) The balloon gets sucked into the test tube.
- (d) The balloon's material gets burnt at the rim.

Correct Answer: (b)

LOB: Demonstrate an experiment in order to conclude that air expands on heating.

1) A teacher makes a paper lantern, out of lightweight paper, in the shape of a large balloon. The base of the lantern has a suspended wick in the centre. Two students volunteer to hold the lantern vertically, as the teacher lights the wick.



Soon, the students felt the lantern is pushing upwards, and eventually it takes flight. Which attribute of matter is responsible for this?

- (a) The light weight paper heated up and rose upwards.
- (b) The air inside the lantern expanded and rose upwards.

(c) Pressure exerted on the walls of the lantern made it fly.

(d) Pressure exerted by cold air outside the lantern made it fly.

Correct Answer: (b)

LOB: Attribute the direction of movement of wind currents to the uneven heating of atmosphere at various regions of earth & rotation of earth.

1) The air around the Equator moves towards both the north and south of the Equator, in summer. This warm air rises upwards and cold air rushes to fill its place, creating air circulation. Where is this cooler air coming from?

(a) Winds produced by rising polar air

(b) Winds between 0-30 degrees latitude

(c) Winds between poles and 60 degrees latitude

(d) Winds from the pole which tilts further from the Sun.

Correct Answer: (b)

2) A scientist observed that the circulation of warm and cool winds from the equator move in the anticlockwise direction in the north, whereas, it moves in the clockwise direction in the south of equator. What causes this difference in direction of movement of wind currents?

(a) A difference in air pressure between hot and cold air

(b) Faster rotation of Earth at the equator than the poles

(c) Difference in movement of north and south ocean currents

(d) The changing distance between Earth & Sun during a revolution

Correct Answer: (b)

LOB: Recall the concept of land breeze and sea breeze in order to describe monsoon winds.

1) Which of the following is the characteristic of a monsoon wind in a coastal region in summers?

(a) A warm breeze from land to sea

(b) A warm breeze from sea to land

(c) Water containing wind from sea to land

(d) Water containing wind from land to sea

Correct Answer: (c)

2) What kind of differential heating occurs, affecting winds during the monsoon season?

(a) Land is hotter than water so warm air rises up and moves towards the sea

(b) The sea is hotter than land, so warm air rises up and moves towards land

(c) The sea and land both get heated and lead to rising warm air and low pressure

(d) The sea is cooler than land since warm wind moves towards land

Correct Answer: (a)

LOB: Suggest the possible reasons for absence of cyclones/thunderstorms in certain areas, whereas their abundance in others.

1) There are certain regions in the world where cyclones are less likely to occur. These are generally areas surrounded by oceans with colder water currents and high-speed winds. Why do these attributes result in lower possibility of a cyclone?

(a) Cold ocean currents make evaporation more difficult

(b) Cyclones form when hot air rises from warm oceanic surfaces

(c) Cyclones form when speed wind and high-pressure regions develop

(d) High speed wind over colder oceanic regions leads to temperature drop

Correct Answer: (b)

2) Which of the following factors contribute towards a lower probability of cyclones occurring over a region?

(a) Warm sea surface temperature

(c) Lower humidity

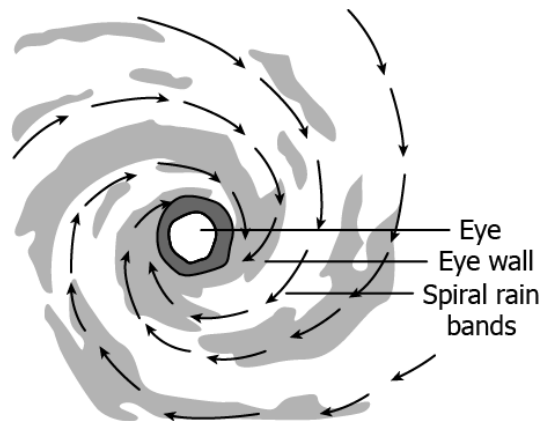
(b) Warm ocean currents

(d) Thunderstorms

Correct Answer: (c)

LOB: Describe the structure of a cyclone in order to list the factors that contribute to its development and explain the damage it causes.

1) Consider the following diagram of wind flow in a cyclone, as seen from above.



What are some characteristics of the region the area labelled “eye”?

(a) High speed winds and no clouds

(b) Large clouds and cold winds

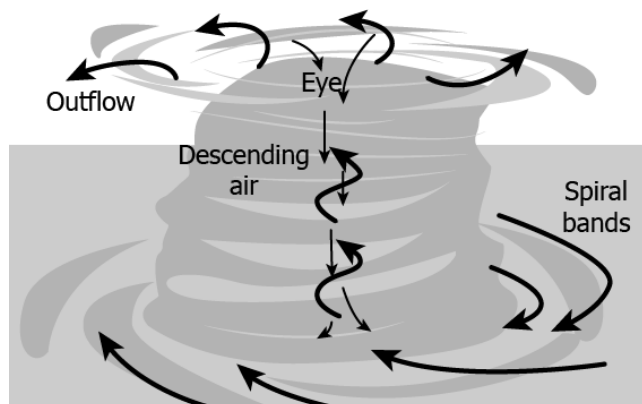
(c) Light clouds and humid air

(d) No clouds and light winds

Correct Answer: (d)

LOB: Describe the structure of a cyclone in order to list the factors that contribute to its development and explain the damage it causes.

1) Consider the following diagram of a cyclone formation.



The region of land or oceans under the “spiral bands” of a cyclone, generally experiences which of the following?

(a) Thunderstorms and property damage

(c) Brief snowstorms and cold winds

(b) Mild rainfall and high-speed winds

(d) Cloud bursts and flooding

Correct Answer: (a)

LOB: Recall details about safety measures and precautions against cyclones, thunderstorms & tornados.

1) Which of the following measures must be taken when one is stranded in a region experiencing a cyclone?

(a) Drive towards the eye of the cyclone

(b) Stay indoors, away from the windows

(c) Move to the highest point in the building

(d) Move out of your homes, into an open field

Correct Answer: (b)

2) As a precautionary measure during thunderstorms, it is advised to not use umbrellas with metallic ends or to stand anywhere close to metallic poles and large structures. What might be the reason behind this?

(a) The metallic items my get damaged by lightning.

(b) Heavy rainfall may lead to rusting of metallic structures.

(c) Lightning is attracted by metal, which is a good conductor.

(d) In case a heavy metallic object were to fall, it could be fatal.

Correct Answer: (c)

LOB: Implement knowledge of storms/cyclones/tornados and safety measures and precautions against them in order to devise new safety measures and precautions.

1) In the event of a cyclone, if the water supply in a city is affected, what can be done to ensure safe drinking water at home?

- (a) Tap water should be boiled and filtered
- (b) Soil in flood water should be allowed to settle
- (c) Rainwater should be passed through sand filter
- (d) Groundwater water should be boiled repeatedly

Correct Answer: (a)

LOB: Implement knowledge of storms/cyclones/tornados and safety measure and precautions against them in order to devise new safety measures and precautions.

2) A region that is prone to tornados, more recently has been experiencing more and more extreme weather events, as a result of climate change. Besides taking precautions during such events, what can residents of such areas do to ensure their safety, before such an event occurs?

- | | |
|---|---|
| (a) Mandate a community-wide tornado watch squad | (c) Harvest rainwater in open reservoirs for the community |
| (b) Build underground bunkers and stock up food & water | (d) Assign an open field as a place to gather, during emergencies |

Correct Answer: (b)

LOB: Summarize the consequences of absence of precautionary measures against storms/cyclones/tornados, etc.

1) The alert for an approaching cyclone is issued between 48-24 hours before the cyclone hits a town. If such an alert is avoided, what is an avoidable repercussion, of NOT being prepared?

- (a) Flooding in the streets
- (b) Loss of electricity supply
- (c) Damage to roofs of houses
- (d) Lack of stored food supply

Correct Answer: (d)

2) In cyclone prone coastal towns, while damage to infrastructure may be unavoidable, what steps can be taken by the authorities, in order to minimize the loss of life of inhabitants in these regions?

- (a) Make sure no leakages are present in water supply
- (b) Install wave-breakers, just off the coast of the town

(c) Heed cyclone warnings and call for timely evacuation

(d) Assign zones within the city, for all residents to gather

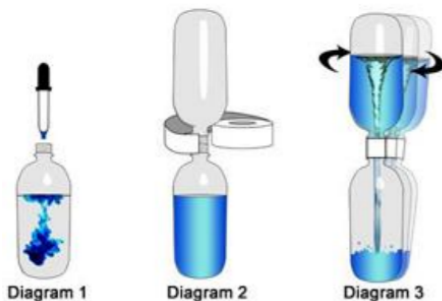
Correct Answer: (c)

Suggested Teacher Resources



Activity



Activity 1	Cyclone in a Bottle
Materials required	2 two-liter empty plastic bottles, masking tape, food colour, 1.5-liter water, stopwatch, masking tape
Procedure	<ol style="list-style-type: none">1. Pour the water into one of the bottles and add a few drops of food colouring. (diagram 1)2. Stand the water-filled bottle up and place the empty bottle on top of it.3. Tape the two bottles together by wrapping masking tape around the necks of the bottles. (diagram 2)4. Flip the bottles over (so the water-filled bottle is on top) and swirl them in a circle. (diagram3)5. Use the stopwatch to time the cyclone. <div data-bbox="727 1365 1166 1663"><p>Diagram 1 Diagram 2 Diagram 3</p></div> <p>(Source: https://www.aidr.org.au/media/5267/aidr-cyclone-lesson-plan.pdf)</p>

Reflection questions	<ol style="list-style-type: none"> 1. What did you observe? Describe the cyclone. 2. How long did it take for the cyclone to drain into the other bottle? 3. If now you repeat the experiment without swirling the above bottle, how much time does it take for the water to drain? 4. Can you now conclude what makes cyclones so destructive?
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Activity 2	Real-Life Cyclone Story
Materials required	Reading printouts
Procedure	Looking into the eye of Cyclone Fani – A story on Indian state of Odisha <ol style="list-style-type: none"> 1. Distribute prints of the above case study and let students read them in pairs. 2. Answer the reflection and hold a large group discussion.
Reflection questions	<ol style="list-style-type: none"> 1. Where did cyclone Fani originate and how much damage did it cause? 1. Do you think the state was prepared with management strategies to mitigate the effects of the cyclone? 2. What steps is the government planning to take to improve for the future? How will it be helpful?

9. Soil

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Soil and Life	Predict the consequence of absence of soil on life on earth.
Soil Profile	Classify soil into different categories based on its properties.
	Describe all the layers in the soil profile in order to classify them into A-, B-, C- horizon and bedrock.
Types of Soil	Compare different types of soils in connections with properties shared along with contrasting features.
Properties of Soil	Determine the percolation of given soil using the time of percolation.
	Examine different soil samples in order to infer that moisture is contained in soil.
	Examine different soil samples in order to calculate the percentage of water absorbed and assess moisture absorbing property of soil
	Evaluate the characteristics of soil that will support a particular type of crop with reasons.
Soil Pollution and Erosion	Construct a cause & effect model of effects of soil pollution on life on earth.

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Compare different types of soils in connections with properties shared along with contrasting features.	Differentiates materials and organisms such as, digestion in different organisms; unisexual and bisexual flowers; conductors and insulators of heat; acidic, basic and neutral substances; images formed by mirrors and lenses, etc., on the basis of their properties, structure and function
Determine the percolation of given soil using the time of percolation.	
Examine different soil samples in order to infer that moisture is contained in soil.	

Examine different soil samples in order to calculate the percentage of water absorbed and assess moisture absorbing property of soil	Differentiates materials and organisms such as, digestion in different organisms; unisexual and bisexual flowers; conductors and insulators of heat; acidic, basic and neutral substances; images formed by mirrors and lenses, etc., on the basis of their properties, structure and function
Classify soil into different categories based on its properties.	Classifies materials and organisms based on properties /characteristics, e.g., plant and animal fibres; physical and chemical changes
Describe all the layers in the soil profile in order to classify them into A-, B-, C- horizon and bedrock.	
Determine the percolation of given soil using the time of percolation.	Conducts simple investigations on his/her own in order to seek answers to queries: (such as, can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?)
Examine different soil samples in order to infer that moisture is contained in soil.	
Examine different soil samples in order to calculate the percentage of water absorbed and assess moisture absorbing property of soil	
Evaluate the characteristics of soil that will support a particular type of crop with reasons	Relates processes and phenomena with causes, e.g., wind speed with air pressure; crops grown with types of soil; depletion of water table with human activities, etc.
Construct a cause & effect model of effects of soil pollution on life on earth.	
Predict the consequences of absence of soil on life on earth.	Applies learning of scientific concepts in daily life/real life situations in order to solve problems/give solutions/take preventive measures/etc.: (such as, dealing with acidity; testing and treating soil; taking measures to prevent corrosion; cultivation by vegetative propagation; connecting two or more electric cells in proper order in devices; taking measures during and after disasters; suggesting methods for treatment of polluted water for reuse, etc.)
Construct a cause & effect model of effects of soil pollution on life on earth.	

Construct a cause & effect model of effects of soil pollution on life on earth.

Makes efforts to apply to daily life the understanding of environment and steps to conserve it, in order to contribute to the protection of the environment: (such as, following good practices for sanitation at public places; minimising generation of pollutants; planting trees to avoid soil erosion; sensitising others with the consequences of excessive consumption of natural resources, etc.)

Test items



LOB: Predict the consequences of absence of soil on life on earth and recall details pertaining to soil profile

1) A student studies that the soil is a life support system for most living things. Which of these statements explains the importance of soil?

- (a) birds to fly
- (b) grass to grow
- (c) fishes to swim
- (d) humans to drink

Correct Answer: (b)

2) Which problem is likely to be observed if soil ceases to exist on the earth's surface?

- (a) No shelter for flies such as bees
- (b) Flow of water in river would be reduced
- (c) No shelter for organisms such as earthworms
- (d) Flow of air in the atmosphere would be stopped

Correct Answer: (c)

LOB: Classify soil into different categories based on its properties

1) A student observed a soil sample which is composed mostly of aggregations of rock fragments in it. Which component of the soil is the student referring to?

- (a) Clay
- (b) Gravel
- (c) Humus
- (d) Sand

Correct Answer: (b)

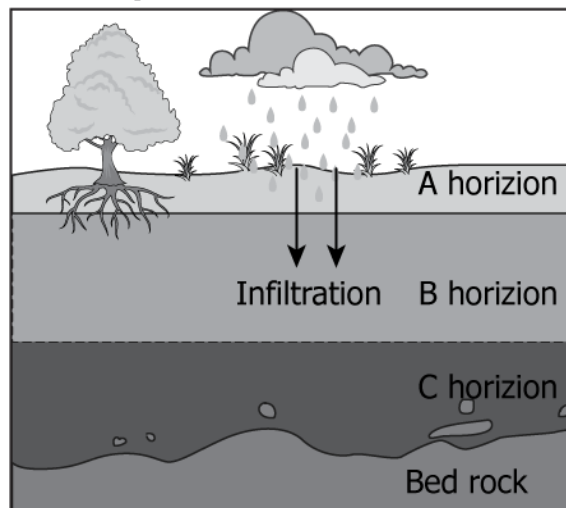
2) A student studies that the top layer of soil is called humus and is highly nutritious. Which of these is a characteristic of humus?

- (a) Coarse grained soil
- (b) Rotting dead matter
- (c) Very fine-grained soil
- (d) Aggregation of rocks pieces

Correct Answer: (b)

LOB: Evaluate the characteristics of soil that will support a particular type of crop with reasons

1) The given image represents a soil profile.



Which layer of soil from the soil profile is likely to have small lumps of rocks?

- (a) A-horizon
- (b) Bedrock
- (c) B-horizon
- (d) C-horizon

Correct Answer: (d)

2) Which of these options correctly describes the layer of the soil profile?

- (a) A-horizon → hardest layer
- (b) C-horizon → highest amount of humus
- (c) B-horizon → lesser humus but more minerals
- (d) Bedrock → porous and can retain maximum water

Correct Answer: (c)

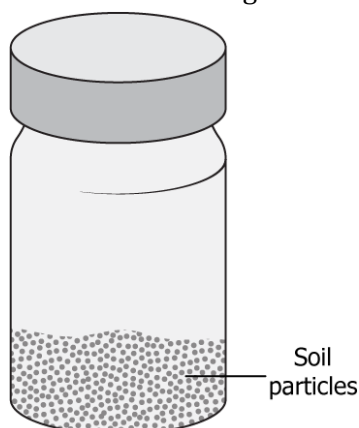
LOB: Compare different types of soils in connections with properties shared along with contrasting features

1) Which of these statements describes the characteristics of the soil type?

- (a) Sandy soil → a greater proportion of fine particles
- (b) Loamy soil → a greater proportion of fine particles
- (c) Loamy soil → equal proportion of big and fine particles
- (d) Sandy soil → equal proportion of big and fine particles

Correct Answer: (c)

2) A student collects a soil sample as shown in the image.



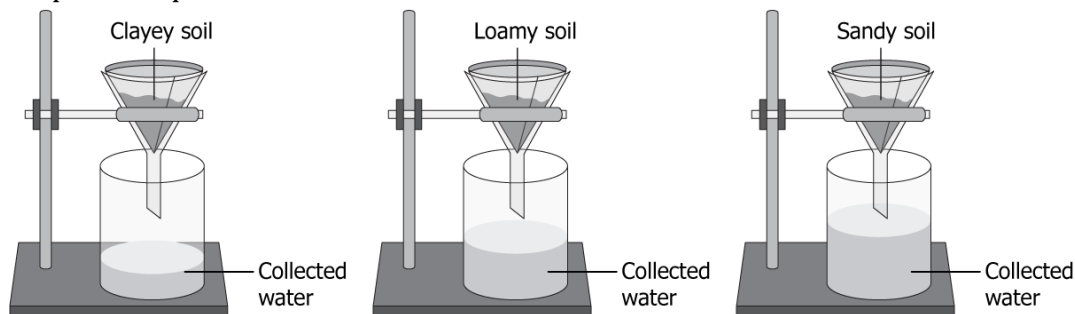
Which of these explains the soil type and its characteristics?

- (a) Clayey soil as it is mainly composed of particles that are circular
- (b) Clayey soil as it is mainly composed of particles that fit close together
- (c) Sandy soil as it is mainly composed of particles that have similar colour
- (d) Sandy soil as it is mainly composed of particles that do not fit close together

Correct Answer: (d)

LOB: Determine the percolation of given soil using the time of percolation.

1) A student made an arrangement to understand percolation rate of different types of soil as shown. He poured equal amount of water in all three of them and waited for around 10 minutes.



Which of these explains the rate of percolation of the soil?

- (a) sandy soil has the highest rate of percolation as water passes fastest through it
- (b) clayey soil has the highest rate of percolation as water passes slowest through it
- (c) clayey soil has the highest rate of percolation as it both retains and allows water to pass through
- (d) loamy soil has the highest rate of percolation as it both retains and allows water to pass through

Correct Answer: (a)

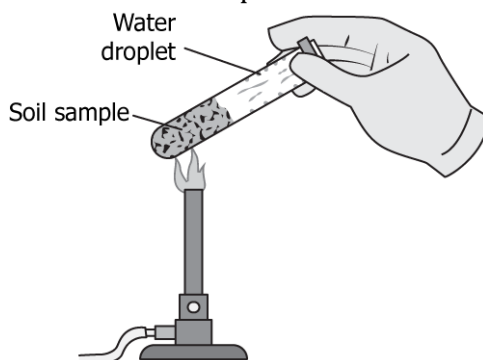
2) A student performs an experiment to measure a soil's percolation rate. Through the soil sample, she allowed 500 mL of water to percolate. She noticed it took about 20 minutes for the water to pass. What is the rate of water percolation in the soil?

- (a) 0.04 mL/min
- (b) 25 mL/min
- (c) 100 mL/min
- (d) 10000 mL/min

Correct Answer: (b)

LOB: Examine different soil samples in order to infer that moisture is contained in soil

1) A student took some sample in a test tube and placed it over a burner as shown in the image.

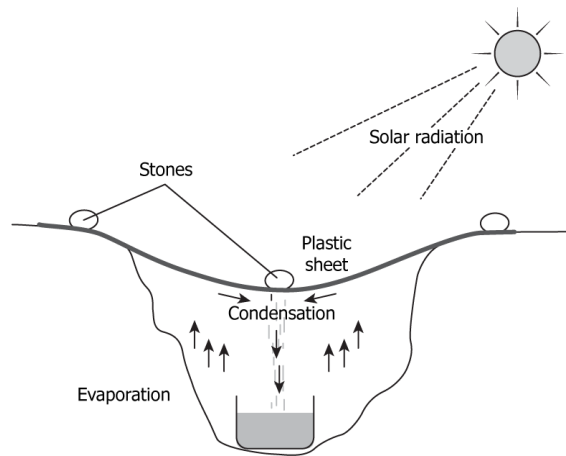


The student noticed that some water droplets were collected on the inner surface of the test tube. What does the accumulation of water droplet suggest?

- (a) Soil contains moisture
- (b) Air is present around us
- (c) Water is present in the air
- (d) Heating produces water droplets

Correct Answer: (a)

2) A student performed an activity where he digs a soil pit on the ground. He placed a plastic sheet and made an arrangement as shown in the image.



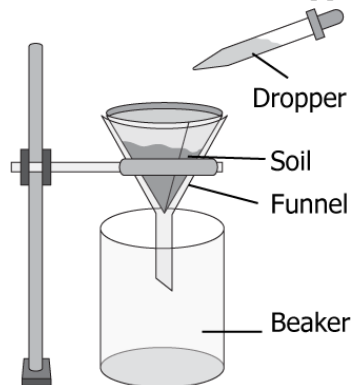
The student noticed that water vapours condensed on the plastic sheet which then collected in the container. What can be concluded from the activity?

- (a) Moisture is contained in the soil
- (b) Plastic sheet helps to enhance evaporation
- (c) Condensation occurs only on a plastic surface
- (d) Condensation occurs in the presence of sunlight

Correct Answer: (a)

LOB: Examine different soil samples in order to calculate the percentage of water absorbed and assess moisture absorbing property of soil

1) A student performed an activity where she took some soil sample in a funnel and placed it in over a beaker as shown in the image. Further, she used a dropper to add some water to the soil.

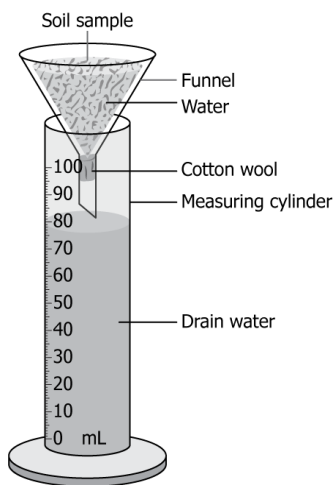


She noticed that the water was not collected in the beaker. What likely caused the water droplets to vanish?

- (a) Evaporation by the wind
- (b) Condensation by the soil
- (c) Absorption of water by the soil
- (d) Percolation of the water through the soil

Correct Answer: (c)

2) A student conducts an experiment for measuring the amount of water that a soil sample absorbs. He pours 90 mL of water on a 50gm soil sample. The amount of water drained in the cylinder after around 15 mins is observed to be about 80 mL as seen.



What percentage of the water is absorbed by the soil?

- (a) 0.2
- (b) 5
- (c) 20
- (d) 67

Correct Answer: (c)





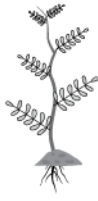

LOB: Evaluate the characteristics of soil that will support a particular type of crop with reasons

1) A student studies that soil rich in clay is ideal for paddy. What makes clay soil ideal for the cultivation of paddy?

- (a) The ability of the soil to mould
- (b) Good water retention capability
- (c) The ability to percolate more water
- (d) Good capacity to produce freshwater

Correct Answer: (b)

2) A student does an activity to research which soil type is best for gram and rice plantation. She planted seedlings from both plants in different soil types and took good care of all the plants for about a month. She recorded the development of the plants as shown in the table.

After 1 month			
Rice			
Gram			
	Sandy	Loamy	Clayey

Which of these statements supports the performed activity?

- (a) Gram and rice are most suitable for sandy soil
- (b) Gram and rice are most suitable for clayey soil
- (c) Neither gram nor rice is suitable for loamy soil
- (d) Gram is suitable for clayey soil whereas rice is suitable for sandy soil

Correct Answer: (b)

LOB: Construct a cause & effect model of effects of soil pollution on life on earth

1) Which of these activities are likely to cause soil pollution?

- (a) Excess use of fertilizers → Loss of topsoil
- (b) Deforestation → Contamination of nearby lakes
- (d) Dumping of chemicals in soil → Reduce in the amount of rainfall
- (c) Dumping of polythene bags in soil → Release of harmful chemicals

Correct Answer: (d)

2) A student studies that soil pollution has harmful effects. Which effect is likely to be observed due to soil pollution?

