BRITISH COUNCIL

CBSE

Competency-based education for CBSE

Item Bank:

Science Class 9

September 2021

Content created by AlphaPlus

Introduction for teachers

A bank of resources has been created to support teachers to develop and administer end-of-class tests. These resources should be used together. You can view and download the following resources from http://cbseacademic.nic.in:

- Learning ladder for science
- Assessment specification for science
- Sample lesson plans

This document is a compilation of the sample items for Science Class 8. There are 59 items.

This item bank is supported by the assessment specification which sets out the end-of-class assessment requirements and the learning ladder for the subject which maps the CBSE syllabi content to the NCERT curriculum. The item index (page 6) shows how each item maps to the learning ladder content and the assessment objectives.

What these assessment items can be used for

You can use the bank of questions in whatever way you wish but three main purposes have been identified:

- Create end-of-class assessments using the items from the bank to meet the requirements set out in the assessment specifications.
- Create end-of-topic tests using the items from the bank for when you finish teaching a topic.
- Use individual or groups of questions from the bank to create or add to worksheets for use in class and for homework.

What is in this document

You will find linked questions and single questions which cover different aspects of the learning ladder content and different assessment objectives. You can use these questions to create your own assessments.

Each item in this document begins with the metadata (see Figure 1). The metadata gives details of the content, assessment objective coverage and the number of marks.

There is then a section showing any source material needed followed by the questions themselves and finally the mark scheme for the questions.

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science8VS61a	1				8.1.7	1
Science8VS61b	1				8.1.7	1
Total marks						2

Figure 1: Example of metadata

How to use the assessment items

You can peruse the bank of items by flicking through this document and selecting questions you wish to use. However, if you are assessing specific content then you can use the learning ladder to identify this content and then use the item index (page 7) to find any items which cover that content.

Please note that not all of the content will have items. The item bank is only a sample of the questions which could be created so it may be necessary for you to write questions of your own to fill gaps.

When you find a relevant assessment item in this document, you can copy and paste the question(s) and any source material into a new Word document which will form the assessment or worksheet. Other questions from the bank can be copied and pasted to this document and an assessment or worksheet covering a range of items created. The questions can then easily be edited in the new document using Word and you can add any questions you write to best meet the needs of your classes.

Once the questions have been pasted into the new document the numbering of the items can be changed so that they run through 1, 2 etc. There should be no need to change the numbering of parts (a), (b) etc unless a question has been deleted.

You can create the mark schemes in the same way by copying the relevant section of the item documents and pasting them into a separate Word document which will form the mark scheme. Again, the question numbering will need to be amended. You can use these mark schemes to make sure that the marking is standardised, particularly if more than one teacher uses the assessment.

When creating an end-of-class test the teacher should use the assessment specification to identify the number of marks and questions needed, the balance of content to be covered and the weighting of the assessment objectives needed. You can then select items from the bank to build a test that meets the assessment specification and then order these in a logical manner so that it allows the students to work through the assessment. You should also add a front page with the assessment name and details of the number of marks and the length of the assessment. Again, the mark scheme can be created at the same time and question numbers will need to be amended.

When copying items from the bank care needs to be taken to keep the format and style of the items consistent including the spacing and layout and ensuring that the number of marks available for each question is clearly linked to the question.

Assessment objectives

This document sets out the assessment objectives for CBSE Science and their percentage weighting for the CBSE end of year tests for the different classes from VI to X.

		Class				
No.	**Description of Assessment Objective**	**VI**	**VII**	**VIII**	**IX**	**X**
AO1	Demonstrate knowledge and understanding of scientific ideas, techniques, and procedures.	40	40	40	30	30
AO2	Apply knowledge and understanding of scientific ideas, techniques and procedures to classroom and real-world situations	40	40	40	30	30
AO3	Analyse scientific information and ideas to present data and interpret patterns and relationships	10	10	10	20	20
AO4	Evaluate scientific information to: • make judgments and draw conclusions • develop and improve experimental procedure	10	10	10	20	20

Item Index

Assessment Content	Assessment topic	Filename	Question ID	AO1	AO2	AO3	AO4
Class 7	Class 7	Science9SRN4	Science9SRN41bi	2			
Class 7	Class 7	Science9SRN4	Science9SRN41bii	2			
Class 7	Class 7	Science9SRN4	Science9SRN41c	2			
Class 7	Class 7	Science9MB3	Science9MB31di		2		
Class 7	Class 7	Science9SRN4	Science9SRN41a		3		
Class 8	Class 8	Science9RK3	Science9RK31bi		1		
9.1.13	Environment	Science9SRN3	Science9SRN31a	1			
9.11.9	Environment	Science9NB4	Science9NB41ai	1			
9.11.9	Environment	Science9SD4	Science9SD41c	2			
9.11.9	Environment	Science9NB4	Science9NB41b		2		
9.11.9	Environment	Science9TS4	Science9TS41d		2		2
9.3.10	Environment	Science9NB4	Science9NB41aii		3		
9.4.15	Environment	Science9TP5	Science9TP51c	1	2		
9.4.15	Environment	Science9SRN3	Science9SRN31c		4		
9.4.16	Environment	Science9PK5	Science9PK51b		4		
9.4.16	Environment	Science9PS4	Science9PS41d		2		2
9.4.18	Environment	Science9RK4	Science9RK41a	1			
9.4.18	Environment	Science9RK4	Science9RK41b		2		
9.4.18	Environment	Science9SD4	Science9SD41a			3	
9.4.18	Environment	Science9SD4	Science9SD41b				3
9.4.19	Environment	Science9PK5	Science9PK51a	1			
9.4.19	Environment	Science9RK4	Science9RK41a	1			
9.4.21	Environment	Science9RK3	Science9RK31c	1			
9.4.21	Environment	Science9RK3	Science9RK31a	2			
9.4.21	Environment	Science9RK3	Science9RK31b		4		
9.6.11	Environment	Science9MB4	Science9MB41b				4

Assessment Content	Assessment topic	Filename	Question ID	AO1	AO2	AO3	AO4
9.8.10	Environment	Science9RK5	Science9RK51a		1		

9.8.10	Environment	Science9RK5	Science9RK51b		1		
9.9.7	Environment	Science9NB4	Science9NB41c	2	2		
9.9.7	Environment	Science9RK4	Science9RK41c	2	2		
9.9.7	Environment	Science9RK4	Science9RK41b		2		
9.9.7	Environment	Science9TP3	Science9TP3				1
9.9.7	Environment	Science9MB3	Science9MB31c				2
9.1.14	Food	Science9TP5	Science9TP51a		4		
9.10.9	Food	Science9DT4	Science9DT41bii		1		
9.10.9	Food	Science9DT4	Science9DT41biii		1		
9.10.9	Food	Science9DT4	Science9DT41bi		2		
9.10.9	Food	Science9DT4	Science9DT41biv				2
9.10.9	Food	Science9DS3	Science9DS31c	2			2
9.3.11	Food	Science9DT5	Science9DT51a		3		
9.3.12	Food	Science9ML3	SCIENCE9ML31a	1	2		
9.3.12	Food	Science9DT4	Science9DT41a		1		1
9.3.13	Food	Science9ML3	SCIENCE9ML31d		2		1
9.3.14	Food	Science9ML3	SCIENCE9ML31ci	1			
9.3.14	Food	Science9ML3	SCIENCE9ML3cii	1			
9.3.14	Food	Science9ML3	SCIENCE9ML31b		2		
9.4.23	Food	Science9DT4	Science9DT41ci	2			
9.4.23	Food	Science9DT4	Science9DT41cii	2			
9.4.25	Food	Science9SRN3	Science9SRN31b		2		
9.4.25	Food	Science9DS3	Science9DS31b		2		
9.6.12	Food	Science9DS3	Science9DS31a			2	
9.8.11	Food	Science9TP5	Science9TP51bi		2		
9.8.11	Food	Science9TP5	Science9TP51bii		3		
9.1.10	Movement and force	Science9TP4	Science9TP41d			3	1
9.1.11	Movement and force	Science9TP4	Science9TP41e	2	2		
9.1.9	Movement and force	Science9PK2	Science9PK2	1			
9.1.9	Movement and force	Science9SD1	Science9SD1	1			
9.1.9	Movement and force	Science9RK1	Science9RK1		1		