- (a) Causes the soil to erode easily
- (b) Kills organism living on the soil
- (c) Increases the fertility of the soil
- (d) Causes soil to retain more water

Correct Answer: (a)



Activity

Activity	Soil and Forensics																	
Materials required	Four soil samples (one with plant debris, one with animal debris, one with NaCl, one with baking soda), lab apparatus required as per NCERT activities to calculate percolation rate, moisture and percentage water absorbed.																	
Procedure	<div><div><div>1. Set up a crime scene, "Someone broke into the school building last night and raided the student lockers. The only evidence found was a shoe print and some dirt in the hallway. The building principal wants answers, and I told him/her that you have proven to be effective crime scene investigators and would be willing to assist."</div><div>2. Distribute one out of the above soil samples to each student labelled as crime scene sample.</div><div>3. Ask students to get into groups of four and measure percolation rate, moisture and percentage water absorbed for all the known soil samples (mark these four samples as samples of four suspects).</div><div>4. Ask students to individually measure percolation rate, moisture and percentage water absorbed for the crime scene sample.</div><div>5. Compare the crime scene sample values with the four suspects and whichever matches is the culprit.</div></div><table><tr><td>Soil Sample</td><td>Colour</td><td>Odor</td><td>Percolation Rate</td><td>Moisture</td><td>Percentage of Water Absorbed</td></tr><tr><td>Suspect Sample</td><td></td><td></td><td></td><td></td><td></td></tr></table></div>						Soil Sample	Colour	Odor	Percolation Rate	Moisture	Percentage of Water Absorbed	Suspect Sample					
Soil Sample	Colour	Odor	Percolation Rate	Moisture	Percentage of Water Absorbed													
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	<table><tr><td>Sample A</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Sample B</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Sample C</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Sample D</td><td></td><td></td><td></td><td></td><td></td></tr></table>	Sample A						Sample B						Sample C						Sample D					
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Sample C																									
Sample D																									
Let's think	<div><div>1. What other information about the soil could have helped examine the crime scene sample better?</div><div>2. Why do you think soil analysis is an important part of forensics?</div></div>																								



Activity

Activity	Soil Erosion
Procedure	<p><u>WATCHING WATER EROSION</u></p> <ol style="list-style-type: none"> 1. Engage the class in a hands-on demonstration of soil erosion. 2. Show students a pile of dirt (about a gallon) on a large piece of plastic. 3. Place little plastic figures like plastic people, tiny houses, model trees, etc., in different places around the mound of dirt. 4. Use a spray bottle or hose to spray the mound until the dirt starts to erode. 5. Watch the people, houses, and trees slide down the mound. 6. Measure the amount of runoff. Drain the water and only measure the amount of soil runoff. <p><u>USING PLANTS TO SLOW EROSION</u> (Minimum time required: 2 weeks)</p>

	<ol style="list-style-type: none"> 1. Ask students to get into groups of 3 to 4 to come up with the plan of a garden which will help to keep the soil in place. 2. Take a tin foil tray and plant the garden. 3. Once the garden has grown to the point where the roots have been established, two weeks should be plenty, it can be tested for erosion. 4. Place the garden on a block so that one end of the tray is elevated 3-4 inches. 5. Place the opposite end on a catch bin (use aluminum foil or some other type of material that will catch the dirt and water runoff.) 6. Sprinkle the gardens with equal amounts of water and collect the runoff in the tray at the bottom. The amount of water will depend on how much and how long you choose to pour. Several cups of water should produce enough runoff to test but you can add more if needed. 7. Now measure the amount of soil/plant runoff from each garden.
Let's think	<ol style="list-style-type: none"> 1. Which group had the least amount of runoff? Which group had the most? How did your garden plans differ? What might be the cause of this difference? 2. How would you plant your garden differently next time to more effectively limit the amount of lost soil? 3. How does this experiment relate to the real world and the use of vegetation and rocks to reduce runoff? 4. Can you see any examples of this on or around your school grounds?

10. Respiration in Organism

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Cellular Respiration	List the functions performed by a cell in order to infer the need of energy for various processes
	Define cellular respiration in order to differentiate between aerobic and anaerobic respiration.
	List instances when anaerobic respiration conditions might set in human beings/ways to reverse such situations to aerobic conditions
Breathing	Examine inhalation, exhalation and breathing rate in own body in order to analyse the effect of various activities on breathing rate
	Recall details/definitions of terminology related to respiration in humans.
	Describe the process of breathing in humans in order to explain the role of nostrils (hair and mucus), trachea, lungs, ribs and diaphragm.
	Observe the reaction of exhaled air with lime water in order to infer the gas exhaled.
Respiration in Other Animals	Describe the process of respiration in cockroach, earthworm, fish and plants in order to predict consequences of absence of respiratory organs/features, in animals or plants.
Additional Optional Outcomes	Construct a cause and effect model of respiratory processes in animals and plants, as an extension of available resources and respiratory organs/features.
	Select distinguishing features and categorize them as belonging to respiratory systems in plants and human beings (stomata & lungs).

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Define cellular respiration in order to differentiate between aerobic and anaerobic respiration.	Differentiates materials and organisms such as, digestion in different organisms; unisexual and bisexual flowers; conductors and insulators of heat; acidic, basic and neutral substances; images formed by mirrors and lenses, etc., on the basis of their properties, structure and function
Examine inhalation, exhalation and breathing rate in own body in order to analyse the effect of various activities on breathing rate.	Conducts simple investigations on his/her own in order to seek answers to queries: (such as, can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?)
Observe the reaction of exhaled air with lime water in order to infer the gas exhaled.	
Examine inhalation, exhalation and breathing rate in own body in order to analyse the effect of various activities on breathing rate	
Construct a cause and effect model of respiratory processes in animals and plants, as an extension of available resources and respiratory organs/features.	
List the functions performed by a cell in order to infer the need of energy for various processes	Explains processes and phenomena, e.g., processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.
Recall details/definitions of terminology related to respiration in humans.	
Describe the process of breathing in humans in order to explain the role of nostrils (hair and mucus), trachea, lungs, ribs and diaphragm.	
Describe the process of respiration in cockroach, earthworm, fish and plants in order to predict consequences of absence of respiratory organs/features, in animals or plants.	
Select distinguishing features and categorize them as belonging to respiratory systems in plants and human beings (stomata & lungs).	
Define cellular respiration in order to differentiate between aerobic and anaerobic respiration.	Writes word equation in order to express chemical reactions: (such as, acid-base reactions; corrosion; photosynthesis; respiration, etc.)

Examine inhalation, exhalation and breathing rate in own body in order to analyse the effect of various activities on breathing rate.	Measures and calculates in order to demonstrate understanding of measurability of various scientific processes/phenomena: (such as, measurement and calculation of temperature; pulse rate; speed of moving objects; time period of a simple pendulum, etc.)
Describe the process of breathing in humans in order to explain the role of nostrils (hair and mucus), trachea, lungs, ribs and diaphragm.	Draws labelled diagrams/flow charts of organisms/structures/processes in order to demonstrate knowledge of structure/processes/relationships: (such as, of organ systems in human and plants; electric circuits; experimental set ups; life cycle of silk moth, etc.)

Test items



LOB: List the functions performed by a cell in order to infer the need of energy for various processes

1) Cells perform various functions like digestion, excretion, reproduction, and transport. This is the reason the cells require energy to perform all these activities in organisms. What is the source of the energy which is utilized by the cells?

- (a) Stored energy in the water which releases during nutrition
- (b) Stored energy in the food which releases during respiration
- (c) Stored energy in the body which releases during reproduction
- (d) Stored energy in the blood which releases during transportation

Correct Answer: (b)

2) The table lists some human activities.

- | |
|---|
| <ul style="list-style-type: none"> • Dancing • Playing • Eating • Sleeping • Reading |
|---|

A student claimed that out of these activities, sleeping is the only activity in which energy is not needed by the cells. Is the claim made by the student correct?

- (a) No; the cells require energy during all the human activities.
- (b) Yes; while sleeping, all the body cells are at rest, so energy is not required.
- (c) No; reading is another activity in which energy is not needed by the cells.
- (d) Yes; sleeping is the activity in which energy is not used, but is released inside the body.

Correct Answer: (a)

LOB: Define cellular respiration in order to differentiate between aerobic and anaerobic respiration

1) The breakdown of food particles takes place inside the cell, and during this process, lots of energy releases out. Which life process helps the cell to perform this function?

- (a) Excretion
- (b) Reproduction
- (c) Transportation
- (d) Cellular respiration

Correct Answer: (d)

2) A researcher worked on two types of microbial cells, which were placed in two different culture plates. The table shows the impact on cells when cultured in the absence of oxygen.

Culture plate	Food material	Conditions provided	Impact on cells
A	Glucose	Lack of oxygen	Death of cells
B	Glucose	Lack of oxygen	Growth of cells

What type of microbes have been placed in culture plate A and culture plate B?

- (a) Culture plate A-aerobes; Culture plate B- aerobes
- (b) Culture plate A-anaerobes; Culture plate B- aerobes
- (c) Culture plate A-aerobes; Culture plate B- anaerobes
- (d) Culture plate A-anaerobes; Culture plate B- anaerobes

Correct Answer: (c)

LOB: List out instances when anaerobic respiration conditions might set in, in human beings/ways to reverse such situations to aerobic conditions.

1) Ramesh did a heavy exercise continuously for 3 hours, and then after sometime, he experienced muscle cramps. What could be the reason for experiencing cramps in muscles?

- (a) Temporary deficiency of oxygen in muscle cells
- (b) Permanent deficiency of oxygen in muscle cells
- (c) Temporary deficiency of carbon dioxide in muscle cells
- (d) Permanent deficiency of carbons oxide in muscle cells

Correct Answer: (a)

2) A student participated in a cycling competition in his school. When he returned to his home, he experienced severe cramps in his legs due to the accumulation of lactic acids in muscle cells. His mother advised the student to take a hot water bath. The student recalled that her mother is right; it will improve the circulation of blood that will ultimately increase oxygen supply in his body. How does an increase in oxygen supply affect the accumulation of lactic acid?

- (a) Enables the complete breakdown of lactic acid into oxygen and water
- (b) Enables the complete breakdown of lactic acid into glucose and energy
- (c) Allows lactic acid to break completely into carbon dioxide and water
- (d) Allows lactic acid to break completely into carbon dioxide and glucose

Correct Answer: (c)

LOB: Examine inhalation, exhalation and breathing rate in own body in order to analyse the effect of various activities on breathing rate

1) Naman recorded that at rest, he was breathing in and out at the rate of 18 times per minute. After playing the football for 15 minutes, his breathing rate increased up to 27 times per minute. What could be the reason for this change in breathing rate?

- (a) To fulfil the increased demand for water by the body
- (b) To fulfil the increased demand for oxygen by the body
- (c) To fulfil the increased demand for energy by the body
- (d) To fulfil the increased demand for carbon dioxide by the body

Correct Answer: (b)

2) The table shows the activities performed by four students for a period of 10 minutes.

Student	Activities performed
A	Reading
B	Walking
C	Jogging
D	Running

The breathing rate of all these students was measured as soon as they finished their activities. Which student will have the highest breathing rate?

- (a) Student A
- (b) Student B
- (c) Student C
- (d) Student D

Correct Answer: (d)

LOB: Recall details/definitions of terminology related to respiration in humans.

1) The image shows a child who is blowing foggy air out of her mouth.

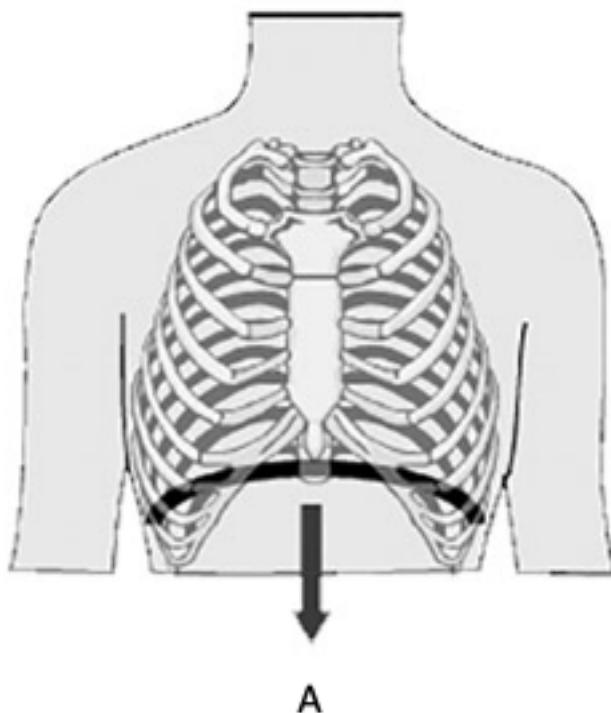


Which terminology would be most appropriate for defining the act of blowing air out?

- (a) Breathing
- (b) Exhalation
- (c) Inhalation
- (d) Respiration

Correct Answer: Option (b)

2) The image shows a human respiratory system



A structure, labelled as 'A' in the image is forming the floor of the chest cavity. What is this structure referred as?

- (a) Lungs
- (b) Diaphragm
- (c) Nasal cavity
- (d) Chest cavity

Correct Answer: Option (b)

LOB: Describe the process of breathing in humans in order to explain the role of nostrils (hair and mucus), trachea, lungs, ribs and diaphragm.

1) A teacher asked a student to observe inhalation. The student observed an expansion in his chest during inhalation. The teacher told the student that it is because of the movement of ribs and diaphragm. What movement is likely to be found in ribs and diaphragm of the student during inhalation?

(a)

Ribs	Diaphragm
Moves up and inward	Moves up

(b)

Ribs	Diaphragm
Moves up and outward	Moves down

(c)

Ribs	Diaphragm
Moves down and inward	Moves up

(d)

Ribs	Diaphragm
Moves up and inward	Moves down

Correct Answer: (b)

2) People use different methods to get rid of nose hairs such as trimmers, waxing, and many more. However, some health specialists are against the idea of removing nose hair. What likely is the concern regarding the removal of nose hairs?

(a) It may affect the sensitivity of the nose for odour.

(b) The amount of inhaled oxygen will be affected.

(c) Germs and foreign particles will get entry inside the body easily.

(d) It may lead to the production of mucous in excessive amounts inside the nose.

Correct Answer: (c)

LOB: Observe the reaction of exhaled air with lime water in order to infer the gas exhaled

1) The image shows the change in colour of limewater.



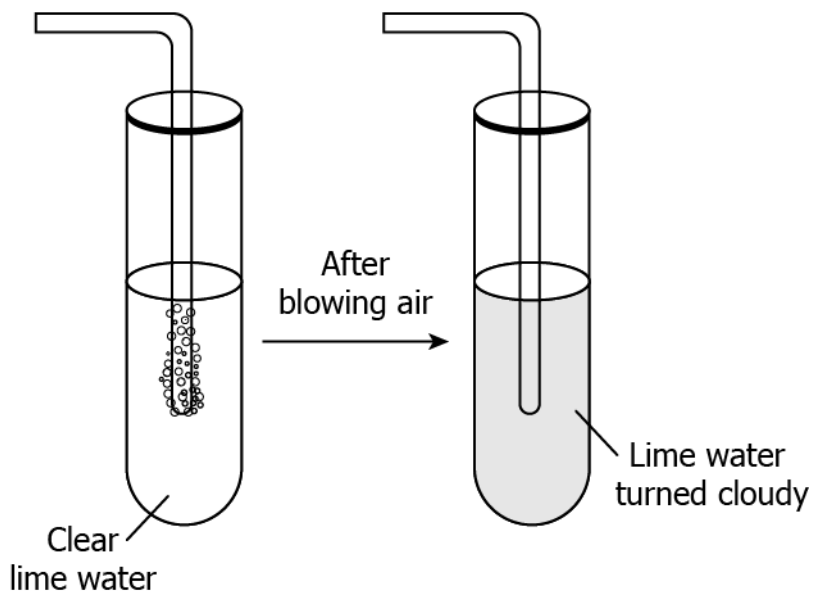
The limewater turns
milky

A teacher told the student that it is due to the reaction of carbon dioxide with lime water. What likely is the source of carbon dioxide that reacted with lime water?

- (a) Water
- (b) Exhaled air
- (c) Atmosphere
- (d) Particles of lime

Correct Answer: (b)

2) An experiment was conducted in a class where students were asked to blow air into a test tube containing lime water with the help of a straw. The observation of the experiment is shown in the image.



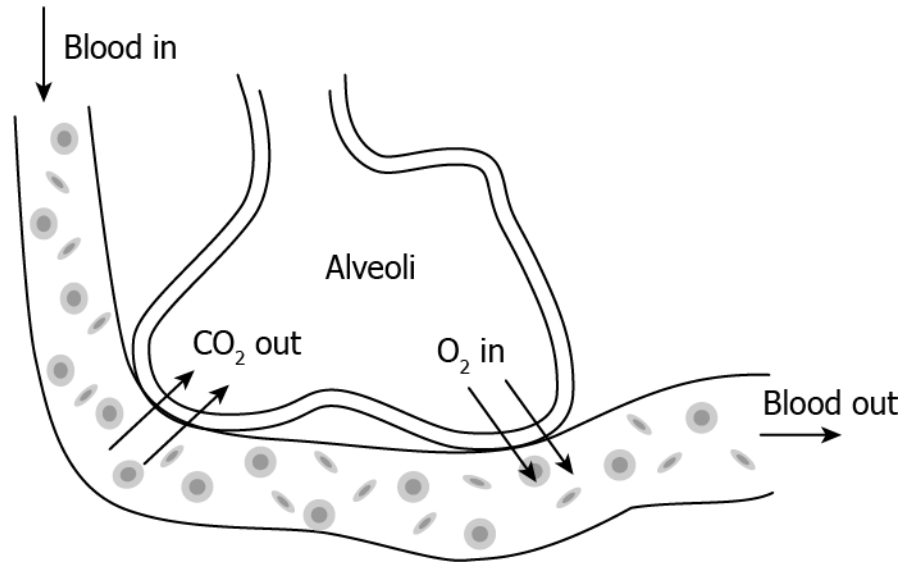
What turns the lime water cloudy?

- (a) Reaction of oxygen gas present in the exhaled air with lime water
- (b) Reaction of all gases present in the atmosphere with the lime water
- (c) Reaction of nitrogen gas present in the atmosphere with the lime water
- (d) Reaction of carbon dioxide gas present in the exhaled air with lime water

Correct Answer: (d)

LOB: Describe the process of respiration in cockroach, earthworm, fish and plants in order to predict consequences of absence of respiratory organs/features, in animals or plants

1) The image shows alveoli, in the human lungs.



The main function of alveoli in humans is to add oxygen into the human blood and to take carbon dioxide from the blood for releasing out of the body. What structures do insects have that act similarly to alveoli?

- (a) Lungs
- (b) Spiracles
- (c) Slimy skin
- (d) Tracheal tubes

Correct Answer: (d)

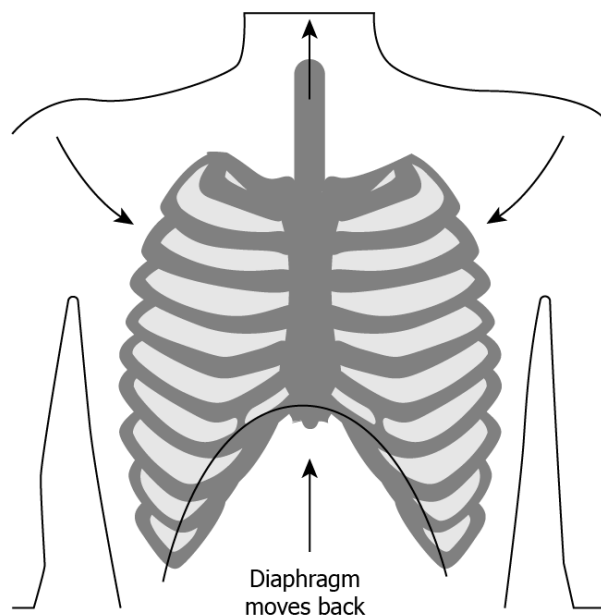
2) It is very difficult to hold a frog in hands because its skin was moist and slippery. What could be the reason for the frog to have moist and slippery skin?

- (a) Moist skin of frogs help them to escape from the predator's grip.
- (b) Moist skin of frogs help them to keep their body cool in summers.
- (c) Moist skin of frogs help them to take oxygen from the surroundings.
- (d) Moist skin of frog help them to get nutrients from the surroundings.

Correct Answer: (c)

LOB: Construct a cause and effect model of respiratory processes in animals and plants, as an extension of available resources and respiratory organs/features.

1) The image shows an upward movement of the diaphragm of an individual.



What will be the effect on the person if the diaphragm loses its ability to move down and persists in the same position?

- (a) The person will breathe in and out at a normal rate.
- (b) The person will breathe in and out at a very fast rate.
- (c) The person will not be able to inhale air, so breathing will stop.
- (d) The person will breathe air inside the body but cannot breathe out.

Correct Answer: (c)

2) The table shows the concentration of oxygen and carbon dioxide in the blood of two individuals.

Individual	Oxygen concentration (mm Hg)	Carbon dioxide concentration
A	85	41
B	40	67

If the normal blood oxygen level varies between 75 and 100 mm of Hg, and normal blood carbon dioxide level varies between 38 to 42 mm of Hg, what can be said about the breathing rate of both individuals?

- (a) Individual A will breath faster than individual B.
- (b) Individual B will breath faster than individual A.
- (c) Individual A and individual B both will breathe at the same rate.
- (d) Individual A and individual B both will breathe at a slower rate.

Correct Answer: (b)

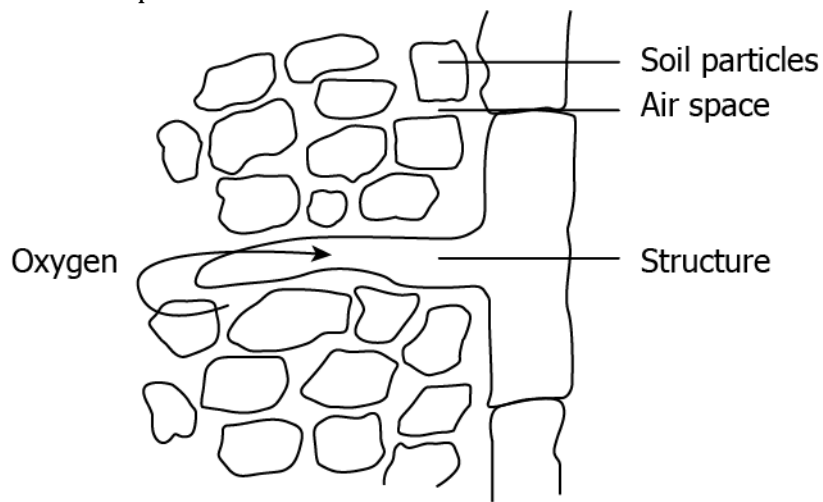
LOB: Select distinguishing features and categorize them as belonging to respiratory systems in plants and human beings (stomata & lungs).

1) A student observed a slide of the epidermal layer of a leaf. The epidermal layer of a leaf contains the structures that help the plant to respire. What structures might have been observed by the student in the slide?

- (a) Gills
- (b) Lungs
- (c) Stomata
- (d) Trachea

Correct Answer: (c)

2) The image shows a structure embedded in between the soil particles that is responsible for taking oxygen from the air spaces.



A student observed the image and concluded that this image is depicting respiration in plants. Is the claim made by the student correct?

- (a) Yes; this structure is stomata, which helps the plant to take in oxygen from the soil.
- (b) Yes; this structure is root hair, which helps the plant to take in oxygen from the soil.
- (c) No; this structure is tracheae, which helps the earthworms to take in oxygen from the soil.
- (d) No; this structure is a spiracle, which helps the cockroaches to take in oxygen from the soil.

Correct Answer: (b)

Suggested Teacher Resources



Activity

Activity	The Origin of Breathing The First Living Thing
Materials required	Laptop (or personal computer), projector (optional), prints of the reading
Procedure	<ol style="list-style-type: none"> 1. Recall the process of photosynthesis and the exchange of gases in the same. Discuss on what do animals breathe in and out and then trace this back to the origin of breathing. 2. Students watch the following video and answer the guiding questions: https://www.youtube.com/watch?v=z2-h3I-WXQ&t=11s 3. Students silently read the following reading in pairs and highlight one thing that excites them, one thing that they are curious to know about and one thing they have a question around. <p>“The first signs of life on earth appeared about 4.5 Ga (1 Ga is an American billion, ie. 10^9 years) ago. It's not yet completely certain exactly how this life arose; hot volcanic mineral springs have been suggested, as have the more traditional lightning-strikes and (rather wonderfully) radioactive beaches. At any rate something happened which led to a little membrane-bound ball with internal nucleic acids which, crucially, could replicate. That was the origin of the first life form.</p> <p>And then it was all over really, bar the evolution.</p> <p>The atmosphere back then was very different, little oxygen and a lot of carbon dioxide. Water, used for photosynthesis, was available in large amounts, but none of the little proto-life-blobs quite had the</p>

energy required to split it (or the physical proteins required back then either) so it mostly stayed unused.

Carbon dioxide levels went down, methane levels went up and the planet warmed up a little due to global warming. Things stayed like that for a billion years or so (1 Ga) and then something quite special happened, something that would have extremely devastating effects on the life surrounding it.

Photosynthesis. The process by which carbon dioxide is converted into sugars by the splitting of a water molecule. The process of photosynthesis produces oxygen, which was highly dangerous for cells. This means that from the point of view of every other organism the newly-evolved photosynthetic blobs were floating around throwing toxic gas into the atmosphere.

The arrival of this new resource (oxygen) led to a change in the way organisms respired as well. Up until what is sometimes called the Great Oxidation Event most respiration was anoxic, probably similar to anaerobic respiration, or fermentation, in anaerobic bacteria around today. This process, while enough to keep life going, is around sixteen times less efficient than aerobic respiration. The proto-bacteria that managed to use the oxygen would therefore have gained a major energy boost.

This energy boost allowed the oxygen-using bacteria to go forth and multiply, leaving the anoxic bacteria clinging to the few environmental niches where no oxygen could penetrate. Some of these oxygen-using bacteria were swallowed up by larger cells who then used them as specialized intracellular breathing compartments. The bacteria became mitochondria, and the cells with mitochondria grew bigger and formed more intracellular compartments. They became eukaryotic cells, the kind of cells that all multicellular animals are made from."

Let's think	<p>Guiding questions following the video:</p> <ol style="list-style-type: none"> 1. Describe what you saw in the video. 2. Do the conditions in the video look habitable for life? 3. How did the cell increase in number? What do you think they would require to be able to do that? (hint, energy) <p>Guiding questions following the reading:</p> <ol style="list-style-type: none"> 1. Why do you think oxygen was initially toxic? 2. How and when did it become useful? 3. What was the result of the availability of abundant oxygen?
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2

Activity

Activity	Analyzing secondary heart rate data
Materials required	Printouts of secondary data
Procedure	<ol style="list-style-type: none"> 1. Divide the class into groups of three and as a group they: <ol style="list-style-type: none"> a. choose any one of the claims given below for their argument. b. summarize the conclusion using the given secondary data. c. use the secondary data to evaluate their claim. d. support their claim with primary data (optional). <p>CLAIMS:</p> <ol style="list-style-type: none"> 1. Men are more physically fit than women. 2. Walking does not affect breathing rate. 3. People who do more physical activity have a lower resting heart rate. 4. Resting heart rate decreases with age.

SECONDARY DATA: (Source:

<https://www.nuffieldfoundation.org/sites/default/files/files/Heart%20rates%20-%20merged%20PDF.pdf>)

Figure 1

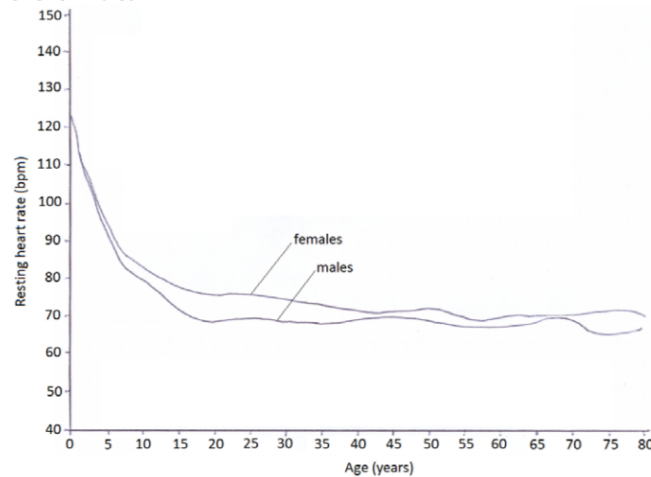
A pair of students wanted to find out about the effect of exercise on heart rate and breathing rate. They measured their heart rate and breathing rate at rest, after walking up and down two flights of stairs, and after running up and down two flights of stairs. Here are the results.

	Heart rate			Breathing rate		
	At rest (bpm)	Walking (bpm)	Running (bpm)	At rest (breaths/min)	Walking (breaths/min)	Running (breaths/min)
Student 1	68	63	112	12	12	16
Student 2	72	86	120	12	12	14

<http://serendip.brynmawr.edu/biology/b103/f00/lab5.html>

Figure 2

The resting heart rates of 35 000 people in the US were measured. These graphs show how the average resting heart rate varies with age. One line shows the data for females and one for males.



US Department of Health and Human Services, National Health Statistics Reports No. 41, 24/8/2011.

Figure 3

Seventeen adult men (ten young, and seven middle-aged) were studied in controlled conditions. At the start of the study they all did very little exercise. Their resting heart rate was measured. They then took part in a three-month physical training programme. After three months their resting heart rate was measured. Here are the results.

	Young men (average age 21)	Middle-aged men (average age 53)
Average resting heart rate <i>before</i> physical training programme	69 bpm	72 bpm
Average resting heart rate <i>after</i> physical training programme	60 bpm	62 bpm

Brazilian Journal of Medical and Biological Research (2002) 35: 741-752

ARGUMENT FRAME:

(Teacher to provide sentence starters for each of the columns depending upon the literacy level of the class)

Claim	Evidence from secondary data and how it supports the claim	Evidence from primary data (if any) and how it supports the claim	Is the data sufficient to fully support the claim? Can you rewrite the claim so that it is fully supported by the data?

Let's think

1. What is your understanding of 'fitness'? Does it depend on the breathing rate or heart rate?
2. What is the effect of exercise on the heart rate? How is it beneficial and/ or harmful for the body?

11. Transportation in Animals and Plants

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Need of Transportation	Outline functions carried out by parts of the human circulatory system in order to examine the importance of circulation of oxygen
Blood	Describe the function of blood and its constituents.
	Distinguish between the functions of arteries and veins, in the functioning of the circulatory system
	Examine one's pulse in order to infer the pulse rate and define it
Heart	Describe the location and function of the heart.
	Analyse the implications of intermixing of oxygenated and deoxygenated blood in order to explain the existence of four chambers in the heart.
Heartbeat	Define heartbeat in order to design a model of a stethoscope to measure it.
	Observe one's heartbeat and pulse rate after different activities in order to draw a relationship between them
Excretion in Humans	Recall details/functions of parts of the excretory system
	Interpret reasons for discrepancies in the process of urine formation and expulsion.
	Compare situations of effective and ineffective functioning of the excretory system, in connection with functions of the parts of the system
Transportation in Plants	Explain the process of transport of water, minerals and food in plants in order to differentiate between xylem and phloem.
	Explain the process of transpiration in order to infer its advantages.
	Predict reasons for decreased absorption of water by plants.

	Attribute reasons for ineffective transportation of materials in plants, to functions of their parts.
Additional Optional Outcomes	Explain the importance and need for blood donations.
	Study excretion in other organisms.
	Analyse the condition of kidney failure in order to explain the process of dialysis.

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Draw a contrast between the functions of arteries and veins, in the functioning of the circulatory system.	Differentiates materials and organisms such as, digestion in different organisms; unisexual and bisexual flowers; conductors and insulators of heat; acidic, basic and neutral substances; images formed by mirrors and lenses, etc., on the basis of their properties, structure and function
Analyse the implications of intermixing of oxygenated and deoxygenated blood in order to explain the existence of four chambers in the heart.	Relates processes and phenomena with causes, e.g., wind speed with air pressure; crops grown with types of soil; depletion of water table with human activities, etc.
Interpret reasons for discrepancies in the process of urine formation and expulsion.	
Predict reasons for decreased absorption of water by plants.	
Outline functions carried out by parts of the circulatory system as being contributory to proper circulation of oxygen.	Explains processes and phenomena, e.g., processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.
Describe the function of blood and its constituents.	
Describe the location and function of the heart.	
Recall details/functions of parts of the excretory system	
Explain the process of transport of water, minerals and food in plants in order to differentiate between xylem and phloem.	
Explain the process of transpiration in order to infer its advantages.	
Study excretion in other organisms.	

Examine own pulse in order to infer the pulse rate and define it.	Measures and calculates e.g., temperature; pulse rate; speed of moving objects; time period of a simple pendulum, etc.
Define heartbeat in order to design a model of a stethoscope to measure it.	
Observe own heartbeat and pulse rate after different activities in order to draw a relationship between them.	
Describe the location and function of the heart.	Draws labelled diagrams / flow charts e.g., organ systems in human and plants; electric circuits; experimental set ups; life cycle of silk moth, etc.
Recall details/functions of parts of the excretory system	Constructs models using materials from surroundings and explains their working, e.g., stethoscope; anemometer; electromagnets; newton's colour disc ,etc.
Define heartbeat in order to design a model of a stethoscope to measure it.	
Compare situations of effective and ineffective functioning of the excretory system, in connection with functions of the parts of the system	Discusses and appreciates stories of scientific discoveries
Attribute reasons for ineffective transportation of materials in plants, to functions of their parts.	
Explain the importance and need for blood donations.	
Analyse the condition of kidney failure in order to explain the process of dialysis.	

Test items



LOB: Outline functions carried out by parts of the human circulatory system in order to examine the importance of circulation of oxygen

1) Hormones are some substances that are formed by the glands of the human body. The secretion of hormones takes place in specific glands, and then these are transported to the cells present throughout the body. Which of these functions of the hormone was carried out by the circulatory system?

- (a) Formation of hormones
- (b) Secretion of hormones
- (c) Activation of hormones
- (d) Transportation to different body cells

Correct Answer: (d)

2) A student read out about various systems of the human body and claimed that the digestive system alone can pass nutrients to every cell of the body. Is the claim made by the student correct?

- (a) Yes; the stomach of the digestive systems helps in the delivery of nutrients to all body cells.
- (b) Yes; the small intestine of the digestive system absorbs the nutrients from the food and delivers to it all cells.
- (c) No; the digestive system passes nutrients into the blood, which is then delivered to body cells through the circulatory system.
- (d) No; the heart is a component of the circulatory system, which directly absorbs nutrients from the stomach and delivers to all body cells.

Correct Answer: (c)

LOB: Describe the function of blood and its constituents

1) Siddhant got an injury on his knee while playing football in the ground. Blood oozed out from the injured site, but after a few minutes, he observed a brown colored clot on the same site. Which component of the blood might have formed this clot?

- (a) Plasma
- (b) Platelets
- (c) Red blood cells
- (d) White blood cells

Correct Answer: (b)

2) A patient was facing trouble in breathing. On diagnosis, the doctor examined that the hemoglobin content in the patient's body is less than the normal range. What role does hemoglobin play in breathing?

- (a) Haemoglobin helps in the transportation of oxygen to all body cells.
- (b) Haemoglobin prevents clot formation inside the respiratory tract.
- (c) Haemoglobin helps the lungs to take in more air from the surroundings.
- (d) Haemoglobin fights against germs that enter into the respiratory tract.

Correct Answer: (a)

LOB: Distinguish between the functions of arteries and veins, in the functioning of the circulatory system

1) The table list some characteristic features of a blood vessel.

- Carry carbon-dioxide rich blood
- Presence of thin walls
- Presence of valves
- Carries blood towards the heart

Which of the following will have all these characteristics features?

- (a) Only pulmonary vein
- (b) Only pulmonary artery
- (c) All veins except the pulmonary vein
- (d) All arteries except the pulmonary artery

Correct Answer: (c)

2) A student observed the cross-section of two blood vessels A and B with the help of a microscope. The table lists the observations made by the student.

Slide	Nature of Wall
A	Thick and elastic
B	Thin

What conclusion can be made about the type of blood carried out by blood vessels A and B

- (a) A –oxygen-rich; B- oxygen-rich
- (b) A –carbon-dioxide rich; B- oxygen-rich
- (c) A –oxygen-rich; B- carbon-dioxide rich
- (d) A –carbon-dioxide rich; B- carbon-dioxide rich

Correct Answer: (c)

LOB: Examine one's pulse in order to infer the pulse rate and define it

1) A person placed his index finger of the right hand on the inner side of his left wrist, and then he felt some throbbing movements. What terminology can be used for these movements, and what could be the reason for feeling them?

- (a) Pulse; due to flow of blood into veins
- (b) Pulse; due to flow of blood into arteries
- (c) Pulse rate, due to flow of blood into veins
- (d) Pulse rate, due to flow of blood into arteries

Correct Answer:(b)

2) The table shows the number of pulse beats counted by two students from their left hand for 2 minutes.

Student	Number of Pulse Beats Counted
A	240
B	144

What likely be concluded from this observation?

- (a) The pulse rate of student A is higher than the normal pulse rate.
- (b) The pulse rate of student B is lower than the normal pulse rate.
- (c) The pulse rate of student A and student B is equivalent to the normal pulse rate.
- (d) The pulse rate of both student A and student B is higher than the normal pulse rate.

Correct Answer: (a)

LOB: Describe the location and function of the heart.

1) People use water pumps in their houses to circulate water in the house pipes. If our blood vessels are compared to water pipes and blood to water, then what organ of the human body acts as a water pump and circulates blood throughout the body?

- (a) Heart
- (b) Kidney
- (c) Lungs
- (d) Liver

Correct Answer: (a)

2) A student was provided with a three-dimensional model of a human circulatory system. The teacher asked the student to identify the heart from all the structures involved in the model. How would the student be able to locate the heart in the circulatory system?

(a) A structure that is located in the chest cavity with its lower tip slightly tilted towards the left

(b) A structure that is located in the chest cavity with its upper tip slightly tilted towards the left

(c) A structure that is located in the abdominal cavity with its lower tip slightly tilted towards the right

(d) A structure that is located in the abdominal cavity with its upper tip slightly tilted towards the left

Correct Answer: (a)

LOB: Analyse the implications of intermixing of oxygenated and deoxygenated blood in order to explain the existence of four chambers in the heart.

1) The human heart contains four chambers, two atria, and two ventricles. A partition separates these chambers from each other. Why is the partition between these chambers necessary?

(a) To maintain the pressure of blood in each chamber of the heart

(b) To avoid mixing of oxygenated blood with the deoxygenated blood

(c) To increase the volume of all chambers so that more blood can be pumped

(d) To provide more volume to oxygenated blood than the deoxygenated blood

Correct Answer: (b)

2) Human beings have a four-chambered heart so that the mixing of oxygenated and deoxygenated blood can be prevented. Which of the following describes the implications of the absence of chambers in the heart?

(a) More carbon dioxide would be available to the body cells.

(b) Lesser oxygen would be available to the body cells.

(c) More amount of blood would be available to the body cells.

(d) More pressure would be exerted on the circulating blood

Correct Answer: (b)

LOB: Define heartbeat in order to design a model of a stethoscope to measure it.

1) A teacher placed the chest piece of a stethoscope on his chest and asked a student to put eardrums of the stethoscope into ears. The student heard some thumping sound. What sound is the student listening?

- (a) Blood pressure
- (b) Breaths
- (c) Heartbeat
- (d) Pulse

Correct Answer: (c)

2) Which of the following constitutes a heartbeat?

- (a) Filling of blood in the heart chambers
- (b) The change in the speed of blood flow inside the heart
- (c) Rhythmic contraction and relaxation of heart muscles
- (d) The opening of the valves present in between the heart chambers

Correct Answer: (c)

LOB: Observe own heartbeat and pulse rate after different activities in order to draw a relationship between them.

1) A student measured his heartbeat with the help of a stethoscope and pulse by placing the index finger on the left wrist for a minute. What relationship might have been observed by the student after getting their values?

- (a) the number of heartbeats will be half of the number of pulses
- (b) the number of heartbeats will be double of the number of pulses
- (c) the number of heartbeats will be equal to the number of pulses
- (d) the number of heartbeats will be one-third of the number of pulses

Correct Answer: (c)

2) The table shows the heartbeat and pulse rate of two students while resting and after running for 4 to 5 minutes.

Name of student	While resting		After running (4-5 minutes)	
	Heartbeat	Pulse rate	Heartbeat	Pulse rate
A	74	74	110	110
B	72	72	97	97

What conclusion can likely be made from this data?

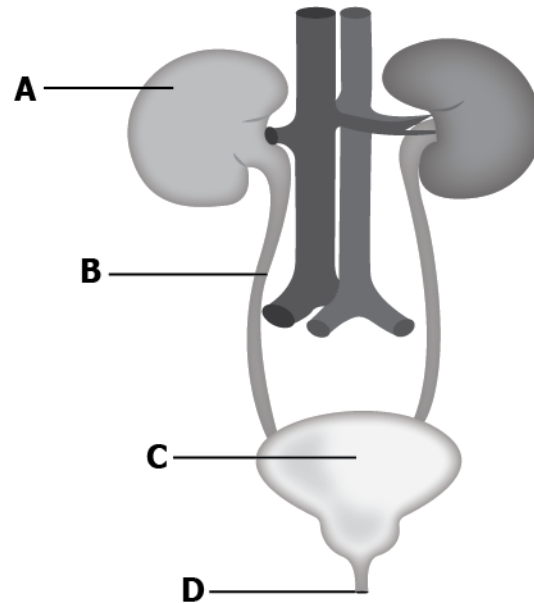
- (a) One pulse generates one heartbeat in the heart
- (b) One pulse generates two heartbeats in the heart

- (c) One heartbeat generates one pulse in the arteries
- (d) One heartbeat generates two pulses in the arteries

Correct Answer: (c)

LOB: Recall details/functions of parts of the excretory system

1) The image shows an unlabelled sketch of the human excretory system.



Which label in the image represents the structure that helps to store urine?

- (a) A
- (b) B
- (c) C
- (d) D

Correct Answer: (c)

2) A patient visited a doctor and complained that from the last 2 months, his urine output is very low. After examination, the doctor said that this is due to the malfunctioning of the blood capillaries that help in the filtering of blood. Which organ of the excretory system has these blood capillaries?

- (a) Kidney
- (b) Ureter
- (c) Urethra
- (d) Urinary bladder

Correct Answer: (a)

LOB: Interpret reasons for discrepancies in the process of urine formation and expulsion.

1) The kidney is an organ that contains blood capillaries that helps in the filtration of blood. The useful substances get absorbed by the blood. Which of the following describes the fate of harmful substances?

- (a) Harmful substances dissolve in water and are removed from the body as urine.
- (b) Harmful substances get accumulated in the kidney and are released out as sweat.
- (c) Harmful substances get absorbed by the blood and then are delivered to the lungs for filtration.
- (d) Harmful substances dissolve in water and then are delivered back to the kidney for filtration.

Correct Answer: (a)

2) The table lists the excretory substances of fish, snake, and humans.

Organism	Excretory product
Fish	Ammonia
Snake	Uric acid
Human	Urea

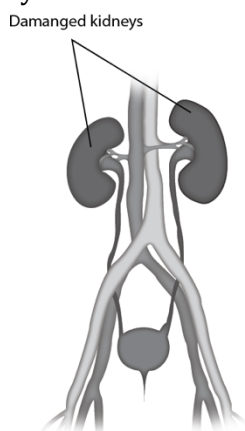
What factor is responsible for this difference in the excretory products of these organisms?

- (a) Availability of waste
- (b) Availability of water
- (c) Availability of nutrients
- (d) Availability of oxygen

Correct Answer: (b)

LOB: Compare situations of effective and ineffective functioning of the excretory system, in connection with functions of the parts of the system

1) The image shows a human excretory system in which both the kidneys have become damaged.



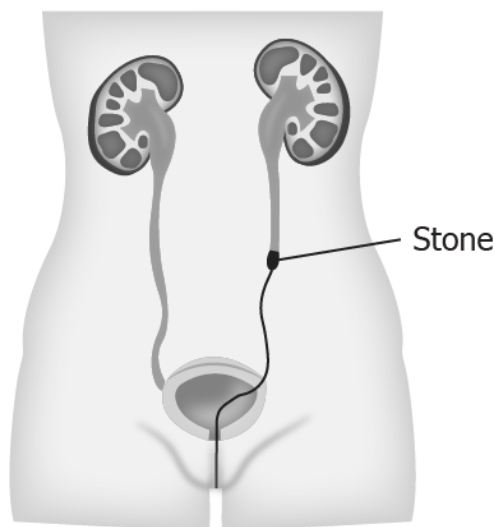
What likely can happen in this condition?

- (a) Accumulation of waste substances in the blood

- (b) More concentration of carbon dioxide in the blood
- (c) Release of harmful substances in urine in a larger amount
- (d) Accumulation of useful substance in the kidneys and then release out of the body as sweat

Correct Answer: (a)

2) The image shows the development of stone in a structure of the excretory system.



Which function of this structure will be hindered because of this condition?

- (a) The ability to hold urine for a longer time
- (b) Passing out the urine from the body
- (c) Absorption of useful substances from the blood
- (d) Passing of urine from kidneys to the urinary bladder

Correct Answer: (d)

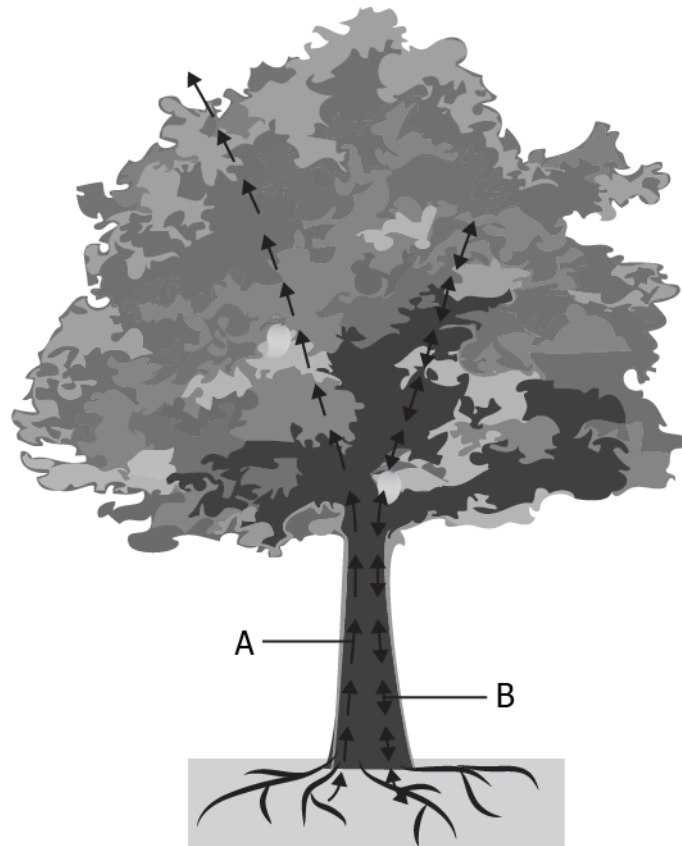
LOB: Explain the process of transport of water, minerals and food in plants in order to differentiate between xylem and phloem.

1) A student performed an experiment in which a potted plant was kept in a bell jar. After some time, the student observed some water drops inside the jar. What plant tissue might have released these water drops in the jar?

- (a) Xylem
- (b) Phloem
- (c) Root hair
- (d) Epidermis

Correct Answer: (a)

2) Arrows in the image are indicating the direction of the movement of substances by two different vascular tissues. Some arrows are labelled as “A” and some are labelled as “B”.



Which of the following correctly describes the name and function of the two different vascular tissues?

(a)

Label	Name	Function
A	Phloem	Transport nutrients
B	Xylem	Transport water

(b)

Label	Name	Function
A	Xylem	Transport nutrients
B	Phloem	Transport water

(c)

Label	Name	Function
A	Phloem	Transport water
B	Xylem	Transport nutrients

(d)

Label	Name	Function
A	Xylem	Transport water
B	Phloem	Transport nutrients

Correct Answer: (d)

LOB: Explain the process of transpiration in order to infer its advantages.

1) How does transpiration occur in very tall trees?

- (a) Most of the excess water in tall trees is given off by the bark
- (b) A suction pull from the leaves causes transport to great heights
- (c) Excess water in taller trees can only be evaporated by lower branches
- (d) Excess water acts against gravity by pushing water towards all branches

Correct Answer: (b)

2) When plants absorb water and minerals from the soil, not all of the water absorbed is utilized within the plant. What happens to the excess water, and how is this helpful outside of the plant body?

- (a) Water condenses on leaves and aids in dew formation
- (b) Water condenses on the plant body and falls back to the soil
- (c) Water evaporates through leaves and keeps the plant cool
- (d) Water evaporates through the plant and causes warmer climate

Correct Answer: (c)

LOB: Predict reasons for decreased absorption of water by plants.

1) Plants absorb water from the soil to make their food. Which of the following factor will decrease the absorption of water by plants?

- (a) A decrease in soil temperature
- (b) A decrease in the rate of transpiration
- (c) An increase in the number of root hairs
- (d) A decrease in the amount of water in the soil

Correct Answer: (b)

2) The table shows the features of four different plants.

Plant	Transpiration rate	Number of root hairs
A	Low	Less
B	Low	More
C	High	Less
D	High	More

Which plant will absorb water at the slowest rate?

- (a) A
- (b) B
- (c) C
- (d) D

Correct Answer: (a)

LOB: Attribute reasons for ineffective transportation of materials in plants, to functions of their parts

1) An experiment was conducted by a student to determine the role of soil water in the transportation of materials in plants. Plant A was watered daily for a month; however, plant B was not watered for a month. It was observed by the student that the plant that was watered daily was healthy and fresh, while plant B was dead. What could be the reason for observing this difference?

- (a) Adding water into the soil aids transportation of materials in plants.
- (b) Adding water into the soil introduces important nutrients to the soil.
- (c) Adding water into the soil reduces the water loss in plants during transportation.
- (d) Adding water into the soil increases the relative humidity of the atmosphere that allows the plant to remain cool.

Correct Answer: (a)

2) The generation of suction pull in plants plays an important role in moving minerals and water from the roots of the plants to all other parts. The generation of suction pull takes place due to the evaporation of water from the leaves. Which of the factor will favour the rapid transport of material in plants?

- (a) Absence of air currents
- (b) Increased relative humidity
- (c) Less absorption of water from the soil
- (d) Increase in environmental temperature

Correct Answer: (d)

LOB: Explain the importance and need for blood donations.

1) Which of the following patients at a hospital would benefit from blood transfusion using a donor's blood?