Assessment Content	Assessment topic	Filename	Question ID	AO1	AO2	AO3	AO4

9.10.7	Movement and force	Science9RK3	Science9RK31a	2			
9.10.7	Movement and force	Science9RK3	Science9RK31bii		1		
9.2.14	Movement and force	Science9SD5	Science9SD51a		4		
9.4.10	Movement and force	Science9PK1	Science9PK1	1			
9.4.10	Movement and force	Science9SD3	Science9SD31b	2			
9.4.10	Movement and force	Science9SD3	Science9SD31c		1	2	1
9.4.8	Movement and force	Science9SD3	Science9SD31a		2		
9.4.8	Movement and force	Science9SD2	Science9SD2	1	2		
9.5.10	Movement and force	Science9RK2	Science9RK2		1		
9.5.12	Movement and force	Science9RK5	Science9RK51cii	1	1		
9.5.12	Movement and force	Science9RK5	Science9RK51ci		1		
9.5.6	Movement and force	Science9TP4	Science9TP41c	1	1		
9.5.7	Movement and force	Science9PK4	Science9PK41a	1	1		
9.5.7	Movement and force	Science9PK4	Science9PK41bi		4		
9.5.9	Movement and force	Science9PK3	Science9PK31c	1	1		
9.7.10	Movement and force	Science9TP4	Science9TP41a	2			
9.7.11	Movement and force	Science9TP4	Science9TP41b	2			
9.7.11	Movement and force	Science9PK4	Science9PK41c		2		
9.7.12	Movement and force	Science9PK4	Science9PK41bii	1	3		
9.7.13	Movement and force	Science9NB3	Science9NB3b	2			

Assessment Content	Assessment topic	Filename	Question ID	AO1	AO2	AO3	AO4
9.7.13	Movement and force	Science9NB3	Science9NB3a	4			
9.7.15	Movement and force	Science9RK3	Science9RK31biii		4		

9.7.16	Movement and force	Science9SD5	Science9SD51b		2		
9.7.16	Movement and force	Science9NB2	Science9NB2			1	
9.7.7	Movement and force	Science9TP2	Science9TP2	1			
9.7.7	Movement and force	Science9TP1	Science9TP1		1		
9.8.5	Movement and force	Science9PK3	Science9PK31a	1			
9.8.5	Movement and force	Science9PK3	Science9PK31b			2	
9.1.1	Nature of matter	Science9PS1	Science9PS1	1			
9.1.1	Nature of matter	Science9TS1	Science9TS1	1			
9.1.2	Nature of matter	Science9PS2	Science9PS2	1			
9.1.2	Nature of matter	Science9MB3	Science9MB31b	1			
9.10.1	Nature of matter	Science9ND1	Science9ND1c				2
9.10.2	Nature of matter	Science9RK6	Science9RK6		2		
9.11.1	Nature of matter	Science9PS4	Science9PS41a	2			
9.11.1	Nature of matter	Science9RK10	Sience9RK10	3			
9.2.1	Nature of matter	Science9TS2	Science9TS2	1			
9.2.1	Nature of matter	Science9PS3	Science9PS31c	3			
9.11.1	Nature of matter	Science9RK10	Sience9RK10	3			
9.2.1	Nature of matter	Science9TS2	Science9TS2	1			
9.2.1	Nature of matter	Science9PS3	Science9PS31c	3			
9.2.1	Nature of matter	Science9RK1	Science9RK1		1		
9.2.1	Nature of matter	Science9TS3	Science9TS31c		2		
9.2.3	Nature of matter	Science9MB3	Science9MB31a	2	2		
9.2.3	Nature of matter	Science9RK5	Science9RK5		3		1
9.3.3	Nature of matter	Science9MB4	Science9MB41ai	3			
9.3.3	Nature of matter	Science9MB4	Science9MB41aii		1		
9.3.3	Nature of matter	Science9RK9	Science9RK9		3		
9.3.3	Nature of matter	Science9PS3	Science9PS31d		4		
9.4.2	Nature of matter	Science9MB1	Science9MB1		1		

Assessment Content	Assessment topic	Filename	Question ID	AO1	AO2	AO3	AO4
9.4.2	Nature of matter	Science9RK2	Science9RK2		1		
9.4.2	Nature of matter	Science9TS4	Science9TS41ai			1	
9.4.2	Nature of matter	Science9TS4	Science9TS41aii			1	
9.5.1	Nature of matter	Science9MB3	Science9MB31dii		1		
9.5.1	Nature of matter	Science9MB4	Science9MB41aiii		1		

9.5.1	Nature of matter	Science9TS3	Science9TS31d		2		
9.5.1	Nature of matter	Science9RK8	Science9RK8		2		
9.5.2	Nature of matter	Science9MB4	Science9MB41aiv		1		
9.5.2	Nature of matter	Science9PS3	Science9PS31b		2		
9.5.2	Nature of matter	Science9PS4	Science9PS41b		2		
9.5.2	Nature of matter	Science9TS4	Science9TS41b		2		
9.6.1	Nature of matter	Science9RK7	Science9RK7		1		
9.6.1	Nature of matter	Science9ND1	Science9ND1a		2		
9.6.1	Nature of matter	Science9ND1	Science9ND1b		2		
9.6.2	Nature of matter	Science9PS4	Science9PS41c			3	
9.6.2	Nature of matter	Science9TS4	Science9TS41c			3	
9.7.1	Nature of matter	Science9MB2	Science9MB2	1			
9.9.1	Nature of matter	Science9PS3	Science9PS31a	1			
9.9.1	Nature of matter	Science9TS3	Science9TS31a	2			
9.9.2	Nature of matter	Science9MB3	Science9MB31e	1			
9.9.2	Nature of matter	Science9TS3	Science9TS31b	2			
9.1.4	The living world	Science9ML4	Science9ML41a	2			
9.1.6	The living world	Science9DT2	Science9DT2	1			
9.1.6	The living world	Science9ML1	Science9ML1	1			
9.1.6	The living world	Science9ML4	Science9ML41bi	1			
9.1.6	The living world	Science9ML4	Science9ml41bii	1			
9.1.6	The living world	Science9ML4	Science9ML41biii	1			
9.1.8	The living world	Science9ML5	Science9ML51b	1			
9.1.8	The living world	Science9ML5	Science9ML51c	2			
9.12.4	The living world	Science9DS4	Science9DS41e	1	2		
9.12.5	The living world	Science9DT5	Science9DT51b				2
9.2.9	The living world	Science9DS1	Science9DS1	1			
9.3.5	The living world	Science9DS4	Science9DS41b	2			
9.4.3	The living world	Science9DS2	Science9DS2	1			
9.4.3	The living world	Science9DT1	Science9DT1	1			

Assessment Content	Assessment topic	Filename	Question ID	AO1	AO2	AO3	AO4
9.4.4	The living world	Science9ML5	Science9ML51a	2			
9.4.5	The living world	Science9DS4	Science9DS41a	1			
9.6.5	The living world	Science9ML2	Science9ML2	1			
9.6.5	The living world	Science9DT3	Science9DT31b	3			
9.7.4	The living world	Science9DT3	Science9DT31a	1			
9.7.4	The living world	Science9DS4	Science9DS41d	3			
9.7.6	The living world	Science9DT3	Science9DT31c		4		

Science9SRN4

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9SRN41a		3			8.2.6 Describe the stages of eukaryotic life cycles:	3

					• Amphibians, exemplified by frogs 9.1.4 Classification of organisms 9.1.6 ... major groups of plants -, Bryophyta, ...with salient features.	
Science9SRN41bi	2				7.2.11 Explain the structure and function of plant organs: • Xylem and phloem	2
Science9SRN41bii	2				7.2.11 Explain the structure and function of plant organs: • Xylem and phloem	2
Science9SRN41c	2				7.2.11 Explain the structure and function of plant organs: • Xylem and phloem	2
Total marks	6	3				9

Item purpose

The question assesses the learning outcomes of Bryophytes of plant kingdom.

Sources and diagrams

Source information if copied: book/journal, author, publisher, website link etc.

Question(s)

1 Fig. 1 shows moss growing on a tree trunk.

Fig. 1

1(a) Moss is one of the bryophytes.