- (a) Patients with Asthma
- (b) Patients with Leukemia
- (c) Patients with Tuberculosis
- (d) Patients with neurological diseases

Correct Answer: (b)

2) Which of the given options does NOT relate to the regular need for blood donation?

- (a) Because blood has a limited shelf life
- (b) Because every 2 seconds someone needs blood
- (c) Because it improves the blood circulation of the donor
- (d) Because blood cannot be manufactured outside the body

Correct Answer: (c)

LOB: Study excretion in other organisms

1) Which of the following organisms excretes Ammonia?

- (a) Bird
- (b) Fish
- (c) Lizard
- (d) Snake

Correct Answer: (b)

2) Which kind of excretory waste is characteristic to fish, and what is the fate of this discharge?

- (a) Liquid uric acid, gets dissolved in water
- (b) Liquid Ammonia, gets dissolved in water
- (c) Gaseous Ammonia, gets dissolved in water
- (d) Semi-solid uric acid, sinks downwards

Correct Answer: (c)

LOB: Analyse the condition of kidney failure in order to explain the process of dialysis.

1) Which of the following components of a human body is directly involved in the process of dialysis?

- (a)** Blood
- (b)** Nephrons
- (c)** Neurons
- (d)** Urine

Correct Answer: (a)

2) Under which of the following conditions would a person have to undergo dialysis?

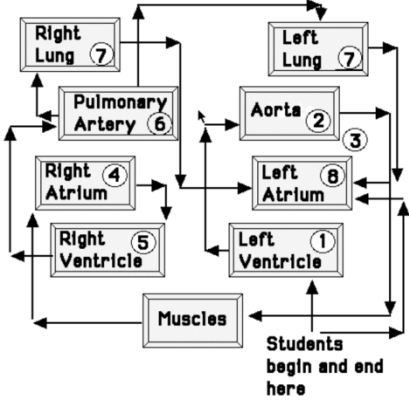
- (a)** Irregular heartbeat
- (b)** Typhoid
- (c)** Kidney failure
- (d)** Respiratory disease

Correct Answer: (c)



I

Activity

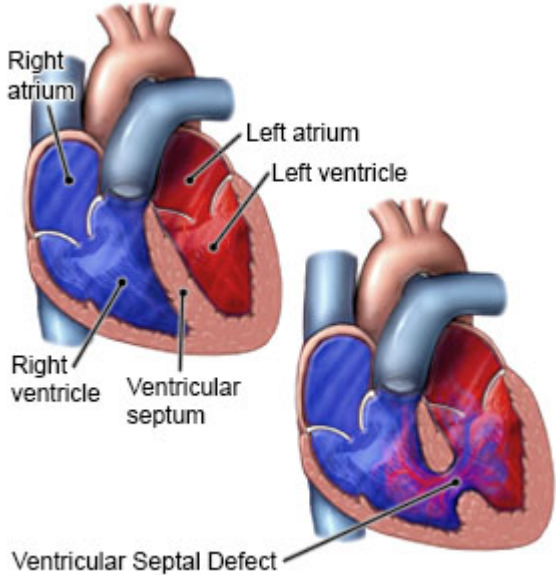
Activity	Circulatory System Relay
Materials required	An open area or playground space, 5 inflated red balloons, 5 inflated blue balloons, drawing of the lungs, chalk
Procedure	 <ol style="list-style-type: none"> 1. Draw the above relay course on the ground. 2. Recall how the blood flows between the four chambers of the heart, lungs and muscles and new vocabulary involved. (link attached above for reference) 3. We will be playing a relay race and time which group will finish first. 4. Divide the class into groups. Red balloons will represent oxygenated blood cells and the blue balloons will represent carbon dioxide deoxygenated blood or the cells' waste. 5. One blood cell (an actual person) at a time will travel through the entire course picking up the appropriate balloons on the way (red balloon to be placed at the lungs and blue balloons at the muscles and then after the completion of one course, these positions will reverse. A team's total time will be until all blue and red balloons are exchanged in position).

	<p>6. One student (blood cell) must go through the entire circulatory system before the next blood cell may continue. Each blood cell should take about 20 to 25 seconds to complete the circuit.</p>
Let's think	<ol style="list-style-type: none"> 1. What do you think will happen if 3-4 people are travelling together? (hint, a blood clot) What could be the health impacts of such a scenario? 2. What could affect the efficiency of blood transport in the body? (can prompt for thickening of artery walls) 3. What would the circulatory system look like in the absence of gravity?

2

Activity

Activity	Congenital Heart Disease
Materials required	Case study prints
Procedure	<ol style="list-style-type: none"> 1. Build the lesson as, 'Have you heard of people who have a hole in their heart? What do you understand about it? What do you think can be the consequences of such a circumstance?' 2. Introduce students to the concept that oxygenated and deoxygenated blood do not mix with each other in the heart. 3. Students to analyse the two images given below, one of a healthy heart and the other with a congenital heart disease and answer the following questions:

	 <p>Right atrium Left atrium Left ventricle Right ventricle Ventricular septum Ventricular Septal Defect</p> <ol style="list-style-type: none"> Where is the oxygenated and deoxygenated blood present in a healthy heart and where does it flow to? What happens when there is a “hole” or defect? What problems can you anticipate if the two kinds of blood intermix? Read the following text: “A ventricular septal defect (VSD) is a common kind of heart defect. With VSD, there is an opening between the two lower chambers (ventricles) of a child's heart. Normally, this closes before a baby is born. A VSD can cause blood to flow back into the right side of the heart instead of to the rest of the child's body. A VSD can lead to heart or lung problems or to low oxygen levels in a child's blood.” (Source: https://www.drugs.com/cg/ventricular-septal-defect-in-children-inpatient-care.html)
Let's think	<ol style="list-style-type: none"> Have you heard of people with this disease? How do you think they cope up with their daily functioning? What precautions must a person with this disease take?

12.Reproduction in Plants

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Introduction and Modes of Reproduction	Define reproduction in order to identify its need
	Observe and recall how different types of plants grow new ones in order to differentiate between asexual and sexual modes of reproduction.
Asexual Reproduction	Infer the mode of reproduction from the features of a plant
	Distinguish between any two modes of asexual reproduction, in connection with parts involved, etc.
Sexual Reproduction	Recall details/definitions pertaining to sexual mode of reproduction in plants.
	Compare the outcomes of sexual reproduction in unisexual plants with those in bisexual plants.
	Critique the idea that any one of the categories of seeds might disperse better than another category, in connection with reference to their features.

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Infer the mode of reproduction from the features of a plant	Identifies materials and organisms, such as, animal fibres; types of teeth; mirrors and lenses, on the basis of observable features, i.e., appearance, texture, functions, etc.
Observe and recall how different types of plants grow new ones in order to differentiate between asexual and sexual modes of reproduction	Differentiates materials and organisms such as, digestion in different organisms; unisexual and bisexual flowers; conductors

Distinguish between any two modes of asexual reproduction, in connection with parts involved, etc.	and insulators of heat; acidic, basic and neutral substances; images formed by mirrors and lenses, etc., on the basis of their properties, structure and function
Compare the outcomes of sexual reproduction in unisexual plants with those in bisexual plants	
Define reproduction in order to identify its need	Relates processes and phenomena with causes, e.g., wind speed with air pressure; crops grown with types of soil; depletion of water table with human activities, etc.
Recall details/definitions pertaining to sexual mode of reproduction in plants	Draws labelled diagrams / flow charts e.g., organ systems in human and plants; electric circuits; experimental set ups; life cycle of silk moth, etc.
Critique the idea that any one of the categories of seeds might disperse better than another category, in connection with reference to their features	Discusses and appreciates stories of scientific discoveries
Draw a contrast between any two modes of asexual reproduction, in connection with parts involved, etc.	



LOB: Define reproduction in order to identify the need for organisms to reproduce.

1) Which of the following statement correctly defines the term “reproduction”?

- (a) Production of new individuals from parents
- (b) An increase in height and weight of organism
- (c) The ability of an organism to withstand unfavourable conditions
- (d) The development of an individual physiologically and emotionally

Correct Answer: (a)

2) A farmer has an apple tree in his garden, which bears sweet apples every year. The farmer wants to add more trees of this variety in its garden. Which life process of the plant will allow it to produce more such plants?

- (a) Growth
- (b) Reproduction
- (c) Respiration
- (d) Transpiration

Correct Answer:(b)

LOB: Observe how different types of plants grow new ones in order to differentiate between asexual and sexual modes of reproduction.

1) Two students were asked to grow different plants. Student A used the stem of a rose plant and buried it into the soil to make a new plant. Student B used to the seed of a cucumber plant and buried it in the soil to grow a new one. After few weeks, the growth of a rose plant and a cucumber plant was observed. What mode of reproduction took place in the plants chosen by student A and student B?

- (a) Student A- Sexual reproduction; Student B- Sexual reproduction
- (b) Student A- Sexual reproduction; Student B- Asexual reproduction
- (c) Student A- Asexual reproduction; Student B- Sexual reproduction
- (d) Student A- Asexual reproduction; Student B- Asexual reproduction

Correct Answer:(c)

2) A teacher visited a vegetable farm with students. The table shows the plants growing in that farm.

- Pumpkin plant
- Cucumber plant
- Potato plant
- Tomato plant

The teacher pointed out a plant and said that its mode of reproduction is different from the other three plants. Which plant might have been pointed by the teacher, and why?

- (a) Tomato plant as it reproduces sexually, and other three plants reproduce asexually.
- (b) Pumpkin plant as it reproduces asexually, and other three plants reproduce sexually.
- (c) Potato plant as it reproduces asexually, and other three plants reproduce sexually.
- (d) Cucumber plants as it reproduces sexually, and other three plants reproduce asexually.

Correct Answer:(c)

LOB: Infer from features of a plant/factors that govern reproduction, the mode of reproduction to be asexual.

1) The table shows the area of a pond in percentage covered by green algae within 20 days.

Day	Covered area of the pond with algae (%)
1	5
12	30
20	80

A student claimed that algae reproduces sexually and grows rapidly in the pond. Is the claim made by the student correct?

- (a) Yes; Algae reproduce sexually by means of spores.
- (b) Yes; Algae reproduce sexually by means of gametes.
- (c) No; Algae reproduce asexually by means of budding.
- (d) No; Algae reproduce asexually by means of fragmentation.

Correct Answer:(d)

2) A potato plant does not produce seeds, but it produces new plants by means of vegetative propagation. The table lists some parts of a potato plant.

- Buds
- Flowers
- Leaves
- Eyes of potato
- Cutting of its stem

What plant part governs asexual reproduction in a potato plant?

- (a) Flowers
- (b) Buds
- (c) Eyes of potato
- (d) Cutting of stems

Correct Answer:(c)

LOB: Draw a contrast between any two modes of asexual reproduction, in connection with parts involved, etc.

1) A teacher showed ginger from which some sprouts were coming out to students. After some time, the teacher asked the students to observe a slide in which a yeast cell was reproducing. What mode of reproduction has been studied by the students in both these organisms?

(a)

Ginger	Yeast
Vegetative propagation	Vegetative propagation

(b)

Ginger	Yeast
Budding	Budding

(c)

Ginger	Yeast
Budding	Vegetative propagation

(d)

Ginger	Yeast
Vegetative propagation	Budding

Correct Answer:(d)

2) The addition of yeast into bread dough makes it raised by increasing its volume, and the growth of fungus takes place on bread slide when it is left for a longer time in moisture. A researcher took samples from the dough of bread on slide A, and from old bread on slide B. The researcher observed the growth of these organisms under the microscope. What type of asexual reproduction might have been observed by the researcher on both the slides?

- (a) Slide A- Budding, Slide B-Fragmentation
- (b) Slide A- Spore formation, Slide B-Budding
- (c) Slide A- Budding, Slide B-Spore Formation
- (d) Slide A- Fragmentation, Slide B-Spore Formation

Correct Answer: (c)

2) Plants use their different parts to produce new plants, as shown in the table.

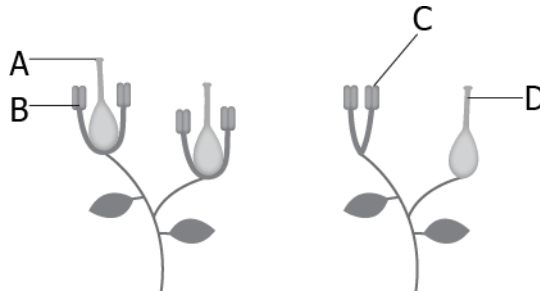
Plant	Part used
Rose	Stem-cutting
Bryophyllum	Leaf
Fern	Spores
Cucumber	Seed

Which of the plant uses a sexual mode of reproduction?

- (a) Bryophyllum
- (b) Cucumber
- (c) Fern
- (d) Rose

Correct Answer: (b)

2) The image represents the female and male reproductive parts of two different flowers.



A teacher asked a student to identify the label that represents pollen grain containing part of a bisexual flower. Which label should be chosen by the student?

- (a) Label A
- (b) Label B
- (c) Label C
- (d) Label D

Correct Answer: (b)

LOB: Compare the outcomes of sexual reproduction in unisexual plants with those in bisexual plants.

1) The table shows some plants grouped into two groups, 1 and 2 based on the difference in their outcomes of sexual reproduction.

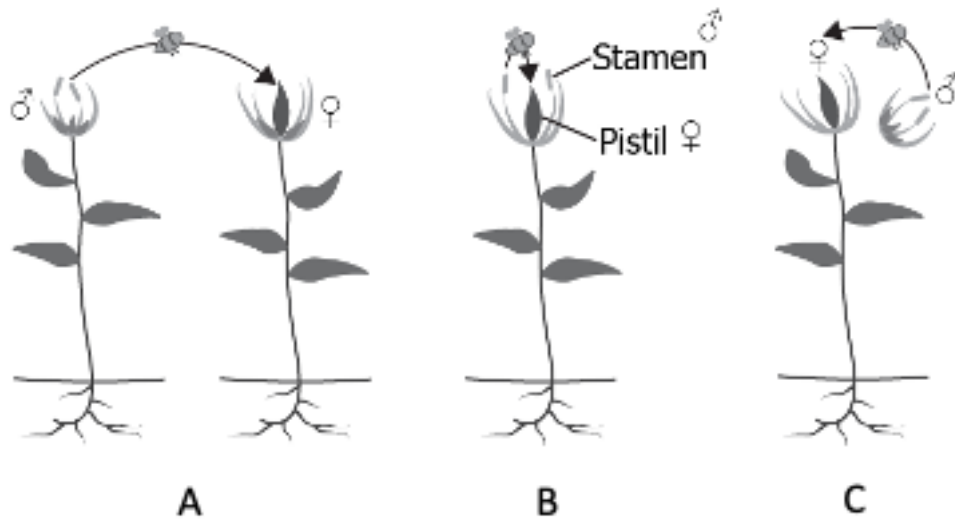
Group 1	Group 2
• Pine	• Mustard
• Papaya	• Rose
• Maize	• Lily

Which other plant can be included in group 1?

- (a) Cucumber
- (b) Mango
- (c) Petunia
- (d) Tomato

Correct Answer:(c)

2) The image represents three different conditions in which insects are transferring pollen grains of unisexual and bisexual flowers for governing reproduction in them.



Which of the condition/conditions would lead to the production of new varieties of plants?

- (a) Only condition 1
- (b) Only condition 3
- (c) Both, condition 1 and condition 3
- (d) Both, condition 2 and condition 3

Correct Answer:(c)

LOB: Critique the idea that any one of the categories of seeds might disperse better than another category, in connection with their features.

1) The table shows the features possessed by seeds of four different plants.

Plant	Feature
Drumstick	Winged seeds
Xanthium	Spiny seeds with hooks
Coconut	Seed with the fibrous outer coat
Aak	Hairy seeds

Seeds of which plant have features to disperse better in water than seeds of other plants?

- (a) Seeds of aak plant
- (b) Seeds of coconut plant
- (c) Seeds of drumstick plant
- (d) Seeds of xanthium plant

Correct Answer:(b)

2) A teacher told students that the seed dispersal in the Xanthium plant takes place by animals; however, seed dispersal in maple trees takes place by air. What features of these plants make their mode of seed dispersal different?

- (a)

Xanthium	Maple
Spiny seeds with hooks	Fibrous outer coat
- (b)

Xanthium	Maple
Winged seeds	Spiny seeds with hooks
- (c)

Xanthium	Maple
Spiny seeds with hooks	Winged seeds
- (d)

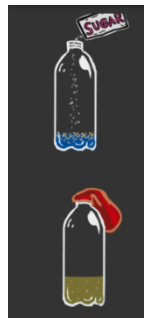
Xanthium	Maple
Fibrous outer coat	Winged seeds

Correct Answer:(c)



I

Activity

Activity	Yeast Balloon (Demonstrate the process of fermentation)
Materials required	Yeast, small bottle, sugar, warm water, one balloon
Procedure	<ol style="list-style-type: none"> 1. Recall how yeast reproduces as observed under the microscope. 2. Add sugar and warm water to a bottle and some yeast powder. 3. Put the balloon on the mouth of the bottle. 4. Let the bottle sit in a warm place for about 20 minutes and the balloon will begin to inflate!  <p>(Source: https://sciencebob.com/blow-up-a-balloon-with-yeast/)</p>
Let's think	<ol style="list-style-type: none"> 1. Why did the balloon inflate? Which gas filled it up? 2. Why is yeast used in bread baking? 3. What in the process of reproduction of yeast aids the quick rising of bread or the inflating of the balloon as the above activity? 4. Try different "yeast food" to check which helps in most gas in the balloon. (sugar, honey, salt etc.)

Activity	Have Seeds, Will Travel
Materials required	Organic wastes (seeds, twigs, leaves, wood, fiber, paper etc.), large open space, laptop (or personal computer), projector
Procedure	<ol style="list-style-type: none"> 1. Recall plant reproduction and that it requires seed to travel from the male reproductive to female reproductive part of the plant. 2. Students watch the following four videos and examine designs that help seeds to Float in Water, Attach to Animals, Wind Dispersal and Fly. 3. Distribute some organic materials in small student groups and ask them to design and test ideas for seed dispersal from one point to the other. (Students can test their designs to see if they can get their lima beans to: float in water for 5 minutes; stick to an animal and get carried over a distance of 10 feet; float in the air over a distance of 5 feet.)
Let's think	<ol style="list-style-type: none"> 1. Examine some seeds to analyse their design and compare with the design you created. 2. How is Nature able to down-size such structures without compromising on their ability to transport over large distances?

13. Motion and Time

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Speed	Recall the definition of speed(average speed) as distance covered in unit time.
	Recall the instrument used to measure speed.
	Recall change in position of the body with respect to surroundings as motion.
	Derive the mathematical formula to calculate speed in order to compare the speeds of various moving objects (uniform and non-uniform motion).
Measurement of Time	Identify repetition of natural events at definite/regular intervals of time/fraction of second in order to describe periodicity.
	Paraphrase the to and fro motion of simple pendulum/metallic bob suspended by a string as oscillatory motion
	Calculate speed or distance or time taken if any two of these three are quantitates are provided
Measurement of Speed	Utilize data given in odometer to measure distance travelled, average speed for a given time.
Distance-Time Graphs	Infer from the given data that time taken to complete one oscillation as time period of simple pendulum.
	Record data for distance covered in fixed intervals of time for a moving object in order to plot a distance-time graph and interpret the shape.

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Paraphrase the to and fro motion of simple pendulum/metallic bob suspended by a string is known as oscillatory motion	Conducts simple investigations to seek answers to queries, e.g., can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?
Recall change in position of the body with respect to surroundings as motion.	Explains processes and phenomena, e.g., processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.
Identify repetition of natural events at definite/regular intervals of time/fraction of second in order to describe periodicity.	
Infer from the given data that time taken to complete one oscillation as time period of simple pendulum.	
Paraphrase the to and fro motion of simple pendulum/metallic bob suspended by a string is known as oscillatory motion	
Recall the definition of speed (average speed) as distance covered in unit time.	Measures and calculates e.g., temperature; pulse rate; speed of moving objects; time period of a simple pendulum, etc.
Recall the instrument used to measure speed.	
Derive the mathematical formula to calculate speed in order to compare the speeds of various moving objects (uniform and non-uniform motion).	
Calculate speed or distance or time taken if any two of these three are quantitates are provided	
Utilize data given in odometer to measure distance travelled, average speed for a given time.	
Record data for distance covered in fixed intervals of time for a moving object in order to plot a distance-time graph and interpret the shape.	Plots and interprets graphs e.g., distance-time graph



LOB: Recall the definition of speed (average speed) as distance covered in unit time.

1) Which of these defines the speed of an object?

- (a) The size of the object and the distance covered
- (b) Total covered distance divided by total time taken
- (c) The length of space between two particular points
- (d) Total covered distance multiplied by total time taken

Correct Answer: (b)

2) During a race, a cyclist covers a total of 30 km distance in an hour. What is the average speed of the cyclist?

- (a) 10 km/hr
- (b) 20 km/hr
- (c) 30 km/hr
- (d) 300 km/hr

Correct Answer: (c)

LOB: Recall the instrument used to measure speed.

1) Which of these instruments is likely to help in measuring the speed of an object?

- (a) Anemometer
- (b) Beaker
- (c) Thermometer
- (d) Watch

Correct Answer: (d)

2) A student wants to measure the speed of a ball rolling down a ramp. He found a few instruments which are listed in the table.

- | |
|---|
| 1. Hourglass
2. Thermometer
3. Measuring tape
4. Stopwatch
5. Balance scale |
|---|

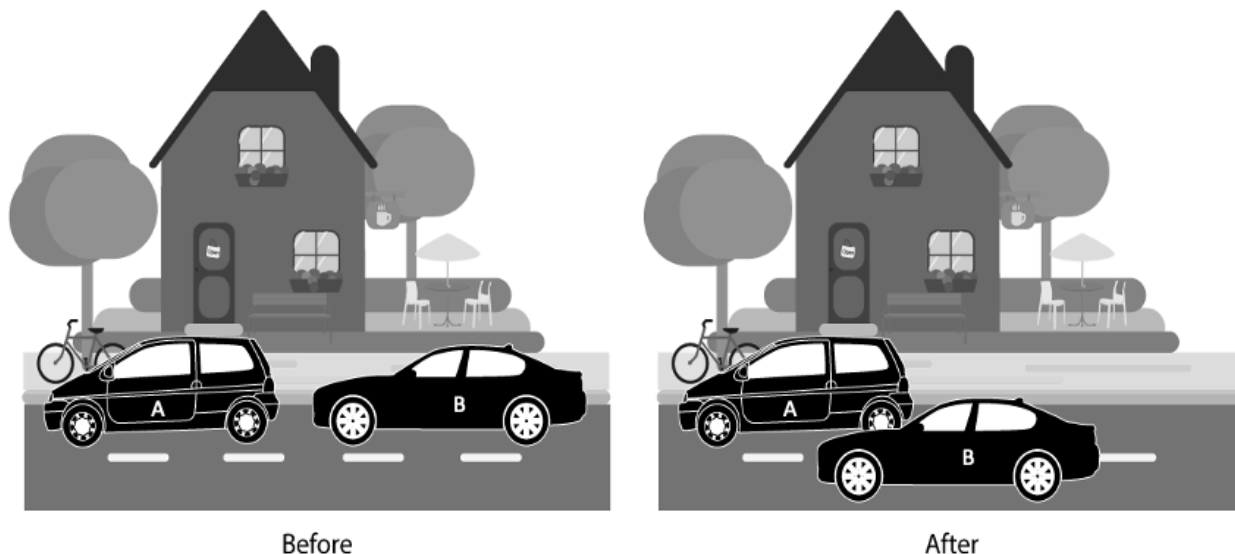
Which of these are required to measure the speed of the ball?

- (a) Hourglass and thermometer
- (b) Balance scale and stopwatch
- (c) Measuring tape and stopwatch
- (d) Measuring tape and thermometer

Correct Answer: (b)

LOB: Recall change in position of the body with respect to surroundings as motion.

1) A student observes the positions of two vehicles at different instants of time as shown.



Which of these statements explains the motion of the vehicles?

- (a) Car A is in motion as it changed its position with respect to the surroundings
- (b) Car B is in motion as it changed its position with respect to the surroundings
- (c) Car A is in motion as it did not change its position with respect to the surroundings
- (d) Car B is in motion as it did not change its position with respect to the surroundings

Correct Answer:(b)

2) A student drops a ball from a slope. He notices the ball rolling down as shown in the image.



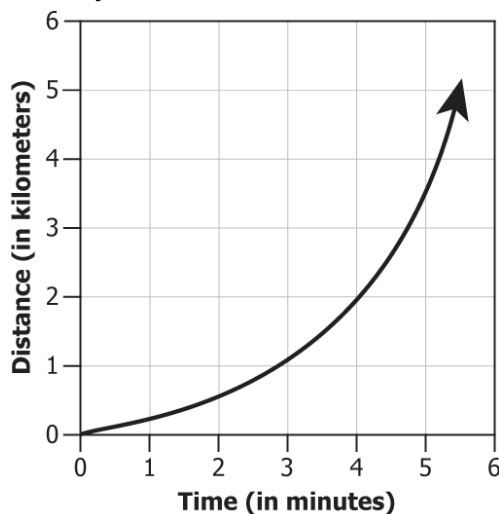
Which of these statements is true about the motion?

- (a) The student is in motion as he is standing
- (b) The student is in motion as he drops the ball
- (c) The ball is in motion as it rolls down the slope
- (d) The ball is in motion as its shape changes over time

Correct Answer:(c)

LOB: Derive the mathematical formula to calculate speed in order to compare the speeds of various moving objects (uniform and non-uniform motion)

1) The graph represents time taken by a car to cover a certain distance.

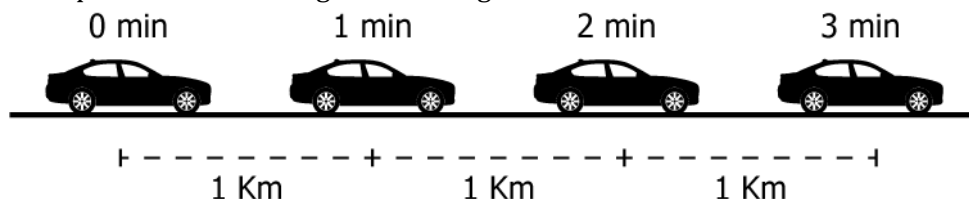


Which of these statements is true for the speed of the vehicle?

- (a) It has a uniform speed as time and distance both are increasing
- (b) It has a uniform speed as speed of the vehicle keeps on changing
- (c) It has a non-uniform speed as time and distance both are decreasing
- (d) It has a non-uniform speed as speed of the vehicle keeps on changing

Correct Answer:(d)

2) The time and position of a moving car covering a distance of 3 km is shown in the image.



What can be concluded from the position of the car?

- (a) It was moving at a uniform speed of 60 km/hr
- (b) It was moving at a non-uniform speed of 60 km/hr
- (c) It was moving at uniform speed as it covered 3 km in 3 min
- (d) It was moving at non-uniform speed as it covers 3 km in 3 min

Correct Answer:(c)

LOB: Identify repetition of natural events at definite/regular intervals of time/fraction of second in order to describe periodicity.

1) The table lists a few motions which relate to measuring time.

1. Motion of pendulum
2. Sand falling in an hourglass
3. Change in the position of a shadow

Which of these motions can be considered as a periodic motion?

- (a) Only 1
- (b) Only 2
- (c) Both 1 and 2
- (d) Both 2 and 3

Correct Answer:(c)

2) Which of these motions explains a periodic motion?

- (a) That follows a curve path
- (b) That occurs in a straight path
- (c) That is associated with calculating time
- (d) That repeats in an equal interval of time

Correct Answer:(d)

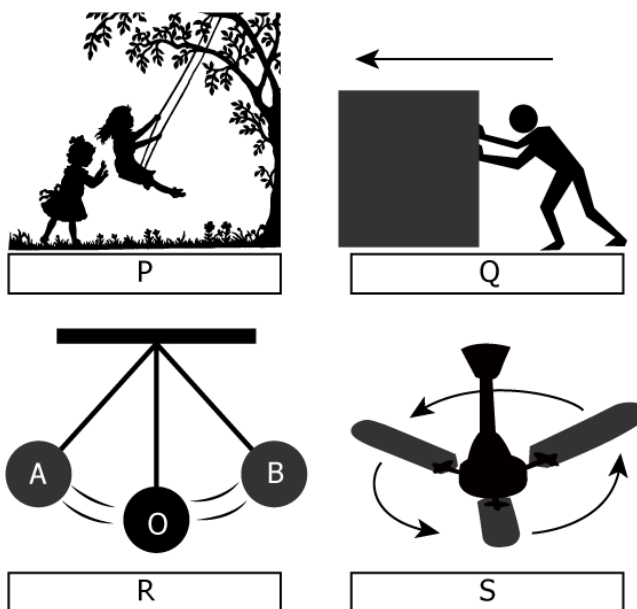
LOB: Paraphrase the to and fro motion of simple pendulum/metallic bob suspended by a string is known as oscillatory motion

1) Which of these directions can be considered as oscillatory motion?

- (a) To and fro along a mean value
- (b) Non-repetitive up and down
- (c) Vertically down
- (d) Straight horizontal

Correct Answer (a)

2) A few activities are provided in the given image.



Which of these motions are oscillatory in nature?

- (a) P and Q
- (b) P and R
- (c) Q and S
- (d) Q and R

Correct Answer:(b)

LOB: Calculate speed or distance or time taken if any two of these three are quantities are provided

1) A car covers a total of 200 kilometres in 4 hours. What is the average speed of the car?

- (a) 40 km/hr
- (b) 50 km/hr
- (c) 100 km/hr
- (d) 800 km/hr

Correct Answer:(b)

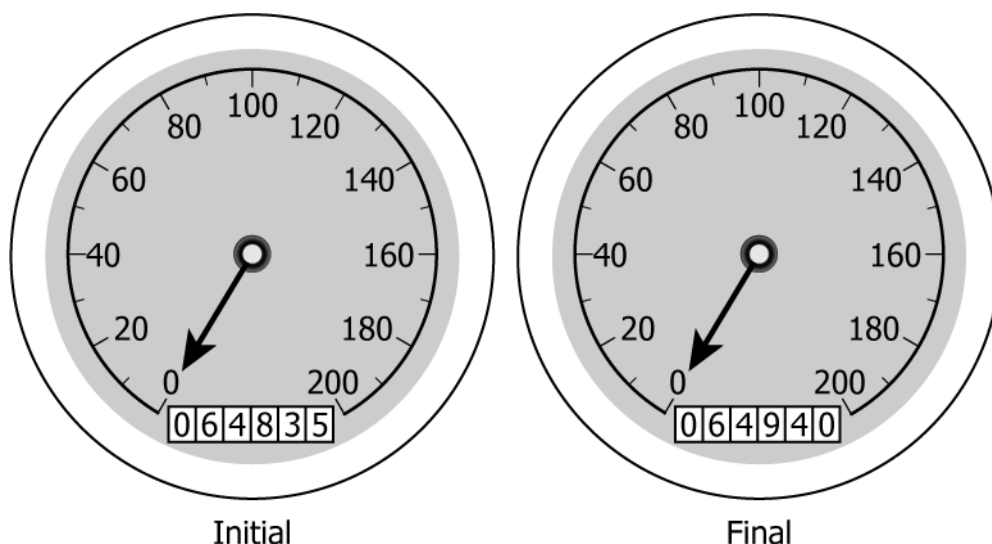
2) A person starts riding at 9:00 am to reach a location X which is about 175 km away from the starting point. He drives at an average speed of 70 km/hr. When is the person likely to reach the destination?

- (a) 10:00 am
- (b) 10:30 am
- (c) 11:00 am
- (d) 11:30 am

Correct Answer:(d)

LOB: Utilize data given in odometer to measure distance travelled, average speed for a given time.

1) A student with his father plans to visit his grandmother during a vacation. They used a motorcycle for the ride. Before starting the trip the student took a picture of the odometer marked as initial in the image. After reaching his grandmother's home he took another picture of the odometer marked as final.



What is the distance between the student and his grandmother's house?

- (a) 5 km
- (b) 80 km
- (c) 105 km
- (d) 150 km

Correct Answer:(c)

2) The school organised an educational tour for the students. They arranged a bus scheduled to leave for the trip at around 8:00 am. The odometer reading of the bus at the start and end of the trip is provided in the table.

	Time	Odometer Reading
Start	08:00 am	247344
End	11:00 am	247554

What was the average speed of the bus during the trip?

- (a) 30 km/hr
- (b) 70 km/hr
- (c) 90 km/hr
- (d) 210 km/hr

Correct Answer:(b)

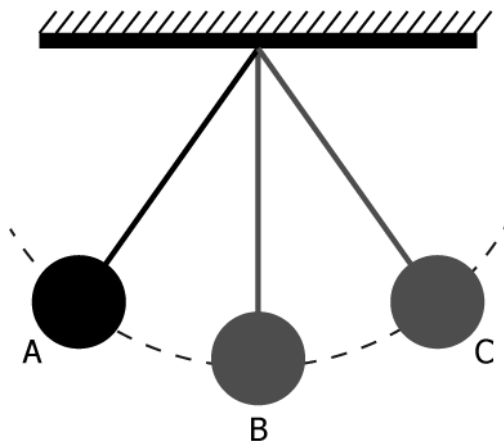
LOB: Infer from the given data that time taken to complete one oscillation as time period of simple pendulum

1) Which of these explains the time period of a simple pendulum?

- (a) The number of oscillations in one hour.
- (b) The number of oscillations in one minute.
- (c) Time taken to complete one full oscillation.
- (d) Time taken by the pendulum to come at rest.

Correct Answer:(c)

2) A student notices the swing of a pendulum as shown in the image. She notices that the bob of the pendulum starts from position A to C and then back to A in 2 seconds.



What is the time period of the pendulum?

- (a) 0.5 second
- (b) 1 second
- (c) 2 seconds
- (d) 4 seconds

Correct Answer:(c)

LOB: Record data for distance covered in fixed intervals of time for a moving object in order to plot a distance-time graph and interpret the shape.

1) The table reads the distance-time data for a moving toy car.

Distance (in meters)	Time (in minutes)
20	2
40	4
60	6

What is likely to be the shape of the plotted distance-time graph?

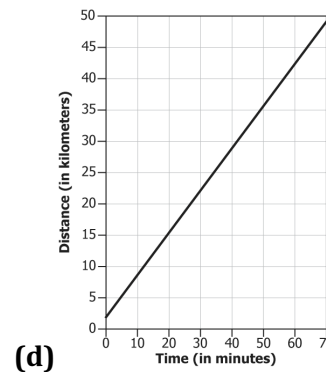
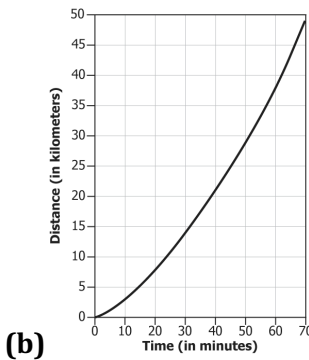
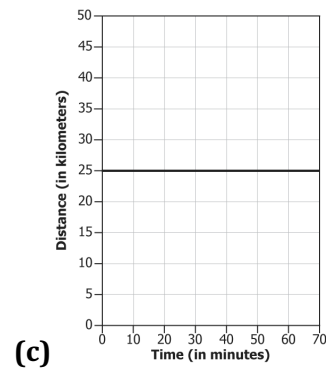
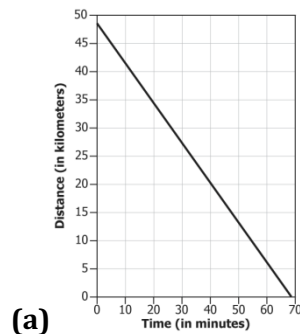
- (a) Circle
- (b) Square
- (c) Straight line
- (d) Triangle

Correct Answer:(c)

2) The table represents the distance-time data of a cyclist participating in a race.

Time (in min)	Distance (in Km)
10	3
20	8
30	14
60	38

Which of these graphs would be similar to the plotted graph for the distance versus time data provided?



Correct Answer:(b)



Activity

Activity	Investigate speed of toy cars															
Materials required	30 cm ruler (or a meter scale is preferred), masking tape, toy cars, large open space, stopwatch															
Procedure	<div><div><div>1. Mark one-meter long distances on the ground and label the points starting line, A, B, C and D (finishing line).</div><div>2. Divide students in groups of 3-4 with one toy car each.</div><div>3. Assign group roles (depending on classroom context) with one person noting the time and another observations in the following table. Run three sets of this exercise.</div><div>4. Ask students to draw some conclusions as a group from the data they have obtained. (equal distance, unequal time, car is going from slow to fast)</div></div><table><tr><th>Point</th><th>Distance (m)</th><th>Time (seconds)</th></tr><tr><td>A</td><td></td><td></td></tr><tr><td>B</td><td></td><td></td></tr><tr><td>C</td><td></td><td></td></tr><tr><td>D</td><td></td><td></td></tr></table><div><div>5. Recall the mathematical formula for speed and let students calculate it for all sets of observations.</div></div></div>	Point	Distance (m)	Time (seconds)	A			B			C			D		
Point	Distance (m)	Time (seconds)														
A																
B																
C																
D																

Let's think	<ol style="list-style-type: none"> 1. Goldie Goldfish, a speed swimmer, loves to race around the park's pond, which is 0.5 km around. If she can swim 20 laps around the track in 2 hours, what is her average speed? 2. It takes Stu, a slimy slug, 20 minutes to travel from his favorite bush to the local trash can (a trip of 30 meters), how far can he travel in 1 hour (60 minutes)?
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2

Activity

Activity	<u>Plotting speed-time graphs for different kinds of motion</u>																
Materials required	30 cm ruler (or a meter scale is preferred), masking tape, large open space, stopwatch, graph sheets																
Procedure	<ol style="list-style-type: none"> 1. Mark one meter long distance from starting point to ending point in a large open space. 2. Assign group roles (depending on classroom context) with one person noting the time and another observations in the following table. Run three sets of this exercise with different persons. 3. Ask students to draw some conclusions as a group from the data they have obtained. <table border="1"> <thead> <tr> <th>Activity</th><th>Distance (m)</th><th>Time (seconds)</th></tr> </thead> <tbody> <tr> <td>Walking</td><td></td><td></td></tr> <tr> <td>Walking backward</td><td></td><td></td></tr> <tr> <td>Speed Walking</td><td></td><td></td></tr> <tr> <td>Hopping</td><td></td><td></td></tr> </tbody> </table>		Activity	Distance (m)	Time (seconds)	Walking			Walking backward			Speed Walking			Hopping		
Activity	Distance (m)	Time (seconds)															
Walking																	
Walking backward																	
Speed Walking																	
Hopping																	

	<ol style="list-style-type: none"> 4. Recall the mathematical formula for speed and let students calculate it for all sets of observations. 5. Recall how to graph a speed-time graph and let students draw the same for data of at least one student in all different activities on different graph sheets.
Let's think	<ol style="list-style-type: none"> 1. Which task provided the fastest speed? 2. Which task provided the slowest speed? 3. Is the graph always a straight line? Is the shape of the graph same in all cases? 4. What sets apart the graph of each of these from the other?

14. Electric Current and its Effects

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Symbols of Electric Components	Translate a circuit with actual components into a circuit diagram.
	Recall the precautions to be observed while working with electricity.
Heating Effect of Electric Current	Observe heating effect of current in order to enlist its uses and compare it for conductors of different material, length and thickness.
	Summarize the benefits of using CFLs over ordinary electric bulbs.
	Evaluate the role of a fuse wire and MCBs provide for electrical safety in a circuit.
Electromagnetism	Perform a simple activity to demonstrate the magnetic effect of an electric current.
	Examine how that an electric current can be used as a magnet in order to list its uses.
	Outline the construction and uses of electromagnets and electric bell.

Learning Objectives and Learning Outcomes:

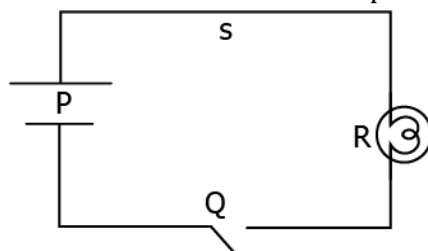
Learning Objectives	Learning Outcomes
Examine how that an electric current can be used as a magnet in order to list its uses.	Explains processes and phenomena, e.g., processing of animal fibres; modes of transfer of heat; organs and systems in human and plants; heating and magnetic effects of electric current, etc.
Outline the construction and uses of electromagnets and electric bell.	

Translate a circuit with actual components into a circuit diagram.	Draws labelled diagrams / flow charts e.g., organ systems in human and plants; electric circuits; experimental set ups; life cycle of silk moth, etc.
Observe heating effect of current in order to enlist its uses and compare it for conductors of different material, length and thickness.	Constructs models using materials from surroundings and explains their working, e.g., stethoscope; anemometer; electromagnets; newton's colour disc ,etc.
Perform a simple activity to demonstrate the magnetic effect of an electric current.	
Recall the precautions to be observed while working with electricity.	
Summarize the benefits of using CFLs over ordinary electric bulbs.	
Evaluate the role of a fuse wire and MCBs provide for electrical safety in a circuit.	Discusses and appreciates stories of scientific discoveries



LOB: Translate a circuit with actual components into a circuit diagram

1) The image represents an electric circuit with different components.

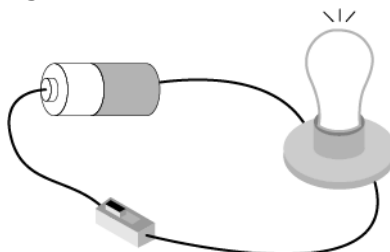


Which of the marked components represents a battery in the circuit?

- (a) P
- (b) Q
- (c) R
- (d) S

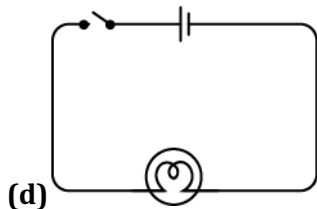
Correct Answer (a)

2) The given image shows the arrangement of an electric circuit.



Which of the circuit diagram represents the correct electric circuit?

- (a)
- (b)
- (c)



Correct Answer:(c)

LOB: Recall the precautions to be observed while working with electricity.

1) Which of these precautions must be followed while working with electricity?

- (a) Avoid switching on an electric switch connected to the mains
- (b) Avoid touching a lighted electric bulb connected to the mains
- (c) Always make your hand wet before touching any electric appliances
- (d) Always wait for the electric appliance to become hot before holding them

Correct Answer:(b)

2) A student wants to conduct an experiment using an electric circuit. He wants to reduce the risk involved in the procedure. Which of these methods should he adopt to reduce the risk involved in an electric circuit?

- (a) Use electricity from mains
- (b) Use an inverter for electricity
- (c) Use a generator for electricity
- (d) Use electric cells for electricity

Correct Answer:(d)

LOB: Observe heating effect of current in order to enlist its uses and compare it for conductors of different material, length and thickness

1) The table list a few electrical appliances:

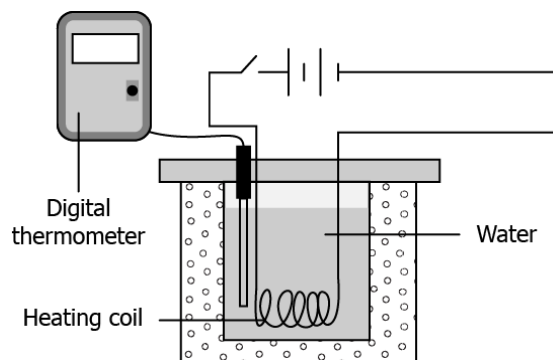
- | |
|---|
| <ul style="list-style-type: none">1. Fan2. Iron3. Geyser4. Television5. Electric bell |
|---|

Which of these appliances converts electricity into heat?

- (a) Fan and Iron
- (b) Iron and Geyser
- (c) Cell phone and Iron
- (d) Electric bell and Television

Correct Answer:(b)

2) A student performs an experiment where he uses a heating coil to heat the water as shown in the image. The initial temperature of the water is measured as 10°C . After switching it on for 5 min, the student records the temperature of the water as 18°C .



The water is allowed to return back to its initial temperature. The activity is then repeated with another heating coil having half the length of the original heating coil. He notices that after 5 min the temperature of the water reads 14°C . Which statement can be concluded based on the activity?

- (a) Reading on thermometer reduces with time
- (b) Temperature of water drops with every repetition
- (c) Length of the material affects the amount of heating
- (d) Temperature of the water increases after a certain period of time

Correct Answer:(c)

LOB: Summarize the benefits of using CFLs over ordinary electric bulbs

1) Which of these statements explains the benefit of CFL over incandescent bulbs?

- (a) It produces electricity from heat
- (b) It gives heat along with the light
- (c) It consumes a lesser amount of electricity
- (d) It does not require electricity to produce light

Correct Answer:(c)

2) A student performs an experiment where he supplied the same amount of electricity to two different bulbs, an incandescent bulb and another CFL. Which of the two bulbs is likely to appear brighter?

- (a) CFL as it uses filament to produce light
- (b) CFL as it requires lesser amount of electricity
- (c) Incandescent bulb as it produces heat along with light
- (d) Incandescent bulb as it requires the most amount of electricity

Correct Answer:(b)

LOB: Explain the role of a fuse wire and MCBs provide for electrical safety in a circuit

1) A student studies that a fuse wire helps in protecting electrical appliances. What role does the fuse wire play in an electrical appliance?

- (a) It reduces the consumption of electricity
- (b) It helps to avoid the passing of large current
- (c) It helps in storage of electricity for further use
- (d) It avoids overheating of an electrical appliance

Correct Answer:(b)

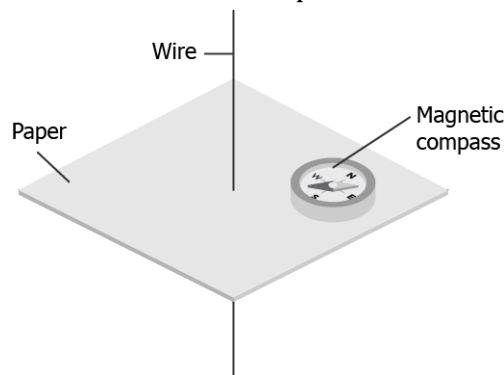
2) An electrician wants to prevent damage to electrical appliances in a house due to a sudden rise in the amount of electric current. Which of this appliance should be installed to avoid the damages?

- (a) Light-emitting diode
- (b) Miniature circuit breakers
- (c) Incandescent electric bulbs
- (d) Compact fluorescent lamps

Correct Answer:(b)

LOB: Perform a simple activity to demonstrate the magnetic effect of an electric current

1) A student performed an experiment where he placed a magnetic compass near a current carrying wire. She notices some deflection in the compass needle.

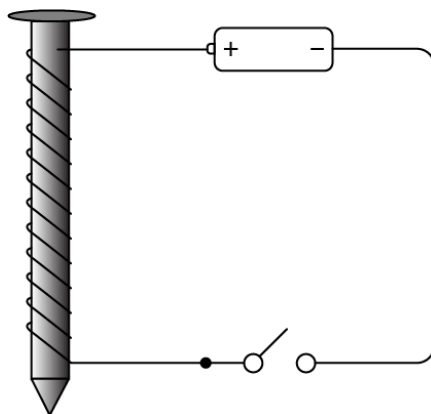


What causes the deflection of the needle in the compass?

- (a) Magnetic effect of the electric current
- (b) Electric effect of the magnetic compass
- (c) Magnetic effect of the compass on paper
- (d) Electric effect of the paper on the compass

Correct Answer: (a)

2) A student performs an experiment where a wire is wrapped around a nail as shown in the image. As she completes the circuit, she notices that a nearby nail gets attracted to the nail wrapped in the wire.



What causes the nails to attract each other?

- (a) Metal objects always attract each other
- (b) Gravitational force causes them to attract
- (c) Difference in the size of the nails causes the attraction
- (d) Magnetic effect due to the flow of electricity causes the attraction

Correct Answer:(d)

LOB: Hypothesize that an electric current can be used as a magnet in order to list its uses

1) Which of these explains the use of an electric current as a magnet?

- (a) Lighting of an incandescent bulb
- (b) Separating pieces of iron from junk
- (c) Turning off a miniature circuit breaker
- (d) Production of heat in an electric kettle

Correct Answer:(b)

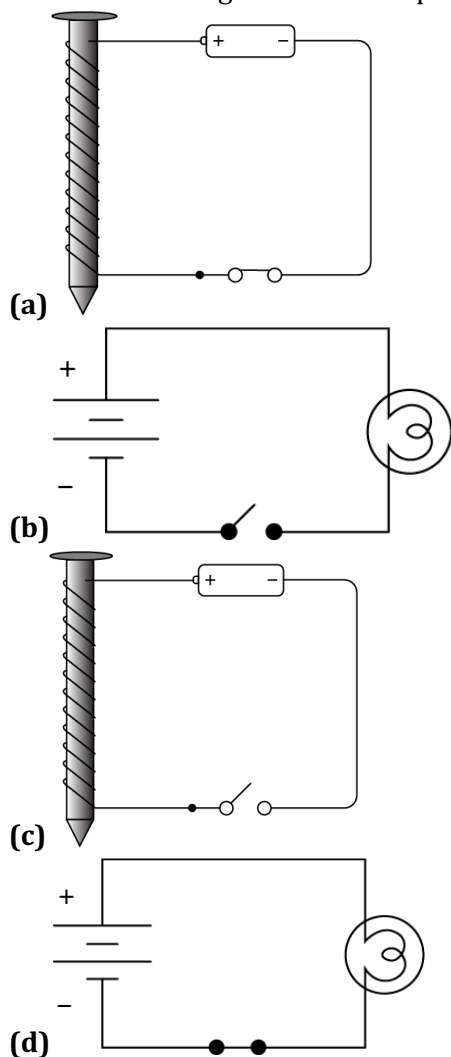
2) A student found a mixture that contains pieces of paper and some pins. He wants to separate the pins from the mixture without handpicking them. Which of these procedures would help him to separate the pins from pieces of paper?

- (a) Build a magnet using electricity
- (b) Place an electric bulb in the mixture
- (c) Build an object that uses electricity to heat
- (d) Place wires carrying electricity into the mixture

Correct Answer (a)

LOB: Outline the construction and uses of electromagnets and electric bell

1) A student requires a magnet for his science project. He decides to prepare a magnet of his own. Which of these arrangements would produce a magnet?



Correct Answer (a)

2) A student understands that a hammer in an electric bell strikes the gong when the current passing through the circuit turns the coil into an electromagnet. He also observes that when a switch is held on, the hammer repeatedly strikes the gong. What causes the hammer to continue striking?