Bryophytes are known as “the amphibians of the plant kingdom”.

Using your knowledge of amphibians suggest the conditions bryophytes need: (3 marks)

- in their habitat,
- to complete their life cycle.

1(b) Vascular tissues are **not** present in bryophytes.

1(b)(i) Xylem is one type of vascular tissue.

Describe the function of xylem. (2 marks)

1(b)(ii) Name **one** other vascular tissue and describe its function.

Name ……

Function …… (2 marks)

1(c) Suggest **two** reasons why bryophytes are environmentally important. (2 marks)

(Total marks 9)

Mark scheme

1 (a) Using your knowledge of amphibians suggest the conditions bryophytes need: • in their habitat, • to complete their life cycle.	
Answer	Guidance
Terrestrial habitat. Moisture / water is needed in life cycle; Water is needed for reproduction (to be successful);	
1 (b)(i) Describe the function of xylem.	
Answer	Guidance
Transport; Water and minerals (from roots);	
1 (b)(ii) Name one other vascular tissue and describe its function.	
Answer	Guidance
Phloem; Transport of nutrients (from leaves).	
1 (c) Suggest two reasons why bryophytes are environmentally important.	
Answer	Guidance
any two from:	

Role in soil formation. Role in soil water retention. Recycling of nutrients. erosion of rock for the release of nutrients for soil formation. AVP.	

Science9MB3

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9MB31a	2	2			9.2.3 Explain how to separate the components of a mixture of sand, common salt	4
Science9MB31b	1				9.1.2 Define substances as elements, compounds and mixtures. Mixtures may be homogenous, heterogenous, colloids or suspensions.	1

Science9MB31c				2	9.9.7 Explain the impact of industry and agriculture on the environment	2
Science9MB31di		2			7.1.1 Define acids, bases and salts.	2
Science9MB31dii		1			9.5.1 Calculate RMM from RAM and formulae of a compound	1
Science9MB31e	1				9/9.2 Explain how to separate liquids using distillation and fractional distillation including desalination of water for drinking and irrigation	1
Total marks	4	5		2		**11**

Item purpose

The question assesses students understanding of mixtures, methods of separation, application in daily life and calculation of RMM from formula.

Sources and diagrams

Source: The New Indian Express 9 March 2021 Article All that's white is salt

Source information if copied: book/journal, author, publisher, website link etc.

Question(s)

1 **Fig. 1** shows salt collection from a pond full of sea water.

Source: The New Indian Express 9 March 2021 Article All that's white is salt

Fig. 1

The process is called solar evaporation.

(a) Describe how salt is separated from sea water in solar evaporation.

(4 marks)

(b) Sea water is a homogeneous mixture. A mixture of salt and sand is heterogeneous.

Describe the difference between a homogeneous mixture and a heterogeneous mixture.

(1 mark)

(c) State **one** advantage and **one** disadvantage of the method of salt collection shown in Fig. 1.

(2 marks)

(d) Sea water is a mixture of different salt compounds.

One of these compounds is sodium chloride.

Sodium chloride contains the elements sodium and chlorine.

(i) State the name of **one other** salt that does **not** contain either sodium or chlorine.

Identify all the elements in this salt.

Name of salt compound ….....

(2 marks)

Name of elements ….....

(ii) Calculate the relative formula mass of sodium chloride, NaC*l*.

(1 mark)

[A_r: Na, 23; C*l* , 35.5]

(e) State one other method of separating a solution of salt and water.

(1 mark)

(Total marks 11)

Mark scheme

1 (a) Describe how salt is separated from sea water in solar evaporation.	
Answer	Guidance

Heat (energy) from the sun; Increased temperature of sea water; faster evaporation of water (molecules); Salt (crystals) are left behind.	**ALLOW** higher level responses describing crystal formation as the solution becomes supersaturated.
1 (b) Describe the difference between a homogeneous mixture and a heterogeneous mixture. Sea water is a homogeneous mixture. A mixture of salt and sand is heterogeneous.	
Answer	Guidance
In sea water we cannot see physically distinct parts but can see salt and sand particles separately.	**ALLOW** sea water has uniform composition and salt and sand has non uniform.
1 (c) State one advantage and one disadvantage of the method of salt collection shown in Fig. 1.	
Answer	Guidance
Advantage - Low cost of production / large scale production/little pollution; Disadvantage- Slow process / dependence on weather / too much manual labour / further purification of salt required.	1 mark for any advantage 1 mark for any disadvantage
1 (d)(i) State the name of one other salt that does not contain either sodium or chlorine. Identify all the elements in this salt.	
Answer	Guidance
Any anion and cation correctly described; All elements correctly identified.	e.g., Magnesium bromide magnesium and bromine copper sulphate copper, sulphur, hydrogen and oxygen
1 (d)(ii) Calculate the relative formula mass of sodium chloride, NaCl.	
Answer	Guidance
58.5;	
1 (e) State one other method of separating a solution of salt and water.	
Answer	Guidance
(fractional) distillation.	

Science9RK3

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9RK31a	2				9.4.21 Explain the features and detailed	2
Science9RK31b		4				4

Science9RK31c	1				processes of the **Bio-geo chemical cycles** in nature: …... Nitrogen.	1
Total marks	3	4				**7**

Item purpose

The question assesses the students' understanding of the role of microbes in nitrogen cycle.

Source

Flow chart diagram showing the role of microbes in nitrogen cycle.

Source information: New Coordinated Science by Brian Beckett and Rose Marie Gallagher

Question(s)

1 **Fig. 1** is a diagram of the nitrogen cycle.

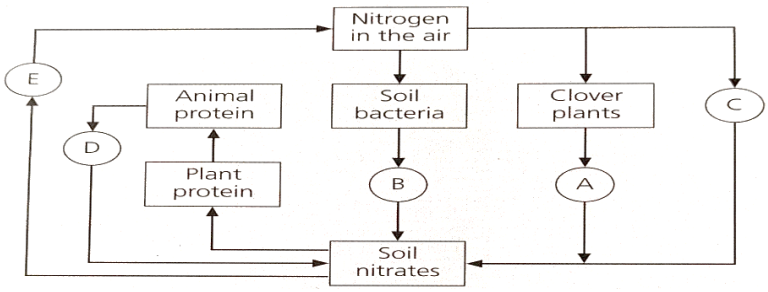


Fig. 1

(a) Explain how clover plants help to convert atmospheric nitrogen into soil

nitrates.

(2 marks)

(b) Atmospheric nitrogen is converted to oxides of nitrogen by lightning.

Describe the process of conversion and explain how these oxides of nitrogen enter the soil.

(4 marks)

(c) Plants use nitrates to assemble proteins from a range of smaller components.

Give the name of the smaller components that form proteins.

(1 mark)

(Total marks 7)

Mark scheme

1 (a) Explain how clover plants help to convert atmospheric nitrogen into soil nitrates.	
Answer	Guidance
roots called nodules; (nitrifying) bacteria / rhizobium;	**ALLOW** clover is a legume

1 (b) Describe the process of conversion and explain how these oxides of nitrogen enter the soil.	
Answer	Guidance
High temperature; Nitrogen reacts with oxygen; NOx mix/dissolve in water; Rainfall;	
1 (c) Plants use nitrates to assemble proteins from a range of smaller components. Give the name of the smaller components that form proteins.	
Answer	Guidance
Amino acids;	

Science9TP5

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9TP51a		4			9.1.14 Identify features of intensive and organic farming methods	4

					9.4.15 Explain the importance of soil for agriculture – nutrient supply for crops, and how soil degradation and improvement can occur.	
Science9TP51bi		2			9.8.11 Describe how to measure the growth and yield of plant crops under different conditions	2
Science9TP51bii		3				3
Science9TP51c	1	2			9.4.15 Explain the importance of soil for agriculture – nutrient supply for crops, and how soil degradation and improvement can occur.	3
Total marks	4	8				**12**

Item purpose

The question assesses the students' understanding of various types of fertilizers, and their effect on crops and environment.

Sources

https://www.dutchnews.nl/wpcms/wp-content/uploads/2014/11/tomatoes-growing.jpg

https://t4.ftcdn.net/jpg/02/28/41/17/360_F_228411708_jvJwkywmim1m6w8QhB9SgPjD2mlQPqWy.jpg

I

Question(s)

1 This question is about different methods of farming.

1(a) The Sahel dry-land zone is located south of the Sahara Desert in Africa.