- (a) Production of heat in the wires of the circuit
- (b) Melting of the wire due to the flow of electricity
- (c) Repetition of breaking and completion of the circuit
- (d) Material of the gong causes vibration in the hammer

Correct Answer:(c)



Activity

Activity	<u>Comparing energy efficiency of incandescent bulbs, LEDs and CFLs</u>
Materials required	Incandescent bulb, LED, CFL, power outlet, electric circuit components, thermometer
Procedure	<ol style="list-style-type: none"> Engage the students by asking the following questions: <ol style="list-style-type: none"> What does it mean to be “energy efficient”? Why is it important? What are some ways we can become more energy efficient at home and at school? (lighting) Name some different types of light bulbs (or tube lights). Divide students into small groups of 3-4 students each and set up as many electrical circuits as the number of groups in the class and give each of them a thermometer and three different types of bulbs to work with. Place one of the bulbs in the circuit and let it be there for 10 minutes in a closed circuit. Place the thermometer 1.5 inches from the end of the bulb so that the bottom reader captures the heat of the bulb and ask students to note down the temperature. Repeat the same with the other two bulbs.
Let’s think	<ol style="list-style-type: none"> Which of the bulbs had the maximum temperature? Do you think the temperature of the bulb is related to the electricity consumed or the “efficiency”? Which bulb of three you compared would you purchase for your home? Why?

15. Light

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Properties of Light and Reflection	Recall reflection as change in direction of light by polished surfaces/mirrors.
Image Formed by Plane Mirror	Observe and describe image formed by a plane mirror in order to enlist its uses. (image/object, erect/inverted, virtual/real, distance from the mirror)
	Analyse the reason behind 'AMBULANCE' written as its mirror image on the hospital vehicles/ambulances.
Spherical Mirrors	Conclude from observations that concave mirror forms real, inverted image at all places except when the object is too close whereas convex mirror is erect, virtual & smaller size than the object.
	Analyse why virtual image cannot be obtained on the screen but still can be photographed.
	Attribute to the type of image formed by convex mirror for its utility as rear view mirror in the vehicles
Spherical Lenses	Differentiate between convex and concave lenses based on the image formed when object is placed at different positions.
	Outline the important uses of spherical mirrors & lenses.
Sunlight	Explain the formation of a rainbow.

Learning Objectives and Learning Outcomes:

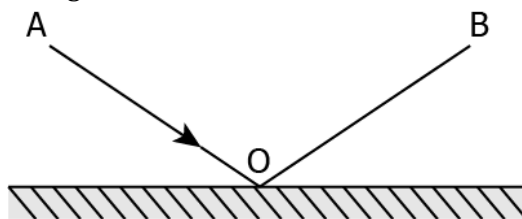
Learning Objectives	Learning Outcomes
Recall reflection as change in direction of light by polished surfaces/mirrors.	Identifies materials and organisms, such as, animal fibres; types of teeth; mirrors and lenses, on the basis of observable features, i.e., appearance, texture, functions, etc.
Observe and describe image formed by a plane mirror in order to enlist its uses. (image/object, erect/inverted, virtual/real, distance from the mirror)	

Conclude from observations that concave mirror forms real, inverted image at all places except when the object is too close whereas convex mirror is erect, virtual & smaller size than the object.	
Differentiate between convex and concave lenses based on the image formed when object is placed at different positions.	Differentiates materials and organisms such as, digestion in different organisms; unisexual and bisexual flowers; conductors and insulators of heat; acidic, basic and neutral substances; images formed by mirrors and lenses, etc., on the basis of their properties, structure and function
Explain the formation of a rainbow.	Conducts simple investigations to seek answers to queries, e.g., can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?
Analyze why virtual image cannot be obtained on the screen but still can be photographed.	Relates processes and phenomena with causes, e.g., wind speed with air pressure; crops grown with types of soil; depletion of water table with human activities, etc.
Explain the formation of a rainbow.	Constructs models using materials from surroundings and explains their working, e.g., stethoscope; anemometer; electromagnets; newton's colour disc ,etc.
Analyze the reason behind 'AMBULANCE' written as its mirror image on the hospital vehicles/ambulances.	Discusses and appreciates stories of scientific discoveries
Attribute to the type of image formed by convex mirror for its utility as rear-view mirror in the vehicles	
Outline the important uses of spherical mirrors & lenses.	



LOB: Recall reflection as change in direction of light by polished surfaces/mirrors.

1) A student observes the path followed by a ray of light as shown in the image. She argues that the path represents the reflection of light.

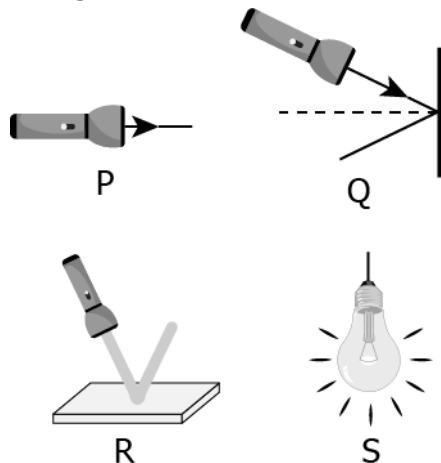


Which of these statements support the argument by the student?

- (a) Absorption of light by the polished surface
- (b) Maintaining a straight path by the ray of light
- (c) Equal amount of light in the initial and final point
- (d) Change in direction of light by a polished surface

Correct Answer:(d)

2) The image represents the path of light followed as it travels from different sources.



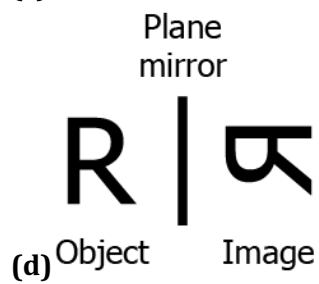
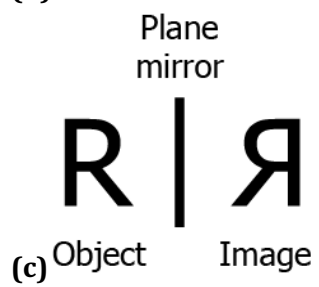
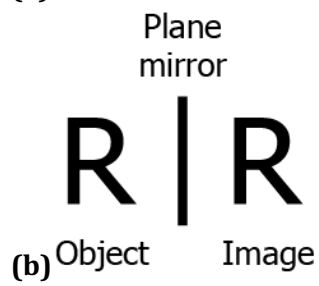
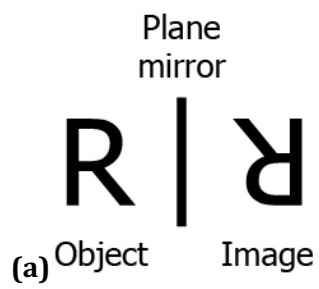
Which of these images represents the reflection of light?

- (a) P and Q
- (b) R and S
- (c) P and S
- (d) Q and R

Correct Answer:(d)

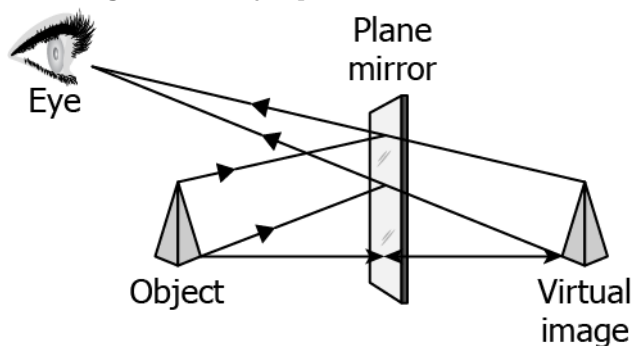
LOB: Observe and describe image formed by a plane mirror in order to enlist its uses (image/object, erect/inverted, virtual/real, distance from the mirror)

1) Which of these represents the correct image formed by a plane mirror?



Correct Answer:(c)

2) The figure represents the image formed by a plane mirror.



Which of these statements explains the characteristics of the image formed by the plane mirror?

- (a) Erect and diminished
- (b) Inverted and magnified
- (c) Erect and of the same size as the object
- (d) Inverted and of the same size as the object

Correct Answer:(c)

LOB: Analyse the reason behind 'AMBULANCE' written as its mirror image on the hospital vehicles/ambulances.

1) A student riding his motorcycle observes a vehicle on his rear-view mirror which has "AMBULANCE" written on it. Which of these steps should be considered when someone sees an ambulance behind them?

- (a) Give way to the vehicle to cross
- (b) Stop the vehicle from moving further
- (c) Ask all nearby vehicle to stop at its place
- (d) Turn on the headlights of the motorcycle

Correct Answer: (a)

2) The image shows how the word "AMBULANCE" is written in vehicles.

AMBULANCE

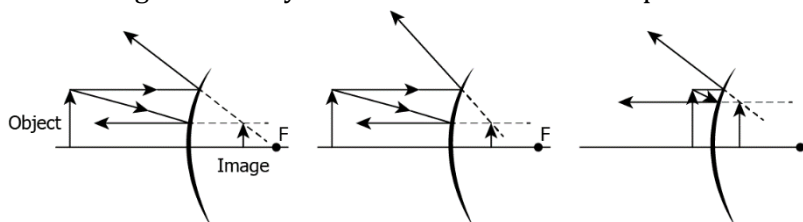
What is the reason behind writing the word in the manner?

- (a) To make the vehicle gain extra speed while travelling
- (b) To make the vehicle look different from rest on the road
- (c) The vehicles ahead can read it easily in the rear-view mirror
- (d) People standing in front of the vehicle can read it from distance

Correct Answer:(c)

LOB: Conclude from the observations that concave mirror forms real, inverted image at all places except when the object is too close whereas convex mirror is erect, virtual & smaller size than the object.

1) The figure shows the image formed by a convex mirror at various positions.

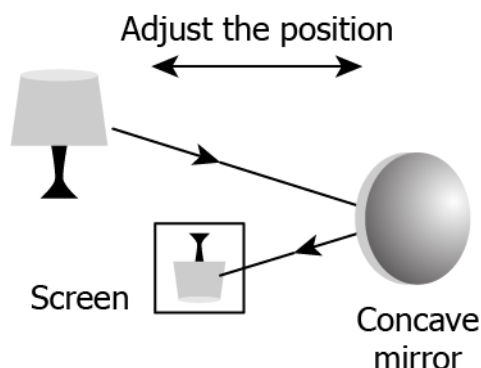


What can be concluded about the nature of the image formed using a convex mirror?

- (a) Always forms a real image irrespective of the position of the object
- (b) Always forms a virtual image irrespective of the position of the object
- (c) Forms a real image only when the object is placed close to the mirror
- (d) Forms a virtual image only when the object is placed close to the mirror

Correct Answer:(b)

2) A student performs an activity where he uses a lamp and projects its image on a screen as shown in the image.



He kept on changing the distance between the lamp and the mirror for various positions. He notices that the image formed on the screen disappears when the lamp is held close to the mirror. What explains the disappearance of the image on the screen?

- (a) Size of the screen should always be larger than of the object
- (b) Objects held close to a concave mirror produces a virtual image
- (c) Concave mirror does not reflect light when the object is held too close to it
- (d) Distance of the screen from the mirror should always be less than that of the object

Correct Answer:(b)

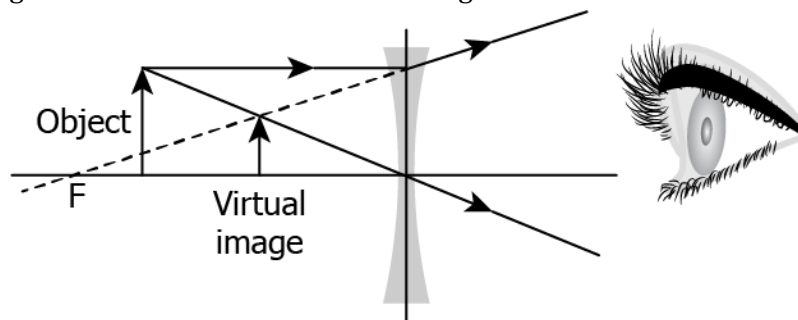
LOB: Analyze why virtual image cannot be obtained on the screen but still can be photographed

1) Which of these explains the reason why the virtual image can never be obtained on the screen?

- (a) They are too small to be obtained on a screen
- (b) The rays of light never converge after reflection
- (c) They always produce an erect image which is difficult to project
- (d) The rays of light are too bright and might burn the screen on projection

Correct Answer:(b)

2) A student understands that a virtual image cannot be obtained on a screen. The formation of a virtual image using a concave lens is shown in the image.



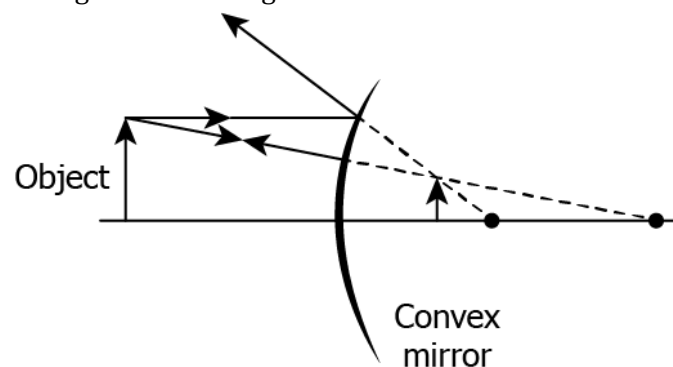
Which statement explains about the photography of the virtual image formed?

- (a) It cannot be photographed as it cannot be obtained in a screen
- (b) It can be photographed as light appears to come from the virtual image
- (c) It cannot be photographed as the size of the object is larger than the image
- (d) It can be photographed as a virtual image formed is erect and diminished in nature

Correct Answer:(b)

LOB: Attribute to the type of image formed by convex mirror for its utility as rear-view mirror in the vehicles

1) The figure shows the image formed using a convex mirror.



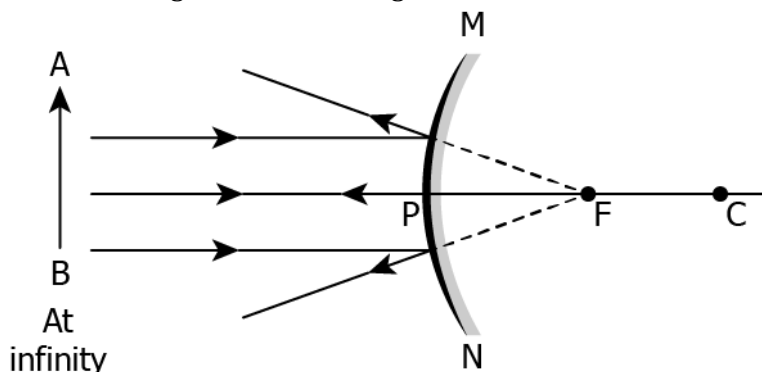
Which of these explains the nature of the image formed by the convex mirror?

- (a) Real and erect

- (b) Virtual and erect
- (c) Real and inverted
- (d) Virtual and inverted

Correct Answer:(b)

2) The figure represents the image formation using a convex mirror.



What makes it best suitable to be used as a rearview mirror?

- (a) It can make the object appear larger
- (b) Image formed is always real in nature
- (c) Image formed is always erect and same size
- (d) It can form images of objects spread over a large area

Correct Answer:(d)

LOB: Differentiate between convex and concave lenses based on the image formed when object is placed at different positions.

1) Which of these matches the nature of the image formed by the lens when an object is placed close to it?

- (a) Concave lens → real and erect
- (b) Convex lens → real and larger
- (c) Convex lens → large and inverted
- (d) Concave lens → virtual and smaller

Correct Answer:(d)

2) A student performs an experiment using a spherical lens. He placed the object far away from the lens. The image formed is inverted and is produced on a screen placed on the opposite side of the lens. Which lens is being used by the student for the experiment?

- (a) Convex lens as it can only produce a real image
- (b) Convex lens as it only produces an inverted image
- (c) Concave lens as it can only produce a virtual image
- (d) Concave lens as it can only form an image for an object at infinity

Correct Answer:(c)

LOB: Outline the important uses of spherical mirrors & lenses.

1) Which of these explains the importance of concave reflectors in the headlight of a vehicle?

- (a) Spread light to a larger area
- (b) Help form an enlarged image
- (c) It can concentrate the light ray at a particular point
- (d) Form images of objects spread over a large area

Correct Answer:(c)

2) A student found a piece of note which has very tiny words imprinted on it. Which of these should the student use in order to recognize the words?

- (a) Convex lens
- (b) Concave lens
- (c) Convex mirror
- (d) Concave mirror

Correct Answer (b)

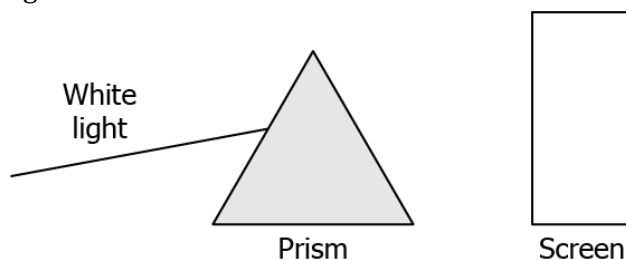
LOB: Explain the formation of a rainbow

1)Which of these explains the formation of a rainbow?

- (a) Converging of light at a single point
- (b) Splitting of white light into different colours
- (c) Changing the direction of light by a polished surface
- (d) Mixing of various colours of light into a single colour

Correct Answer:(b)

2) A student performs an experiment where he allows passing a white beam of light through a prism as shown in the image.



What is likely to appear on the screen behind the prism?

- (a) A single dark black line
- (b) Pattern of different colours
- (c) A single line of bright white light


(d) Series of lines of the same colour
Correct Answer:(b)

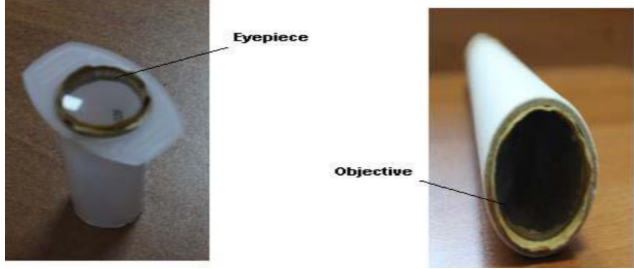

Suggested Teacher Resources

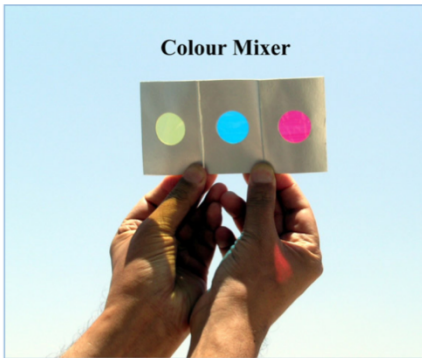


I

Activity

Activity	Making a refractive telescope
Materials required	<p>A cardboard tube (aluminium foil roll), 50 ml syringe, two converging lenses of different focal lengths (one width is according to the cardboard tube for the objective, the other width is according to the injector for the eyepiece) (lenses can be obtained from the optician), masking tape, black wrapping paper</p>  <p>(Source: https://www.eduhk.hk/apfslt/download/v16_issue1_files/tural.pdf)</p>
Procedure	<ol style="list-style-type: none">1. Direct students to tape around the little lens and to place in the syringe as shown in the image below. Now, the eyepiece for the telescope is ready.2. Ask students to repeat the procedure for the big lens to place inside the cardboard tube. This is the objective of the telescope.

	<ol style="list-style-type: none"> 3. Show students how to insert the syringe into the cardboard tube. 4. Ask students to wrap the cardboard tube and injector with black wrapping paper. Now the refracting telescope is ready. 5. Direct students to focus on a distant object and to slide the injector tube in the cardboard tube slightly to ensure the image comes into focus. 6. Tell students they can also observe the moon and stars at night. Warn students never look at the sun through the telescope since it causes serious eye damage. <div data-bbox="634 678 1263 945">  </div> <div data-bbox="501 997 1403 1247">  </div>
Let's think	<ol style="list-style-type: none"> 1. What are some other science tools that use mirrors and/or lenses to magnify? 2. Find out how do modern telescopes differ from telescopes built 100, 200 or 300 years ago?

Activity	Colour Mixer (Additive Colour Mixing)
Materials required	Card sheet, red, blue and yellow cellophane paper
Procedure	 <p>(Source: http://www.arvindguptatoys.com/toys/colourmixer.html)</p> <ol style="list-style-type: none"> 1. Take a card sheet as shown above and put the cellophane papers. 2. Place each combination of colours on top of each other to obtain new colours.
Let's think	<ol style="list-style-type: none"> 1. What are primary colours? 2. Can all colours be obtained by mixing primary colours or a combination of colours obtained from primary colours?

16. Water: A Precious Resource

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Water Scarcity	Recall process that generate waste water that goes down the drains from sinks, showers, toilets, laundries etc.
How much water is available?	Visualise the percentage of freshwater available on the Earth in order to conclude the need for water conservation
Forms of Water	Recall the water cycle in order to describe the processes encompassed by it.
	List the means of access to water in order to trace their origin to the water cycle.
Groundwater	Describe infiltration i.e. seepage of water into the ground in order to define the water table and aquifer
Depletion of Water Table	Construct a cause & effect model of depletion of ground water table
Distribution of Water	Analyse the rainfall map of India in order to attribute reasons and factors leading to shortage and excess of water in major areas.
Management of Water	Suggest some(of his/her own) methods for recharging ground water table
	Examine the role of plants in water management.
	Suggest the steps for efficient water management at individual/community level.
	Elaborate the steps to be taken by the public/private authorities for improved water supply

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Recall process that generate waste water that goes down the drains from sinks, showers, toilets, laundries etc.	Identifies materials and organisms, such as, animal fibres; types of teeth; mirrors and lenses, on the basis of observable features, i.e., appearance, texture, functions, etc.
Examine the role of plants in water management	Conducts simple investigations to seek answers to queries, e.g., can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?
List the means of access to water in order to trace their origin to the water cycle.	Relates processes and phenomena with causes, e.g., wind speed with air pressure; crops grown with types of soil; depletion of water table with human activities, etc.
Describe infiltration i.e. seepage of water into the ground in order to define the water table and aquifer	
Construct a cause & effect model of depletion of ground water table.	
Analyse the rainfall map of India in order to attribute reasons and factors leading to shortage and excess of water in major areas.	
Recall the water cycle in order to describe the processes encompassed by it	Draws labelled diagrams / flow charts e.g., organ systems in human and plants; electric circuits; experimental set ups; life cycle of silk moth, etc.
Suggest some (of his/her own) methods for recharging ground water table	Discusses and appreciates stories of scientific discoveries
Suggest the steps for efficient water management at individual/community level.	
Elaborate the steps to be taken by the public/private authorities for improved water supply	
Visualize the percentage of freshwater available on the Earth in order to conclude the need for water conservation.	Applies learning of scientific concepts in day-to-day life, e.g., dealing with acidity; testing and treating soil; taking measures to prevent corrosion; cultivation by vegetative propagation; connecting two or
Suggest some (of his/her own) methods for recharging ground water table	

Suggest the steps for efficient water management at individual/community level.	more electric cells in proper order in devices; taking measures during and after disasters; suggesting methods for treatment of polluted water for reuse, etc.
Elaborate the steps to be taken by the public/private authorities for improved water supply/debate on steps taken/to be taken by the Government for the supply of clean drinking water to people	



LOB: Recall process that generate waste water that goes down the drains from sinks, showers, toilets, laundries etc.

1) Which of the following constitutes wastewater?

- (a) Harvested rainwater
- (b) Water used for laundry
- (c) Water taken up by plants
- (d) Water present in a bird-bath

Correct Answer:(b)

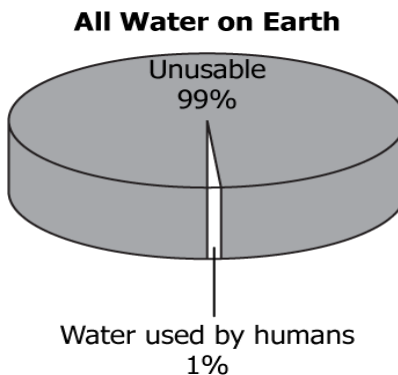
2) It is suggested that taps must be turned off while a person brushes his teeth. What is a consequence of letting the tap run during this daily activity?

- (a)The water will evaporate quicker.
- (b)The drain under the sink will start overflowing.
- (c)The unused freshwater directly becomes wastewater.
- (d)The freshwater is passed on to the next household in line.

Correct Answer:(c)

LOB: Visualise the percentage of freshwater available on the Earth in order to conclude the need for water conservation.

1) A majority of the Earth's surface is covered by water. However, there are several places which are facing water scarcity and several more are on the brink of it. Observe the data in the following pie-chart.



Why is the majority of water on the planet categorized as “unusable” by humans, and calls in for water conservation?

- (a)It is the water in the atmosphere.
- (b)It is the saline water in the oceans.
- (c)It is the unreachable groundwater.

(d) It is the water stored in ice caps.

Correct Answer: (b)

2) A small village in Karnataka, which is dependent on the groundwater and a lake for freshwater supply faced an acute water shortage in 2019, and it led to a draught. In such circumstances, which of the following was/were the worst affected?

- (a) Transportation
- (b) Farmlands
- (c) Education
- (d) Factories

Correct Answer: (b)

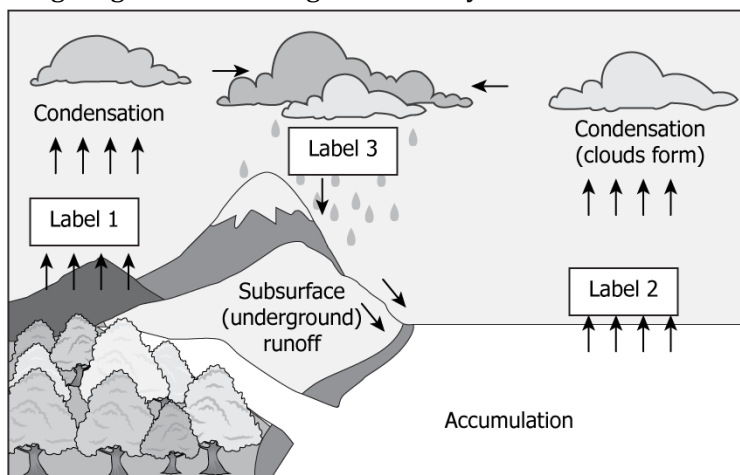
LOB: Recall the water cycle in order to describe the processes encompassed by it

1) Which of the following are reservoirs of water but do not directly contribute to the water cycle?

- (a) Ice caps and glaciers
- (b) Rainfall from heavy clouds
- (c) Water vapour in atmosphere
- (d) Water stored in municipal tanks

Correct Answer: (d)

2) Observe the following diagram illustrating the water cycle.



Which processes in the cycle, refer to the labels, 1, 2 and, 3, respectively?

- (a) 1: Precipitation, 2: Evaporation, 3: Rainfall.
- (b) 1: Evaporation, 2: Transpiration, 3: Rainfall.
- (c) 1: Transpiration, 2: Evaporation, 3: Precipitation.
- (d) 1: Evaporation, 2: Condensation, 3: Transpiration.

Correct Answer: (c)

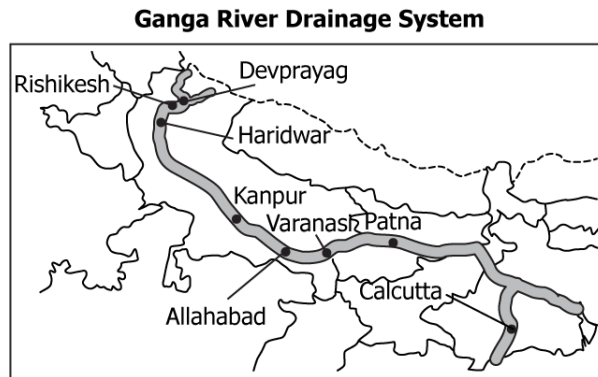
LOB: List the means of access to water in order to trace their origin to the water cycle

1) Which of the following reservoirs of water, depend on groundwater for their replenishment?

- (a) Wells
- (b) Lakes
- (c) Canals
- (d) Glaciers

Correct Answer: (c)

2) The river, Ganges, runs through the Indian states of Uttarakhand, Uttar Pradesh, Jharkhand and West Bengal, supplying freshwater to several towns and communities on its banks.



What is the source from which this long river originates?

- (a) Sea
- (b) Lake
- (c) Ocean
- (d) Glacier

Correct Answer: (d)

LOB: Paraphrases infiltration as seepage of water into the ground in order to define the water table and aquifer

1) Which of the following describes a water table?

- (a) The bottom of a groundwater aquifer
- (b) The upper level of a groundwater aquifer
- (c) The lake into which an aquifer pours out
- (d) The bottom of the lake just above an aquifer

Correct Answer: (b)

2) Which of the following threats to freshwater is posed by the excessive use of fertilizers on a farmland?

- (a) Fertilizers may be eroded from the soil upon rainfall.
- (b) Fertilizers can permeate into the soil and enter aquifers.
- (c) Fertilizers can lead to excessive plant growth and water uptake.
- (d) Fertilizers can lower the soil moisture and make the farm barren.

Correct Answer: (b)

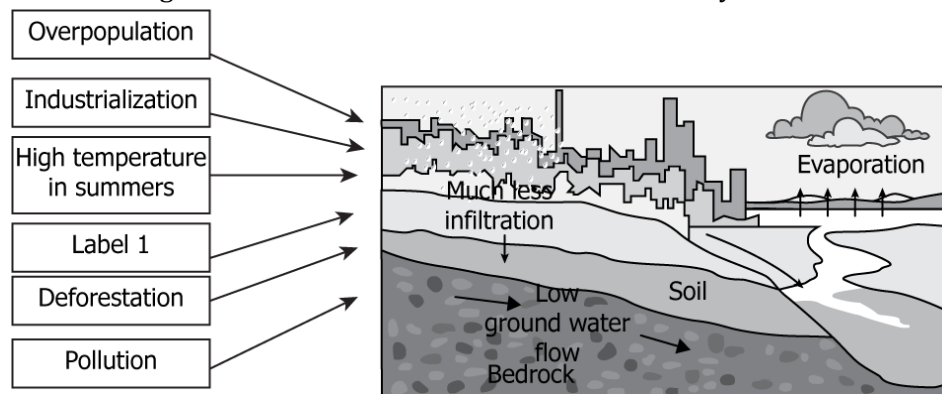
LOB: Construct a cause & effect model of depletion of ground water table

1) Over the past decade, the population of a small village tripled, and has led to a larger number of people sharing the same resources. Which of the following would be a direct consequence on natural resources of such a population boom, in the village?

- (a) Lesser rainfall
- (b) No water in hand-pumps
- (c) Lower agricultural produce
- (d) Greater municipal water supply

Correct Answer: (b)

2) Consider the following illustration of a lowered water table in a city.



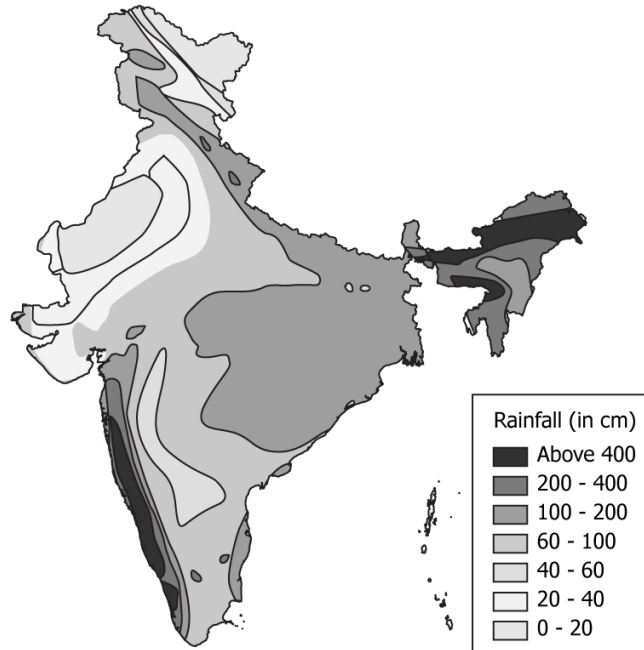
Which of the following, can replace Label 1, as a major reason behind the lowering of the water table, given that the city receives the same amount of rainfall each year?

- (a) Overgrazing of fields
- (b) Stormy weather
- (c) Concrete roads
- (d) Heavy traffic

Correct Answer: (c)

LOB: Analyze the rainfall map of India in order to attribute reasons and factors leading to shortage and excess of water in major areas

1) According to India's rainfall map, which state appears to be most susceptible to draughts?



- (a) Arunachal Pradesh
- (b) Uttarakhand
- (c) Rajasthan
- (d) Kerala

Correct Answer: (c)

2) The state of Maharashtra and Karnataka appear to receive ample rainfall, annually. However, they have several drought-prone regions. Besides rainfall, what other factor may contribute to the drought?

- (a) Greater surface run-off
- (b) Groundwater recharge
- (c) Overgrazing by cattle
- (d) Lower agriculture

Correct Answer: (c)

LOB: Suggest some(of his/her own) methods for recharging ground water table

1) A small village in Rajasthan receives sufficient rainfall during the rainy season, but over the past few years, they have faced water shortages. What could be the best possible solution for the people of this village that enables supply of freshwater for use, and allows time for natural groundwater recharge?

- (a) Urge municipality to increase water supply.
- (b) Expand the area under cultivation in the village.
- (c) Build canals with tributaries reaching the village.
- (d) Harvest every drop of rainwater and store for future use.

Correct Answer: (d)

2) A large metropolitan city has several industries on its outskirts, which over the years, have consumed the city's groundwater resources leading to a lowered water table. While the city receives ample rainfall, most of it is lost to surface-run off. To prevent a drought, which solution can help in lifting the water table?

- (a) Digging of community wells in each locality of the city.
- (b) Minimizing plantation of large trees on the city's outskirts.
- (c) Construction of permeable pavements to allow seepage of rainwater.
- (d) Allocation of separate points of groundwater extraction for industries.

Correct Answer: (c)

LOB: Examine the role of plants in water management

1) Which parts of the water cycle are directly influenced by plant life?

- (a) Transpiration & infiltration
- (b) Perspiration & transpiration
- (c) Evaporation & condensation
- (d) Condensation & precipitation

Correct Answer: (a)

2) It has been suggested that in order to lessen the impact and frequency of droughts, more green cover should be planted in a city. However, plants also consume water from the soil. Why is it beneficial to plant more trees, to conserve water?

- (a) Roots of trees cannot directly reach a water table
- (b) Trees increase the water vapour in the air around them
- (c) Trees use very little amounts of water from the ground
- (d) Trees aid in formation of water-carrying clouds to allow rainfall

Correct Answer: (d)

LOB: Suggest the steps for efficient water management at individual/community level

1) Shops in a locality wash their porches and the wastewater collects on the road creating trouble for customers. What could be a water efficient and a clean practice for the shopkeepers to follow?

- (a) To mop their porches instead of washing
- (b) To dust the porches and not use water
- (c) To ensure water reaches the sewer directly
- (d) Ask local authorities to limit their water consumption

Correct Answer: (c)

2) For a drought-prone village, farmers were encouraged to adopt government subsidized drip-irrigation systems on their fields to tackle an oncoming dry season. What characteristic of drip irrigation motivated the farmers to implement it?

- (a) It uses far less water per square meter than traditional methods.
- (b) It helps in the uptake of fertilizers to produce higher crop yield.
- (c) It is a new technology that can filter large amounts of water.
- (d) It is less expensive than any other means of irrigation.

Correct Answer (a)

LOB: Elaborate the steps to be taken by the public/private authorities for improved water supply

1) According to the U.N., the minimum requirement of water for domestic use is 50 Litres per person, per day. During the Maharashtra droughts, Meena's family, which includes her parents, younger brother and grandmother, received 120 Litres per day from the municipal water supply. Is the municipality granting enough water to the family, to meet their daily needs and maintain hygiene?

- (a) No; 110 Litres less than the minimum requirement
- (b) Yes; 50 Litres more than the minimum requirement
- (c) No; 130 Litres less than the minimum requirement
- (d) Yes; 20 Litres more than the minimum requirement

Correct Answer: (c)



2) Local authorities in a village decided to implement infrastructure changes, in an effort to conserve natural resources. However, some changes were unwelcomed by the residents. Which of the following could be a change that was NOT welcomed by the residents?

- (a) Building of rooftop rainfall reservoirs
- (b) Removal of concrete pavements
- (c) Use of high-pressure taps
- (d) Installation of solar panels

Correct Answer: (b)



Activity

Activity	Create the Water Cycle
Materials required	Plastic zip lock-style bag, Permanent marker(s), Water, Blue food coloring, Clear tape
Procedure	<ol style="list-style-type: none"> Decorate the plastic bag and draw clouds.  <ol style="list-style-type: none"> Add some blue food colour to the water and pour it in the bag.  <ol style="list-style-type: none"> Hang the bag on a window with direct sun.

	<div data-bbox="662 210 1239 522" data-label="Image"> </div> <p data-bbox="521 556 1266 594">4. Observe what happens to the bag after a few hours.</p>
Let's think	<ol data-bbox="521 688 1377 856" style="list-style-type: none"> 1. What is happening in the bag? 2. Where will the water from the clouds go on falling? 3. What do you think will happen if the air is polluted? Do you think it will affect the water cycle?

17. Forests: Our Lifeline

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Shapes of Trees and Structure of Forests	Infer reasons for the aerial appearance of forests(as shown in the chapter), in connection with types of trees/shapes of trees
Uses of Forests	Outline features of forests that are responsible for sustenance of life
Forest Food Webs	Create a flowchart of the food web, taking into consideration some examples of living beings, used in the chapter
Forests: A Dynamic Living Entity	Design a forest ecosystem by considering a few plants and animals and explaining how they support one another

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Infer reasons for the aerial appearance of forests (as shown in the chapter), in connection with types of trees/shapes of trees.	Relates processes and phenomena with causes, e.g., wind speed with air pressure; crops grown with types of soil; depletion of water table with human activities, etc.
Create a flowchart of the food web, taking into consideration some examples of living beings, used in the chapter	Draws labelled diagrams / flow charts e.g., organ systems in human and plants; electric circuits; experimental set ups; life cycle of silk moth, etc.

Outline features of forests that are responsible for sustenance of life.

Design a forest ecosystem by considering a few plants and animals and explaining how they support one another.

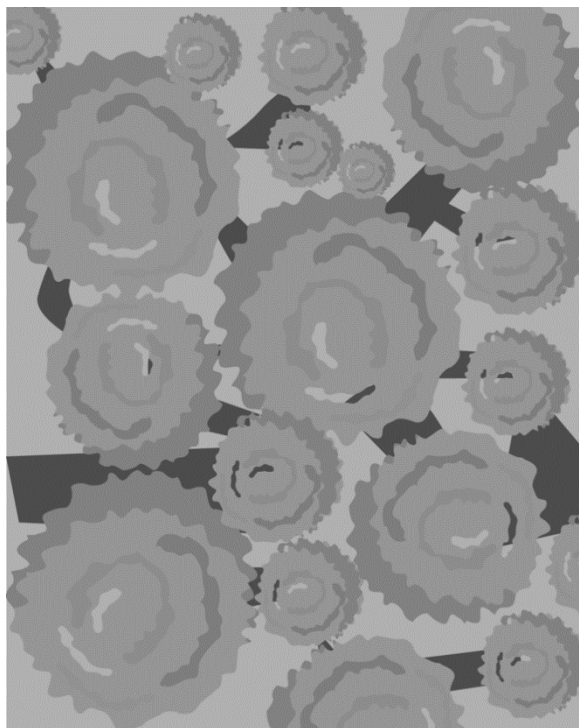
Applies learning of scientific concepts in day-to-day life, e.g., dealing with acidity; testing and treating soil; taking measures to prevent corrosion; cultivation by vegetative propagation; connecting two or more electric cells in proper order in devices; taking measures during and after disasters; suggesting methods for treatment of polluted water for reuse, etc.

Test items



LOB: Infer reasons for the aerial appearance of forests(as shown in the chapter), in connection with types of trees/shapes of trees.

1) The image shows the aerial view of a forest.

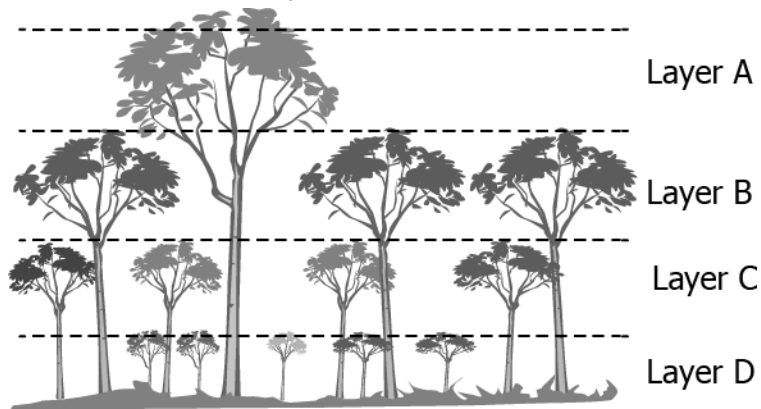


What category of plants makes this uppermost layer of the forest?

- (a) Herbs
- (b) Shrubs
- (c) Trees
- (d) Tall grasses

Correct Answer:(c)

2) The image shows different horizontal layers of a forest.



Which layer makes a forest so dense that no land can be seen in an aerial view?

- (a) A; because it involves all tall trees that make a roof of the forest.
- (b) B; because it involves the canopy of all trees that form a roof over other layers.
- (c) C; because it involves trees and shrubs which cover a large area of the forest.
- (d) D; because it involves the shrubs and herbs which cover the ground completely.

Correct Answer:(b)

LOB: Outline features of forests that are responsible for sustenance of life.

1) The table shows the area under forest in two different regions.

Region	Forest Area (in acres)
A	35000
B	42300000

Which region will be more prone to flood, and why?

- (a) Region A as it will have lesser number of trees so more raindrops can hit the ground directly.
- (b) Region B as it will have a greater number of trees that will prevent the seepage of rainwater into the ground.
- (c) Region A as it will have lesser number of trees that will allow rainwater to seep rapidly into the ground.
- (d) Area B as it will have a greater number of trees that will provide more area for raindrops to hit the ground directly.

Correct Answer:(c)

2) A researcher wants to convey the importance of forest for the sustenance of life. So, the researcher prepared four different set-ups with mice and plants in a glass container with a lid, as shown in the table.

Set-up	Number of Mice	Number of Plants	Number of Days Mice Survived
1	2	1	2
2	2	2	3
3	2	3	4
4	2	4	6

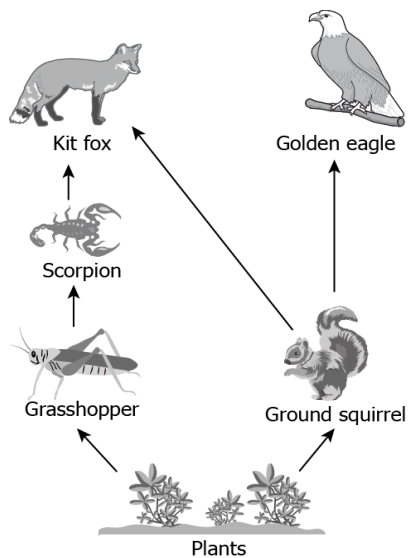
It was observed from the experiment that mice in the set-up 4 survived for a longer time. What feature of plants helped the mice to survive more in set 4?

- (a) Plants are the source of medicine.
- (b) Plants are a natural absorber of water.
- (c) Plants provide a natural habitat to mice.
- (d) Plants release oxygen and absorb carbon dioxide.

Correct Answer:(d)

LOB: Create a flowchart of the food web, taking into consideration some examples of living beings, used in the chapter

1) The image shows a food web that includes three food chains.



Which animals, involved in the food web, would be affected in the absence of plants?

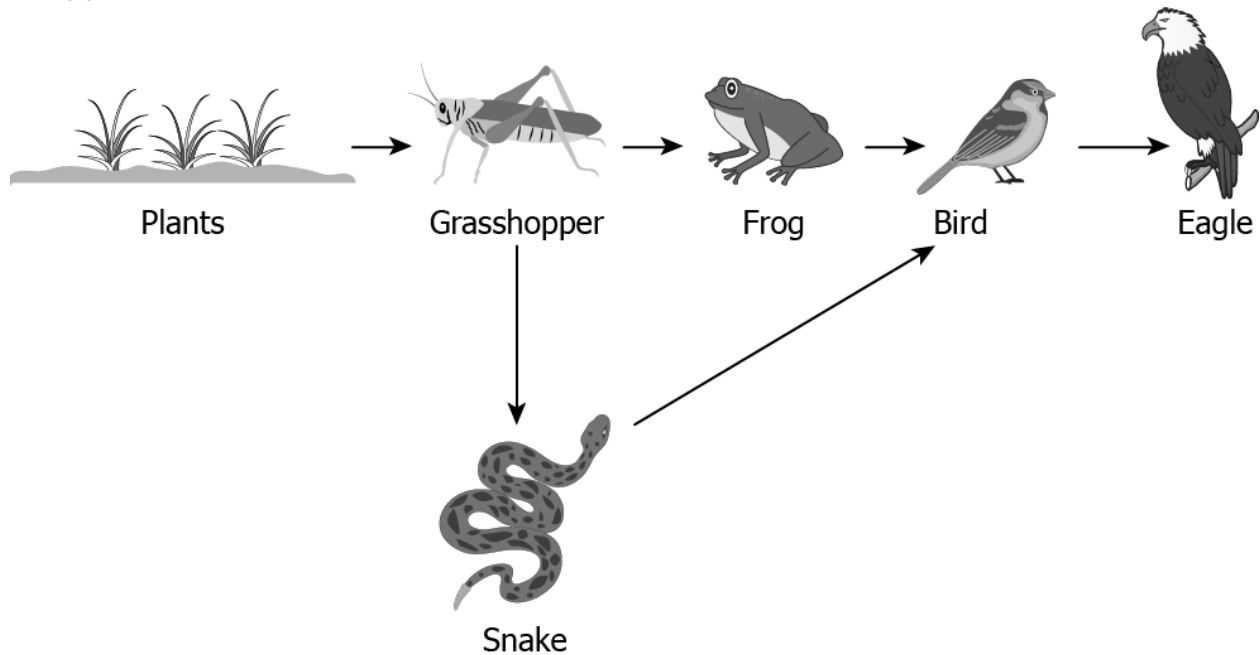
- (a) Only kit fox and golden eagle
- (b) Only scorpion and ground squirrel

- (c) Only grasshopper and ground squirrel
 (d) All the animals involved in the food web

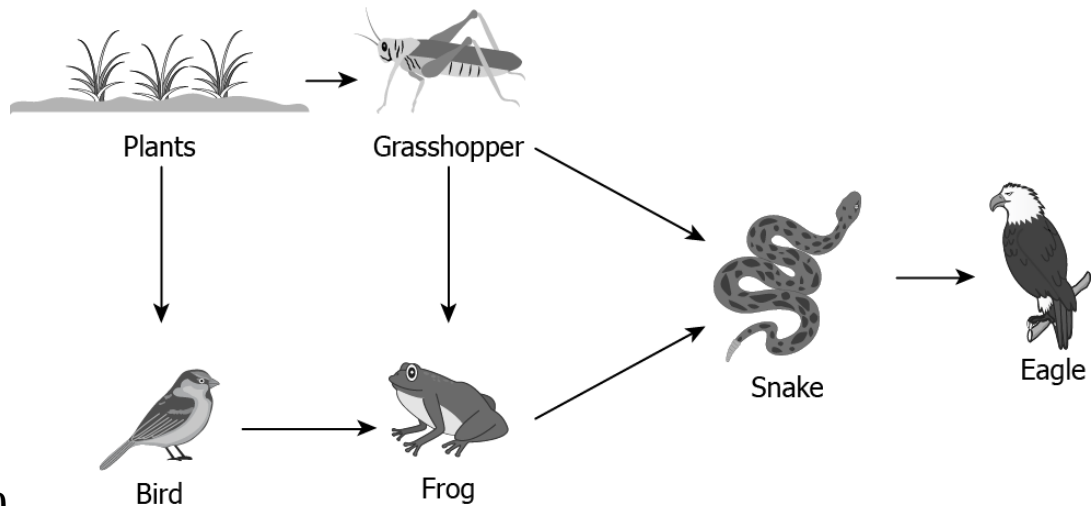
Correct Answer:(d)

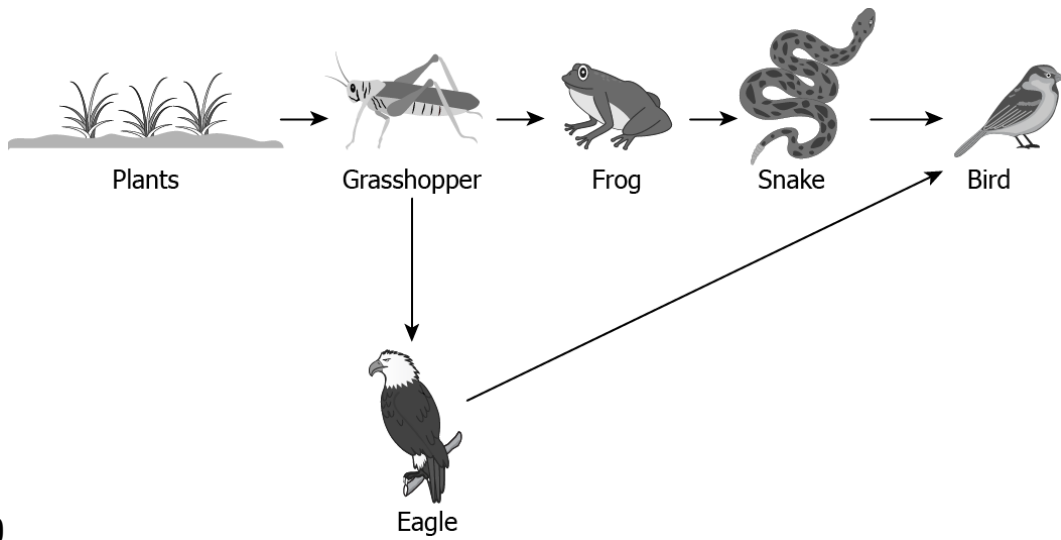
2) A student was trying to make a food web in which grasshoppers feed on plants, which in turn are eaten either by frogs or birds. Birds are consumed by eagles. Frog is also consumed by a snake, which in turn is eaten by eagles. Which option correctly represents the described food web?