The rainfall is less than 400 millilitres a year.

To prevent more land becoming desert, farmers are returning to traditional methods of agriculture.

These methods include:

- regularly moving herds of cattle, sheep and goats to different fields
- planting acacia trees around the edges of fields
- placing thorny branches and rocks in the beds of streams
- digging pits in the fields during the dry season to fill with organic matter

Discuss these methods with reference to:

- Overgrazing
- Producing compost
- Soil erosion
- Soil fertility

(4 marks)

1(b) **Fig. 1** shows tomato plants growing in a commercial greenhouse.

Fig. 1

The plants are grown in carefully managed conditions to maximize yield.

1(b)(i) Describe **one** method to determine the yield.

(2 marks)

1(b)(ii) Suggest **three** conditions for plant growth that are carefully managed inside the greenhouse.

(3 marks)

1(c) Farmers know that earthworms and nematode worms are vital for the maintenance of healthy soil.

Explain what is meant by the term vermicompost and suggest **two** reasons why it is so useful when germinating seeds that are free from plant diseases.

Explanation …….....

Suggestion 1 ……...

Suggestion 2 ……...

(3 marks)

(Total 12 marks)

Mark scheme

1 (a) The Sahel dry-land zone is located south of the Sahara Desert in Africa.

The rainfall is less than 400 millilitres a year.

To prevent more land becoming desert, farmers are returning to traditional methods of agriculture.

These methods include:

- regularly moving herds of cattle, sheep and goats to different fields
- planting acacia trees around the edges of fields
- placing thorny branches and rocks in the beds of streams
- digging pits in the fields during the dry season to fill with organic matter

Discuss these methods with reference to:

- Overgrazing
- Producing compost
- Soil erosion
- Soil fertility

Answer	Guidance
Indicative Science: • Movement of livestock prevents overgrazing;	

• Less overgrazing less exposure of soil to wind erosion; • Droppings from livestock adds fertility to soil; • Decay of organic matter in pits adds fertility to soil; • Pits trap rainfall – wet soil less likely to blow away; • Branches and rocks slow down the flow of water; • Slower water has more time to deposit fertile silt; • Compost in pits are idea for germinating seeds; • Organic matter in pits retains moisture for crops;	
1 (b)(i) Describe **one** method to determine the yield.	
Answer	Guidance
Mass or weight of tomatoes produced; per plant / per square metre;	
1 (b)(ii) Suggest three conditions for plant growth that are carefully managed inside the greenhouse.	
Answer	Guidance
Any **three** from: • Amount of nutrients; • Amount of water; • Amount of light; • Temperature; • Amount of carbon dioxide; Control of pests / diseases;	
1 (c) Explain what is meant by the term vermicompost and suggest **two** reasons why it is so useful when germinating seeds that are free from plant diseases.	
Answer	Guidance
Explanation:	

Compost produced from the digested waste matter of worms AW; Suggestions. Any **two** from: 1. It is rich in nutrients 2. It is sterile 3. It is inexpensive to produce 4. It recycles organic matter	

Level of response

Level	Description	Marks
4	Clear well structured explanation linking effects to causes or underpinning theory.	4
3	Clear description of relevant facts with some explanation relating effects to causes or underpinning theory.	3
2	Description of the basic facts but no link of effects to causes or underpinning theory.	2
1	Limited isolated descriptive points relevant to the topic	1
0	Nothing worthy of credit	0

Science9SRN3

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 Marks	Content Reference(s)	Marks
Science9SRN31 a	1				9.1.13 Identify flows **and stores** in bio-	1

					geo chemical cycles (.... nitrogen)	
Science9SRN31b		2			9.4.25 Explain how the addition of fertilisers (natural manure and man-made ammonium nitrate) change crop productivity but can have negative effects.	2
Science9SRN31c		4			9.4.15 Explain the importance of soil for agriculture – nutrient supply for crops, and how soil degradation and improvement can occur.	4
Total marks	1	6				7

Item purpose

The question assesses knowledge and outcomes of fertility of soil

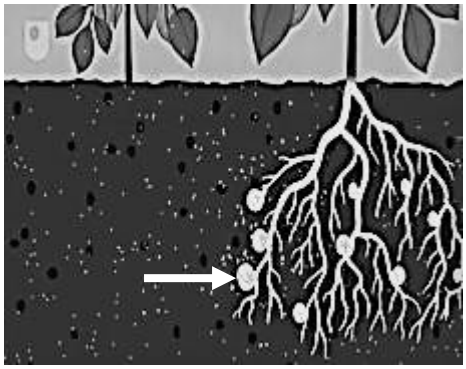
Source(s)

NCERT Test Book for Class IX – Science: https://ncert.nic.in/textbook.php?jesc1=9-16

https://www.britannica.com/Science/nitrogen-fixing-bacteria

Question(s)

1 Fig. 1 shows root nodules.



1(a) Micro-organisms in the root nodules fix nitrogen from the atmosphere.

State the name of these micro-organisms. (1 mark)

1(b) Describe **two** methods used by the farmers to **increase** the fertility of soil.

(2 marks)

1(c) Describe the advantages of natural methods compared with artificial methods for maintaining soil fertility.

(4 marks)

(Total marks 7)

Mark scheme

1 (a) Micro-organisms in the root nodules fix nitrogen from the atmosphere. State the name of these micro-organisms.

Answer	Guidance
Nitrifying bacteria / nitrogen-fixing bacteria / named nitrifying bacteria e.g., rhizobium;	
1 (b) Describe two methods used by the farmers to increase the fertility of soil.	
Answer	Guidance
Any two from: organic manure; artificial fertilizers; growing leguminous crops.	
1 (c) Describe the advantages of natural methods compared with artificial methods for maintaining soil fertility.	
Answer	Guidance
Indicative content: Humous is added: … improved soil structure … improved soil texture … improves aeration … improves water retention / holding capacity … lowers risk of soil wind erosion … lowers risk of soil water erosion / wash-off … increased diversity of ecosystems	

Science9NB4

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9NB41ai	1				9.11.9 Discovery of the holes in the ozone layer at the poles	1
Science9NB41aii		3			9.3.10 Explain how CFCs react with ozone and cause ozone depletion.	3

Science9NB41b		2			9.11.9 ... and Montreal protocol for the protection of the ozone layer	2
Science9NB41c	2	2			9.9.7 Explain the impact of industry and agriculture on the environment in the form of pollution – Acid rain from burning and metal production, ozone depletion caused by CFCs, industrial effluent discharge into rivers poisoning wildlife, fertiliser run off promoting eutrophication of water courses, pesticides and drugs used in farming poisoning animals because of bioaccumulation.	4
Total marks	3	7				**10**

Item purpose

The question assesses the students understanding of Ozone layer depletion and global community actions to restore ozone layer. Students will also explain how human activities pose a threat to the environment and what can be done to prevent it.

Source(s)

Source information: book/journal, author, publisher, website link etc.

Question(s)

1 The ozone layer is a region of gas in the upper atmosphere.

Chemicals released by human activity have depleted some parts of the ozone layer.

1 (a) i. Name the chemicals responsible for the depletion of the ozone layer.

(1 mark)

ii. Explain how these chemicals cause the ozone to be depleted.

(3 marks)

1 (b) What action has been taken by the global community to restore the ozone layer?

(2 marks)

1 (c) Human activities have damaged the environment in other ways.

Give examples of these activities and suggest ways that we can prevent further damage to the environment.

(4 marks)

(Total marks 10)

Mark scheme

1 (a)(i) Name the chemicals responsible for the depletion of the ozone layer.	
Answer	Guidance
(a)(i) CFC / chlorofluorocarbon / HCFC;	
1 (a)(ii) Explain how these chemicals cause the ozone to be depleted.	

Answer	Guidance
(chemical) reaction ; between CFC / chlorine and ozone; in the presence of UV (radiation);	

1 (b) What action has been taken by the global community to restore the ozone layer?	
Answer	Guidance
reference to Montreal protocol/agreement; banning the use of these chemicals/CFCs.	ALLOW international treaty/agreement

1 (c) Human activities have damaged the environment in other ways. Give examples of these activities and suggest ways that we can prevent further damage to the environment.	
Answer	Guidance

Activities - any **two** from: • Disposal of industrial waste which contains poisonous substances into nearby water bodies. • Sewage discharged into sewers from household/domestic units. • Deforestation for industrialization • Excessive use of fertilizers and chemicals in the soil causes soil pollution • Any valid point (**AVP**) Prevention - any **two** from:	

• Use of organic compost in the soil • Plant more trees (afforestation) • Industrial waste should be treated before releasing into the river bodies • Reducing the use of personal vehicles and using mass transportation facilities • Using battery operated vehicles and using sustainable energy • Harnessing solar energy and preventing use of coal and non-renewable resources • Following water efficient theories and water harvesting philosophy • **AVP**	

Level of Response

Level	Description	Marks
4	Clear well-structured explanation linking effects to causes or underpinning theory.	4
3	Clear description of relevant facts with some explanation relating effects to causes or underpinning theory.	3
2	Description of the basic facts but no link of effects to causes or underpinning theory.	2
1	Limited isolated descriptive points relevant to the topic	1
0	Nothing worthy of credit	0

Science9SD4

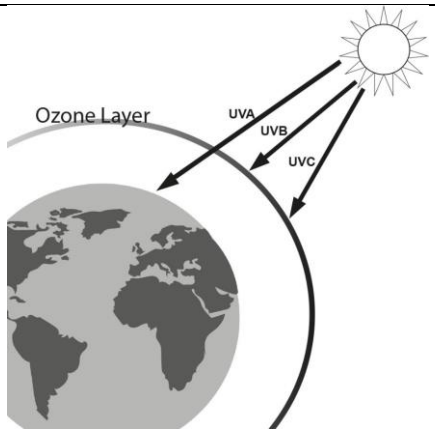
Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9SD41a		3				3
Science9SD41b				3	9.4.18 Explain the 'Holes' in ozone layer - causes and effects. Sources of CFCs. Ozone absorbs incoming UV light.	3

					CFCs react with ozone and remove it from the upper atmosphere. Impact on health through increased exposure to UV light – cancer and cataracts.	
Science9SD41c	2				9.11.9 Discovery of the holes in the ozone layer at the poles and Montreal protocol for the protection of the ozone layer	2
Total marks	2	3		3		**8**

Item purpose

The question assesses the students' understanding of the ozone layer, its function and its importance.

Source(s)



Question(s)

1 The figure above shows the effect of the ozone layer in the Earth's atmosphere on radiation from the Sun.

In recent decades, damage to the ozone layer due to human activity has been observed.

1(a) Using the information shown in the figure, describe the effect of the ozone layer on the Sun's radiation.

(3 marks)

1(b) Explain the importance of the ozone layer to human health.

(3 marks)

1(c) Explain how the damage to the ozone layer is being reversed.

(2 marks)

(Total Marks 8)

Mark scheme

1 (a) Using the information shown in the figure**,** describe the effect of the ozone layer on the Sun's radiation.	
Answer	Guidance
UVA is transmitted; UVB is partially **absorbed** / partially transmitted; UVC is **absorbed**;	**ALLOW** passes through; **ALLOW** some UVB passes through

1 (b) Explain the importance of the ozone layer to human health.	
Answer	Guidance
UV is (mildly) ionizing; Damages cells/DNA; Causes cancer/cataracts;	
1 (c) Explain how the damage to the ozone layer is being reversed.	
Answer	Guidance
International treaty/agreement; Banning use of CFCs; New ozone is produced (by reactions in the atmosphere);	

Science9TS4

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9TS41ai			1		9.4.2 Use atomic structure and construct simple chemical formulae of compounds using valency information.	1
Science9TS41aii			1			1

Science9TS41b		2			9.5.2 Use Mass = RMM x Moles to calculate the number of moles or mass of a substance	2
Science9TS41c			3		9.6.2 Draw atomic shell models for different elements	3
Science9TS41d		2		2	9.11.9 Discovery of the holes in the ozone layer at the poles and Montreal protocol for the protection of the ozone layer	4
Total marks		4	5	2		11

Item purpose

The question assesses students' understanding of the concept of atoms and molecules and mole concept, the structure of atoms given by Neil Bhor, valency, arrangement of subatomic particles inside an atom and how atoms combine to form molecules.

Source(s)

https://mhsapes.weebly.com/uploads/1/3/4/1/13416460/x-20090223162051546_orig.jpg

Question(s)

1 Table 1 shows information about some elements in the Periodic Table.

Element	**Symbol**	**Atomic number**	**Valence electrons**	A_r
Aluminium	Al	13	3	27
Chlorine	Cl	17	7	35.5
Oxygen	O	8	6	16

Sodium	Na	11	1	23
Iron	Fe	26	8	56

Table 1

1(a) Using Table 1 determine the chemical formula of:

1(a)(i) Sodium Oxide

(1 mark)

1(a)((ii) Aluminium chloride

(1 mark)

1(b) Calculate the number of moles of iron in a pure sample of mass 140g.

(2 marks)

1(c) Complete Fig. 1 to show the arrangement of the electrons around the nucleus, N, of an atom of chlorine.

(2 marks)

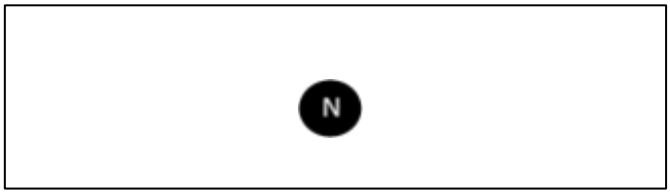


Fig. 1

(d) Fig. 2 shows a chemical process in the Earth's upper atmosphere.

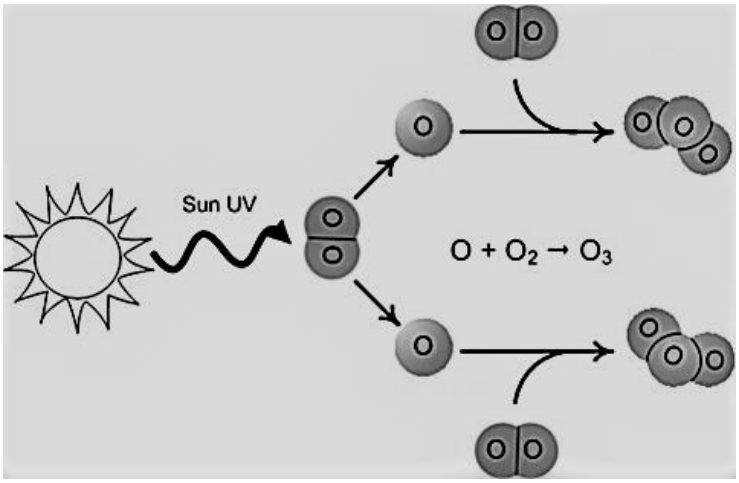


Fig. 2

Describe this process and explain why it has important consequences for human health.

(4 marks)

(Total marks 11)

Mark scheme

1 (a) Using Table 1 determine the chemical formula of: (i) Sodium Oxide (ii) Aluminium chloride	
Answer	Guidance
(i) Na2O (ii) Al Cl3;	
1 (b) Calculate the number of moles of iron in a pure sample of mass 140g.	
Answer	Guidance
140/56; 2.5;	
1 (c) Complete Fig. 1 to show the arrangement of the electrons around the nucleus, N, of an atom of chlorine.	
Answer	Guidance

17 electrons **and** three shells; Arranged 2, 8, 7;	

1 (d) Describe this process and explain why it has important consequences for human health.	
Answer	Guidance
Indicative Science Description of process • Ozone formation • UV breaks O_2 bond • UV provides energy to break O_2 bond • O + O_2 combine/react Consequences • Ozone also absorbs UV • Reduces UV reaching lower atmosphere • Reduces risk of cancer/cataracts in humans	**ALLOW** Max 3 from each list

Level of response

Level	Description	Marks
4	Clear well-structured explanation linking effects to causes or underpinning theory.	4
3	Clear description of relevant facts with some explanation relating effects to causes or underpinning theory.	3
2	Description of the basic facts but no link of effects to causes or underpinning theory.	2
1	Limited isolated descriptive points relevant to the topic	1
0	Nothing worthy of credit	0

Science9PK5

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9PK51a	1				9.4.19 Explain the causes and impact of water pollution from sewage, mining and industrial processes and fertiliser run off from farming.	1
Science9PK51b		4			9.4.16 Explain Air water and soil pollution and its impact on life.	4
Total marks	1	4				**5**

Item purpose

The question assesses the student ability to understand the causes of water pollution and its impact on living organisms.