(a)

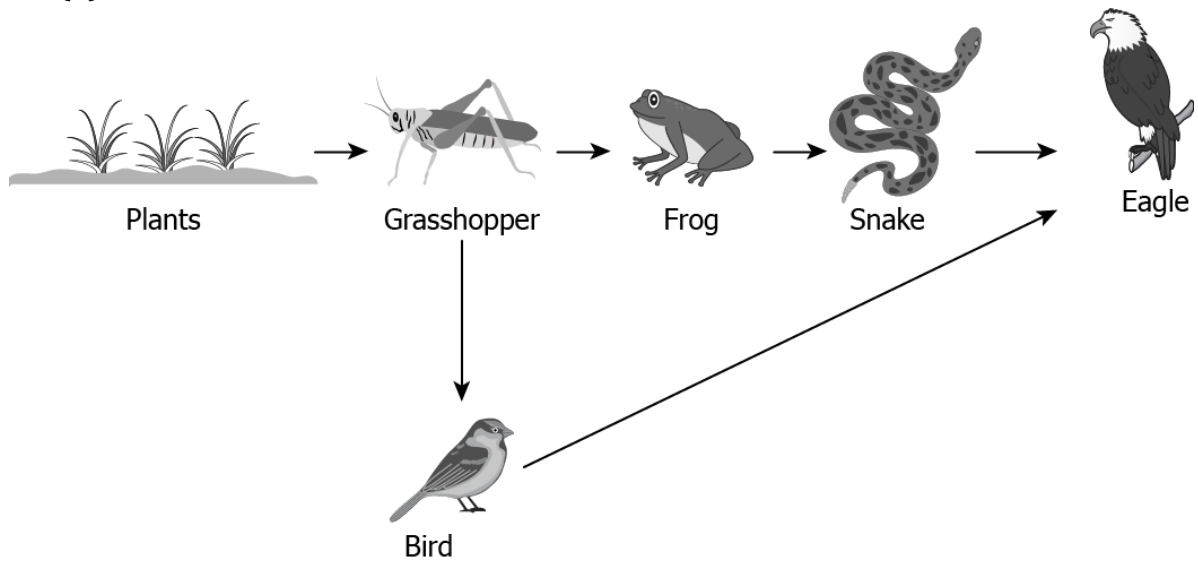


(b)





(c)
(d)



Correct Answer:(d)

LOB: Design a forest ecosystem by considering a few plants and animals and explaining how they support one another.

1) The image shows a forest ecosystem in which animals and plants are supporting each other.



How do plants and animals benefit each other?

(a)

Plants	Animals
provide shelter, oxygen, and food to animals	help in seed dispersal, pollination and their dung provides nutrients

(b)

Plants	Animals
provide shelter, carbon dioxide, and food to animals	help in seed dispersal, water absorption and their dung provides nutrients

(c)

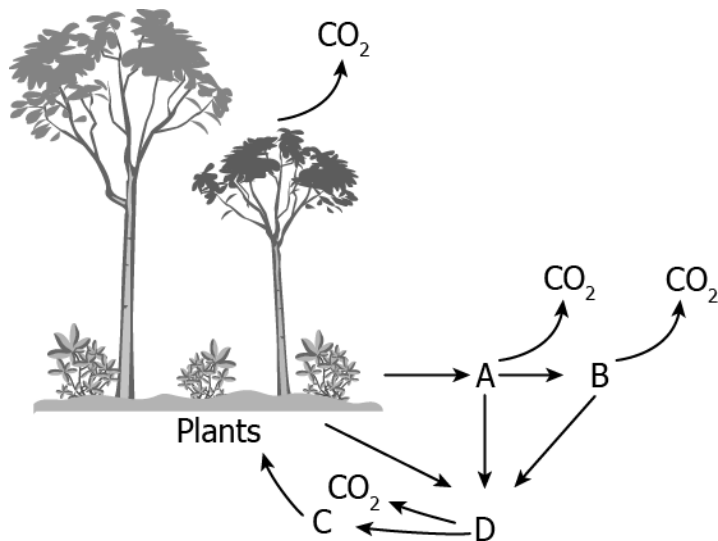
Plants	Animals
provide shelter, water, and food to animals	help in absorbing nutrients from soil and pollination

(d)

Plants	Animals
provide water, carbon dioxide, and food to animals	help in seed dispersal and in respiration by releasing oxygen

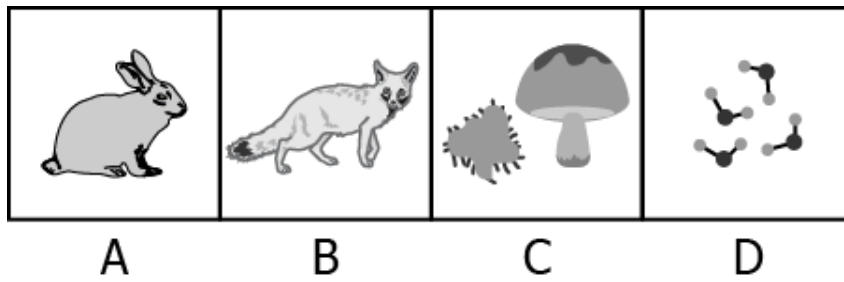
Correct Answer (a)

2) The image below represents a forest ecosystem in which matter is recycled over and over again.

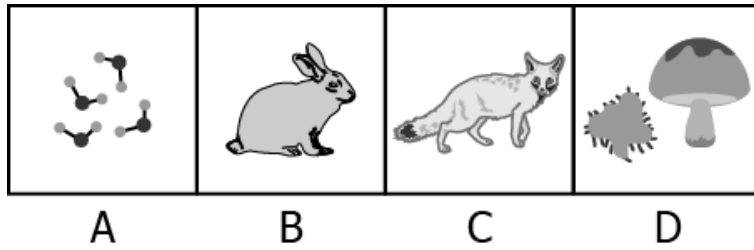


Which option correctly represents A, B, C & D?

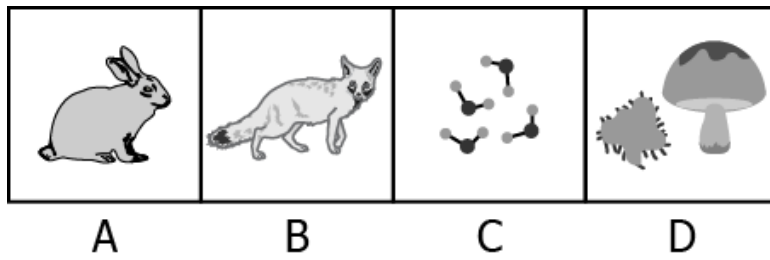
(a)



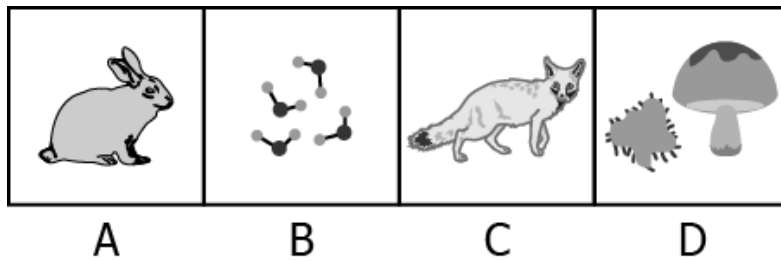
(b)



(c)



(d)



Correct Answer:(c)



Activity

Activity	Trees Make Great Windbreakers
Materials required	Wooden craft sticks, buttons, modelling clay, glue, craft paper, twigs, fresh and dried leaves.
Procedure	<ol style="list-style-type: none"> 1. Ask students to get into groups and from the available materials create their models of trees. 2. Have students test the wind breaking capabilities of their trees using a pedestal or table top fan as a source of moving air. 3. To measure the effectiveness, tie ribbons to both the pedestal fan and to the tree sculpture. 4. The relative speed of wind at the wind at the fan and at the tree can be noted by keen observation of the movement of the ribbon at the both the points. 5. Encourage students to improve their models to better the wind breaking capacity,
Let's think	<ol style="list-style-type: none"> 1. Tree wind breakers are used widely in agriculture. Why do you think so? 2. From improvements in your model, discuss what features of trees make them an effective element of a wind breaking system.

Activity	<u>Trees are a Source of Dyes and Pigments</u>
Materials required	Beetroot skins, Onion skins, Red cabbage leaves, Spinach, Orange peels, Small saucepans
Procedure	<ol style="list-style-type: none"> 1. Add one of the chopped ingredients to a small saucepan and cover with two times as much water as the fruit or vegetable. Place over medium heat, and let it simmer for one hour. 2. Turn off the heat, and let water come to room temperature. Strain the cooled dyes into glass containers. 3. To create colored fabrics, place the cloth you're planning on coloring in a fixative. For fruit dyes, simmer the fabric in 1/4 cup salt and 4 cups water. For vegetable dyes, simmer in one cup vinegar and four cups water. Boil for one hour. 4. Rinse the article of clothing in cold water, and then let soak in the natural dye until it reaches desired color.
Let's think	<ol style="list-style-type: none"> 1. Read a blog (<u>http://www.keycolour.net/blog/natural-vs-synthetic-dyes-which-is-better/</u>) on Natural v/s Synthetic Dyes and answer the questions: <ol style="list-style-type: none"> a. What are the advantages and disadvantages of Natural Dyes? b. What are the advantages and disadvantages of Synthetic Dyes? c. Which one would you prefer and what modifications would you suggest to creating them after carrying out the above activity? d. Will your suggestions be practical for large-scale production?

3

Activity

Activity	Forest Walk
Materials required	<p>Resources to aid in-depth learning (can be fit according to classroom context):</p> <ol style="list-style-type: none"> 1. https://ecosystems.psu.edu/youth/sftrc/lesson-plans/forestry 2. https://cradleofforestry.com/pre-and-post-trip/ 3. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5201734.pdf
Procedure	<p><u>Objective:</u> Your students will spend time in the forest in order to understand how and why this time and these forests are so important.</p> <p><u>Outcomes:</u> Students will be able to:</p> <ul style="list-style-type: none"> ● Discover myriad opportunities in nature, and actively choose to return to the forest during their out-of-school time. ● Experience time in nature (specifically, forests) that is beneficial to their mental and physical well-being. ● Explain how “healthy forests” are an interconnected web of resources that can be threatened by fire, invasive species, loss of open space, and unmanaged recreation, and understand how to protect them. ● Explain the benefits of forests to our communities. ● Engage with their local forests through exploration and conservation activities. ● Explore forest-related careers. ● Connect with like-minded students across the country and join the effort to conserve forests for future generations. <p>(Source: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5201734.pdf)</p>

18. Wastewater Story

QR Code:



Learning Objectives:

Content area/ Concepts	Learning Objectives
Wastewater	List the uses of water in everyday life in order to identify various source of contamination.
Sewage	Define sewage and list its components in order to identify their points of origin.
Wastewater Treatment Plant	Perform various processes related to treatment of wastewater in order to describe processes inside a Wastewater Treatment Plant
Active Citizenship	Recall the journey of used water as waste water/ water that goes down the drains from sinks, showers, toilets, laundries
	Outline factors responsible for scarcity of clean water and list some waterborne diseases in order to suggest methods of their prevention.
	Make a flow chart/line diagram of sewage route from all the various sources of generation to the treatment plant.
	Conduct a water contamination survey in order to devise a plan for good sanitation practices and avoidance of contagious diseases.
	Devise and execute a step wise plan for treatment of waste water.

Learning Objectives and Learning Outcomes:

Learning Objectives	Learning Outcomes
Recall the journey of used water as waste water/ water that goes down the drains from sinks, showers, toilets, laundries	Identifies materials and organisms, such as, animal fibres; types of teeth; mirrors and lenses, on the basis of observable features, i.e., appearance, texture, functions, etc.

Perform various processes related to treatment of wastewater in order to describe processes inside a Wastewater Treatment Plant	Conducts simple investigations to seek answers to queries, e.g., can extract of coloured flowers be used as acid-base indicator? Do leaves other than green also carry out photosynthesis? Is white light composed of many colours?
List the uses of water in everyday life in order to identify various source of contamination	Relates processes and phenomena with causes, e.g., wind speed with air pressure; crops grown with types of soil; depletion of water table with human activities, etc.
Define sewage and list its components in order to identify their points of origin	
Make a flow chart/line diagram of sewage route from all the various sources of generation to the treatment plant	Draws labelled diagrams / flow charts e.g., organ systems in human and plants; electric circuits; experimental set ups; life cycle of silk moth, etc.
Outline factors responsible for scarcity of clean water and list some waterborne diseases in order to suggest methods of their prevention	Applies learning of scientific concepts in day-to-day life, e.g., dealing with acidity; testing and treating soil; taking measures to prevent corrosion; cultivation by vegetative propagation; connecting two or more electric cells in proper order in devices; taking measures during and after disasters; suggesting methods for treatment of polluted water for reuse, etc.
Conduct a water contamination survey in order to devise a plan for good sanitation practices and avoidance of contagious diseases	Makes efforts to protect environment, e.g., following good practices for sanitation at public places; minimising generation of pollutants; planting trees to avoid soil erosion; sensitising others with the consequences of excessive consumption of natural resources, etc.
Devise and execute a step wise plan for treatment of waste water	



LOB: List the uses of water in everyday life in order to identify various source of contamination

1) Which of the following sources of domestic wastewater is most likely to be rich in inorganic waste but have very low organic matter content?

- (a) Toilets
- (b) Kitchen sinks
- (c) Shower drains
- (d) Garden run-off water

Correct Answer:(c)

2) Which of the following may be components of industrial wastewater, but not domestic wastewater?

- (a) Arsenic
- (b) Detergents
- (c) Oils and fats
- (d) Faecal matter

Correct Answer (a)

LOB: Define sewage and list its components in order to identify their points of origin

1) Which of the following is a component of sewage which is NOT generated by human beings?

- (a) Bacteria
- (b) Rainwater
- (c) Plastic bags
- (d) Heavy metals

Correct Answer:(b)

2) Which of the following is a suspended impurity in sewage water?

- (a) Bicarbonates
- (b) Nitrogen
- (c) E.coli

(d) Urea

Correct Answer:(c)

LOB: Perform various processes related to treatment of wastewater in order to describe processes inside a Wastewater Treatment Plant

1) A group of students make a filtration system using layers of fine sand, coarse sand and gravel and test it in the lab, using 500mL of wastewater sample.



In order to upscale their design, they add a settling tank after the filter. What should they add before their filtration system?

- (a) A wire mesh
- (b) Disinfectants
- (c) An aeration tank
- (d) A mechanical skimmer

Correct Answer: (c)

2) In the wastewater treatment process, there are two points where sludge is accumulated. © of the following is the correct description and fate of either Sludge 1 (from first settling tank) or Sludge 2 (from second settling tank), in the process of wastewater treatment?

- (a) Sludge 1 is activated and contains bacteria © decompose matter.
- (b) Sludge 1 has bacteria within faecal matter © is used in sludge 2.
- (c) Sludge 2 contains bacteria and is dried, to be used as manure.
- (d) Sludge 2 is collected and decomposed by anaerobic bacteria.

Correct Answer: (c)

LOB: Recall the journey of used water as waste water/ water that goes down the drains from sinks, showers, toilets, laundries

1) The modern household RO-water filters generate a lot of wastewater after filtration, in several urban and rural homes. What can be a possible utility of this water that has a higher concentration of mineral salts and trace impurities?

- (a) Bathing
- (b) Cooking
- (c) Doing laundry
- (d) Watering plants

Correct Answer: (d)

2) Kitchen waste in the form of small food particles, used tea leaves, grease etc. is suggested to be disposed along with other organic waste such as fruit peels, etc. in the trash. However, most households end up disposing oils, tea leaves etc, down the kitchen sink, for convenience. Which of the following is the best argument to get households to curb this practice?

- (a) The organic waste should be buried in soil, outside the house.
- (b) Organic and inorganic waste should be disposed off, separately.
- (c) The decomposing organic waste can create a foul smell in kitchens.
- (d) Small food particles, oils and fats clog smaller drains in sewerage.

Correct Answer: (d)

LOB: Outline factors responsible for scarcity of clean water and list some waterborne diseases in order to suggest methods of their prevention

1) Which of the following diseases can be prevented by consuming safe drinking water?

- (a) Tuberculosis
- (b) Typhoid
- (c) Asthma
- (d) Dengue

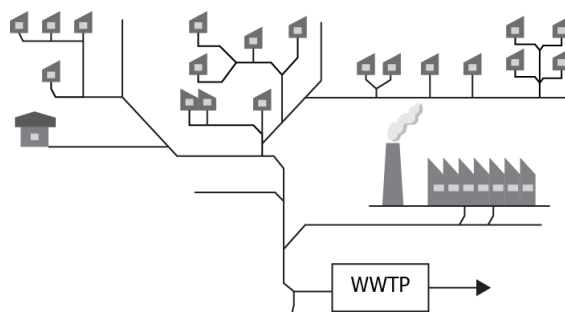
Correct Answer: (b)

2) In a small village, due to contamination of a water resource, several residents simultaneously got affected by dysentery. What measures can be taken at the in households, to ensure protection from such water borne diseases?

- (a) Boil the tap-water before cooking or drinking.
- (b) Test the tap-water for bacterial culture growth.
- (c) Disinfect the village water supply using UV-light.

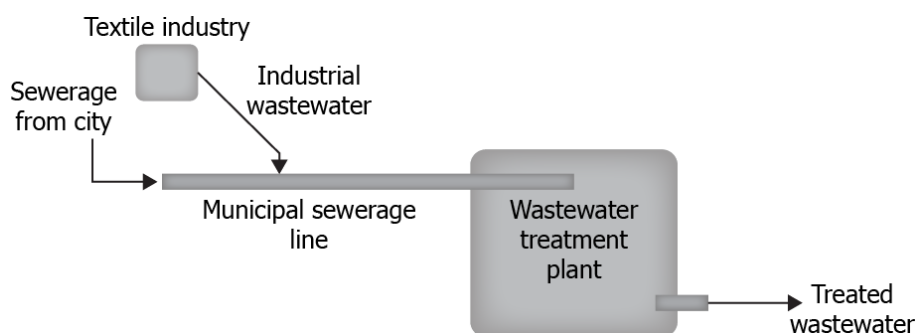
Correct Answer: (a)

1) A village panchayat is tasked with the responsibility of developing a low-cost aid to wastewater treatment, in their village. This is required to ease the burden of the large volume of sewage produced by the small village, since its population has increased a lot, over time.



- (a)** Installing several septic tanks
- (b)** Commissioning large scale disinfection of sewerage.
- (c)** Telling residents to restrict the amount of sewage produced.
- (d)** Using bacteria in their drainage systems to decompose sewage.

2) A textile industry directly drains its wastewater into the sewerage system. This burdens the wastewater treatment plant nearby.



(a) Tell the industry to ban the use of certain industrial effluents

(b) Ask the factory to move and be set up in another municipality

(c) Ask the factory to discharge its wastewater into the local lake

(d) Tell the industry to pre-treat their wastewater before discharge

Correct Answer:(d)

LOB: Conduct a water contamination survey in order to devise a plan for good sanitation practices and avoidance of contagious diseases

1) A student cabinet member notices that an open drain outside the school is generally dry but during the rainy season, it frequently overflows with sewerage. The student cabinet discusses this issue and asks the school authorities to urge the municipality to cover the drain and check for blockages. Which option states the best reason, that made the student cabinet take up this issue?

(a) Sewage water poses an ugly sight outside the school.

(b) Sewage spills can cause infection in several school children.

(c) Sewage can make the roads muddy and slippery.

(d) Sewage overflow can make student's shoes and clothes dirty.

Correct Answer:(b)

2) The school authorities encouraged suggestions by the students in order to incorporate better waste management practices. Upon surveying, a few common recommendations were shortlisted by a student to forward to the authorities. Considering costs and scale, what can be suggested to feasibly reduce the school's environmental impact?

(a) Treat the school's wastewater onsite and discharge to streams

(b) Remove wasteful water filters and use the tap-water for drinking

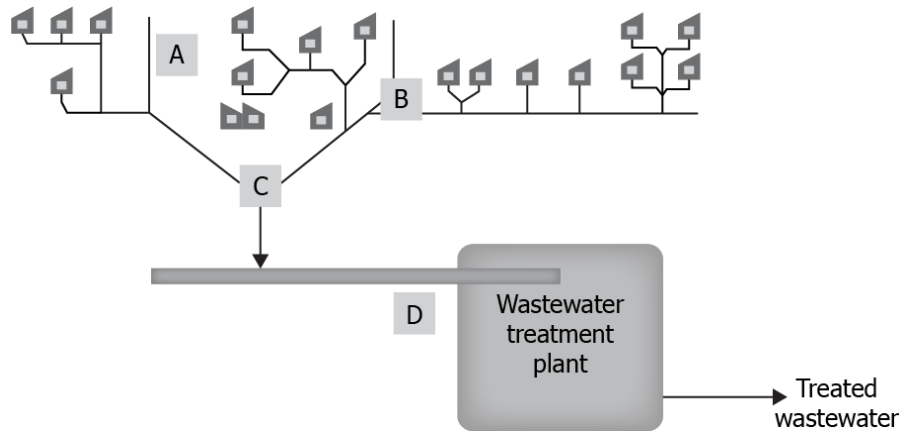
(c) Use aseptic tank in the school and send the sludge to biogas plants

(d) Use less oil in the cafeteria food, so that lesser oil goes down the drain

Correct Answer:(c)

LOB: Devise and execute a step wise plan for treatment of waste water

1) A local authority figure decides to have a septic tank constructed for a local residential complex in a small village. At which point in the existing sewerage system can a septic tank be inserted?



(a) Point A

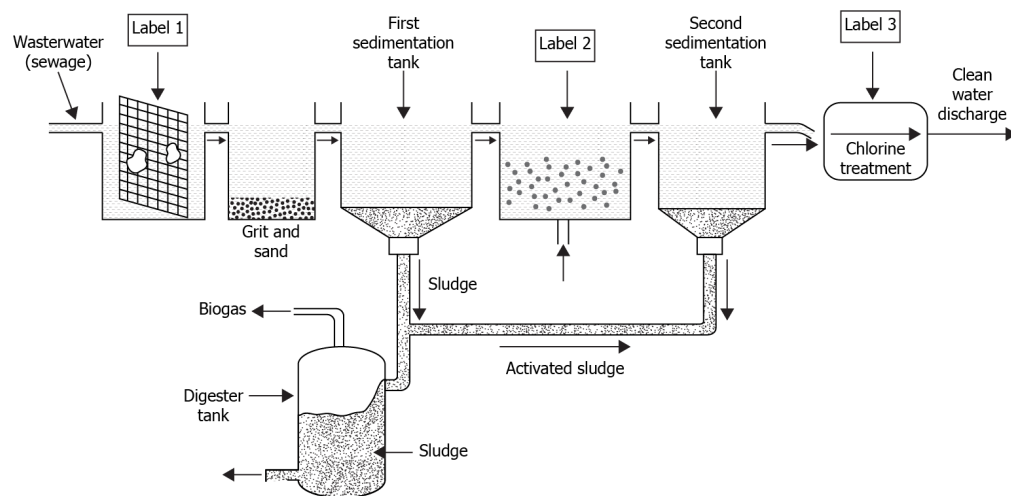
(b) Point B

(c) Point C

(d) Point D

Correct Answer:(c)

2)Consider the following layout of an urban wastewater treatment plant.



In the layout, what do the labels, 1, 2, and 3 correspond to?

(a) 1: Bar screen, 2: Aeration, 3: Disinfection

(c) 1: Sand filtration, 2: Settling tank, 3: Sludge collector

(c) 1: Settling tank, 2: Anaerobic digestion, 3: Disinfection

(d) 1: Grit removal, 2: Aeration, 3: Third sedimentation tank

Correct Answer:(c)



I

Activity

Activity	Clean Water Challenge
Materials required	Dirty water (add some impurities like wires, fabric, glass, sugar, plastic pieces to increase difficulty) , filter paper, strainer, cotton, sponge, nylon fabric, sand, gravel, tissue paper
Procedure	<ol style="list-style-type: none"> 1. Divide the class into groups of 3-4 students and give a sample of dirty water to each of the group. 2. Let the group analyse the kind of waste that is present in the water and list the identifiable items. 3. Distribute items to clean water to each of the groups and let them have time to brainstorm ideas as to how they will clean the water sample. 4. Encourage the students to try different ideas with the materials provided, and remind them that there are no wrong or right answers. 5. Let the students present their clean water sample as a group to the class.
Let's think	<ol style="list-style-type: none"> 1. What did you find that worked the best? 2. Were there any materials that made the water worse? 3. Did you use any sort of process in the challenge? 4. If you found something that worked, did you try it again? 5. If you found something that didn't work, did you try it again? 6. Is it easy or hard to clean water? 7. What if you had to clean all the water you used? 8. What are pollutants that make water unsafe? How can we prevent water pollution?

Activity	Prepare a Sanitation Plan for the Class
Procedure	<ol style="list-style-type: none">1. Students to be divided in groups of 10 to prepare a skit or demonstration for better sanitation and hygiene practices in the school/classroom.2. Present the same in the school assembly.
Let's think	<ol style="list-style-type: none">1. Why did you choose to work on the themes that you did?2. How do you think these improvements will help you, class and the school?3. How can you take these practices back to your neighborhood community?