Question(s)

1 Water pollution is a major environmental issue in India. Recently the people of Maharashtra have witnessed the water in Waldhuni river turning red.

1 (a) Suggest **one** possible cause of the pollution in the Waldhuni river.

(1 mark)

1 (b) Explain **four negative** impacts of pollution on water organisms.

(4 marks)

(Total marks 5)

Mark scheme

Point based

1 (a) Suggest **one** possible cause of the pollution in the Waldhuni river.	
Answer	Guidance
Any **one** from: Sewage / mining (processes) / industrial (processes) / fertiliser (run-off)	
1 (b) Explain **four negative** impacts of pollution on water organisms.	
Answer	Guidance
Indicative Science: Any **two** with explanation: • Reduction in populations – disrupts food chains/webs - extinction of species	

• Endocrine disrupting chemicals – damages reproduction and reduces populations; • Water organisms e.g., fish become toxic to humans – economic impact on fishing communities; • Eutrophication – increased decomposer populations remove oxygen from water – death of other species • Bioaccumulation – predator species feed on toxic fish and pesticide accumulates up the food chain. • AVP and explanation.	

Level of response

Level	Description	Marks
4	Clear well-structured explanation linking effects to causes or underpinning theory.	4
3	Clear description of relevant facts with some explanation relating effects to causes or underpinning theory.	3
2	Description of the basic facts but no link of effects to causes or underpinning theory.	2
1	Limited isolated descriptive points relevant to the topic	1
0	Nothing worthy of credit	0

Science9PS4

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9PS41a	2				9.11.1 Describe the history of atomic models from Dalton's spherical atoms to Thomson's plum pudding model.	2
Science9PS41b		2			9.5.2 Use Mass = RMM x Moles to calculate the number of moles of a substance	2
Science9PS41c			3		9.6.2 Draw atomic shell models for different elements.	3
Science9PS41d		2		2	9.4.16 Explain Air pollution and its impact on life.	4

Total marks	2	4	3	2		11

Item purpose

The purpose of items is to assess whether the students understand the concept of atoms and molecules including mole concept, describe the history of atomic Models and use the concept to draw electronic shell structures as per Bohr's atomic model.

Source(s)

http://www.sparetheair.com/assets/aqi/PM2017.png

https://www.iqair.com/india/delhi

Question(s)

1

(a) In 1904 J. J. Thomson proposed his 'plum pudding' model of the atom.

What are the two main features of this model?

(2 marks)

(b) This question is about moles.

(i) The relative atomic mass of helium is 4.

Calculate the number of moles in 52g of Helium.

(ii) Avogadro's number = 6.0221409×10^{23}

Calculate the number of moles of helium in 12.044×10^{23} atoms.

(2 marks)

(c) Magnesium is in Group 2 and Period 3 of the Periodic Table.

Complete Fig. 1 to show the arrangement of the electrons around the nucleus, N, of the magnesium atom.

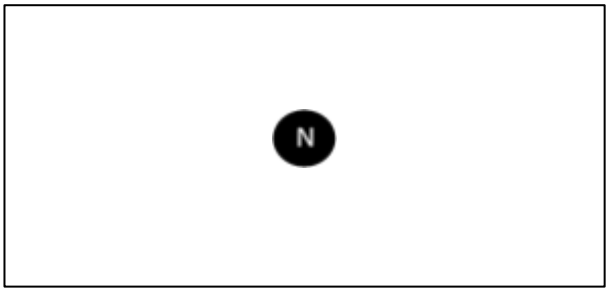


Fig. 1

(3 marks)

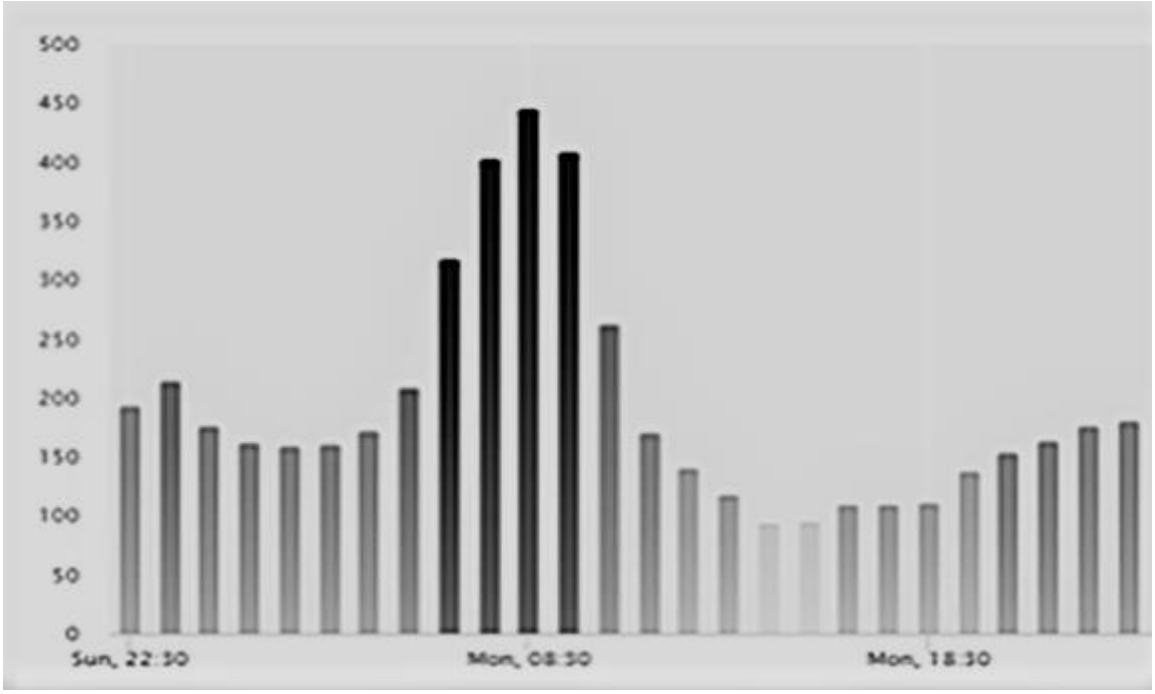
(d) Fig. 2 shows the categories used to describe air quality.

These categories are in different ranges between 0 to 500.

Air Quality Index - Particulate Matter	
301 – 500	Hazardous
201 – 300	Very Unhealthy
151 – 200	Unhealthy
101 – 150	Unhealthy for Sensitive Groups
51 – 100	Moderate
0 – 50	Good

Fig. 2

Fig. 3 shows how the air quality varies on an average Monday in Delhi.



Source: iqair.com, accessed 4/5/21

Discuss the data and the impact of air pollution on human health.

(4 marks)

(Total marks 11)

Mark scheme

1 (a) What are the two main features of this model?	
Answer	Guidance
Balance of positive and negative charges; Positively charged sphere with electrons embedded in it;	
1 (b) This question is about moles. (i) The relative atomic mass of helium is 4. Calculate the number of moles in 52g of Helium. (ii) Avogadro's number = 6.0221409×10^{23} Calculate the number of moles of helium in 12.044×10^{23} atoms.	
Answer	Guidance
(i)13; (ii) 2;	
1 (c) Complete Fig. 1 to show the arrangement of the electrons around the nucleus, N, of the magnesium atom.	
Answer	Guidance
3 shells; 12 electrons; Electron distribution: 2, 8, 2	

1 (d) Discuss the data and the impact of air pollution on human health.

Answer	Guidance
Indicative Science Relating to use of data: • Hazardous between 6 and 9 am • Hazardous between 8 and 10 pm • Moderate between 2 and 4 pm • Unhealthy between midnight and 5am Relating to impact on human health: • Respiratory conditions / COPD / Asthma • Reduced life expectancy • Chronic fatigue • Cardiovascular disease • Cancer • Birth defects • Increased burden on health service	ALLOW Max 2 marks from each list. ALLOW explanation e.g. Due to high traffic volume (as people go to work/school)

Science9RK4

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9RK41a				3	9.4.19 Explain the causes and impact of water pollution from sewage, mining and industrial processes and fertiliser run off from farming	3
Science9RK41b		2		2	9.9.7 Explain the impact of industry and agriculture on the environment in the form of pollution – ... industrial effluent discharge into rivers poisoning wildlife, fertiliser run off promoting eutrophication of water courses....	4
Total marks		2		5		7

Item purpose

The question assesses understanding of students on the effect of pollutants on water bodies.

Source(s)

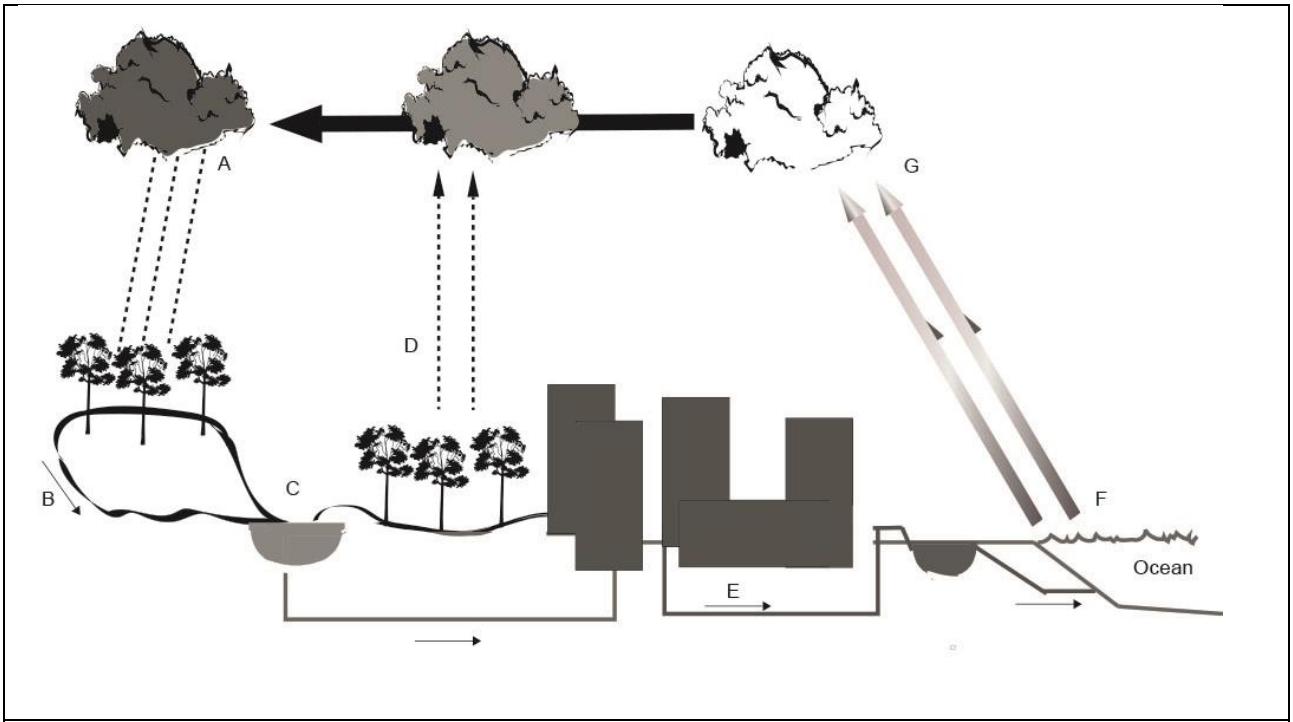


Fig 1

Question(s)

1 **Fig. 1** shows the path of a river from point A to point C.

1 (a) The population of fish is higher at Point **A** than Point **C**.

Suggest **three** reasons for this difference.

(3 marks)

1 (b) An increasing number of water weeds are blocking the river where it passes the farm.

Explain the **cause** of this problem and use the information in **Fig. 1** to explain one **consequence** of this problem.

(4 marks)

(Total marks 7)

Mark scheme

1 (a) Suggest three reasons for this difference.	
Answer	Guidance
Water is de-oxygenated (by sewage microbes after point A); Water is too toxic (due to chemicals after point B); Not enough food for the fish to eat (after Point A);	
1 (b) Explain the cause of this problem and use the information in Fig. 1 to explain one consequence of this problem.	
Answer	Guidance
Indicative Science Cause • fertiliser washed off farm fields • contains nitrate / phosphate • (stimulates) rapid plant growth Consequence • Increased risk of flooding • Economic / structural damage to industry • Destruction of tree plantation / crops • Soil erosion / loss due to floodwater	

Level of response

Level	Description	Marks
4	Clear well-structured explanation linking effects to causes or underpinning theory.	4
3	Clear description of relevant facts with some explanation relating effects to causes or underpinning theory.	3
2	Description of the basic facts but no link of effects to causes or underpinning theory	2
1	Limited isolated descriptive points relevant to the topic	1
0	Nothing worthy of credit	0

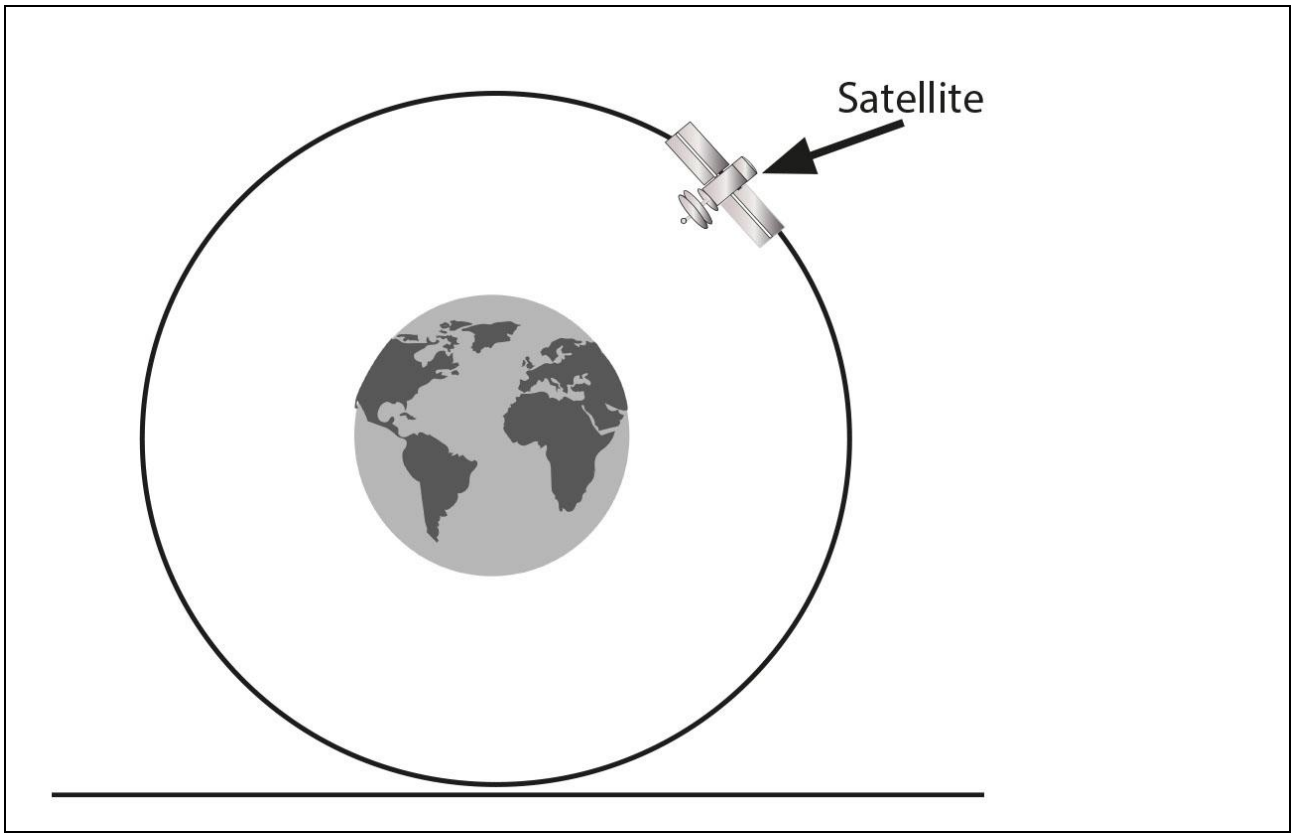
Science9RK31

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9RK31a	2				9.10.7. Explain how circular motion occurs.	2
Science9RK31bi		1			8.2.19 Describe the motion of celestial bodies (comets and the 8 planets) in terms of orbits made possible by speed and by gravitational forces.	1
Science9RK31bii		1			9.10.7 Work done in the process of uniform circular motion	1
Science9RK31biii		4			9.7.15 Identify and explain kinetic and potential energy and how one can be transformed into the other	4
Total marks	2	6				**8**

Item purpose

The question assesses the student's knowledge of uniform circular motion and the cause of motion.

Source(s)



Question(s)

1 The diagram shows a satellite travelling in uniform circular motion around the Earth.

1 (a) Explain what is meant by the term uniform circular motion.

(2 marks)

1 (b) i. The satellite is kept in orbit by a force.
On the diagram draw an arrow to show the direction of this force.

(1 mark)

ii. State and explain whether this force does any work on the satellite.

(1 mark)

iii. Explain why this force does **not** affect the energy of the satellite.

(4 marks)

(Total marks 8)

Mark scheme

1 (a) Explain what is meant by the term uniform circular motion.	
Answer	Guidance
constant speed; changing direction;	**IGNORE** moving in a circle
1 (b)(i) The satellite is kept in orbit by a force. On the diagram draw an arrow to show the direction of this force.	
Answer	Guidance

from centre of satellite to centre of Earth;	
1 (b)(ii) State and explain whether this force does any work on the satellite.	
Answer	Guidance
(No) because force is perpendicular to the motion of the satellite **OR** there is no movement in the direction of the force;	

1 (b)(iii) Explain why this force does **not** affect the energy of the satellite.	
Answer	Guidance
no kinetic energy change; because constant speed; no (gravitational) potential energy change; because constant distance/height;	

Level of response

Level	Description	Marks
4	Clear well structured explanation linking effects to causes or underpinning theory.	4
3	Clear description of relevant facts with some explanation relating effects to causes or underpinning theory.	3
2	Description of the basic facts but no link of effects to causes or underpinning theory.	2

1	Limited isolated descriptive points relevant to the topic	1
0	Nothing worthy of credit	0

Science9MB4

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9MB41ai	3				9.3.3 Explain how mixtures of liquids can be separated using ... **fractional distillation**	3
Science9MB41aii		1			9.3.3 Explain how mixtures of liquids can be separated using ... **fractional distillation**	1
Science9MB41aiii		1			9.5.1 Calculate RMM from RAM and formulae of a compound	1
Science9MB41aiv		1			9.5.2 Use Mass = RMM x Moles to calculate the number of moles or mass of a substance.	1
Science9MB41b				4	9.6.11 Draw and annotate the Water, ... cycles showing detailed processes and flows.	4
Total marks	3	3		4		**10**

Item purpose

The question assesses the student's understanding properties of liquid state of matter (with water as example) mole concept and water cycle.

Source(s)

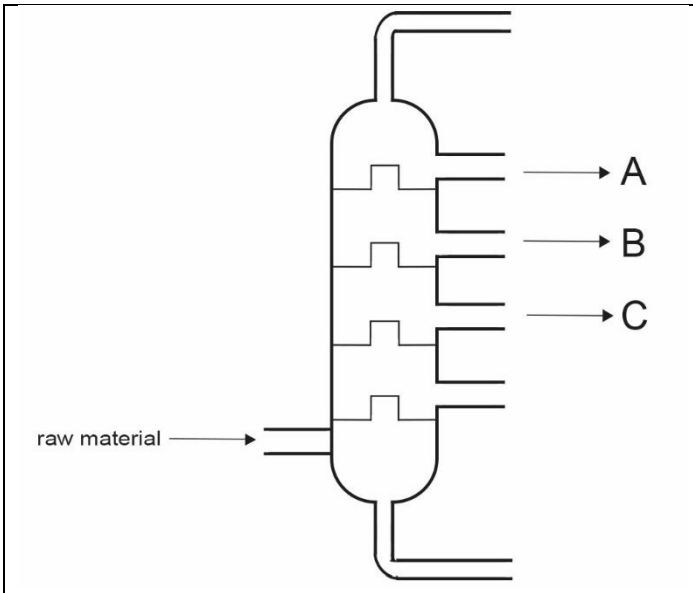


Fig 1

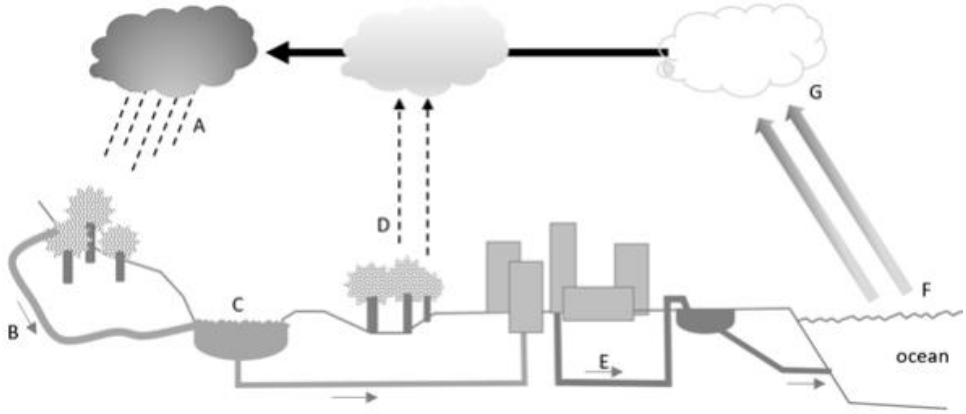


Fig 2

Question(s)

1 Fig. 1 shows a fractional distillation column.

1(a) Raw material is heated to a temperature of 350 °C. At this temperature the raw material is a vapour. It separates into liquid fractions at A, B and C.

1(a)(i) Explain why heating the raw material to a vapour enables it to separate into fractions as the vapour moves up the column.

(3 marks)

1(a)(ii) What is 350 °C in Kelvin?

(1 mark)

1(a)(iii) The molecular formula of a component in fraction A is C_8H_{18}.

Calculate the relative formula mass of C_8H_{18}.

(1 mark)

[A_r: C, 12; H, 1]

1(a)(iv) Using your answer to **(a)(iii)** calculate the number of moles in 1.0 kg of fraction A.

(1 mark)

1(b) Fig. 2 shows part of the water cycle.

i. Identify the processes at A, D, F and G.

ii. State one cause of eutrophication at C.

iii. Suggest what must happen between the city at E and the ocean.

(4 marks)

(Total marks 10)

Mark scheme

1 (a)(i) Explain why heating the raw material to a vapour enables it to separate into fractions as the vapour moves up the column.	
Answer	Guidance
(Fractions A B C have...) different boiling points; A has the lowest boiling point **or** C has the highest boiling point; A condenses at a lower temperature than C or A is still a gas when C condenses;	**ALLOW** 'becomes liquid'
1 (a)(ii) What is 350 □C in Kelvin?	
Answer	Guidance
423 K;	
1 (a)(iii) The molecular formula of a component in fraction A is C8H18. Calculate the relative formula mass of C8H18.	
Answer	Guidance
(8 x 12 + 18 x 1 =) 114;	

1 (a)(iv) Using your answer to (a)(iii) calculate the number of moles in 1.0 kg of fraction A.	
Answer	Guidance
1 kg = 1000 g; 1000 / 114 = 8.8;	**ALLOW** ecf using answer to (a)(iii) **ALLOW** 1 mark if no conversion kg to g
1 (b) i. Identify the processes at A, D, F and G. ii. State one cause of eutrophication at C. iii. Suggest what must happen between the city at E and the ocean.	
Answer	Guidance
Indicative Science: i. A – Precipitation B – Transpiration C – Evaporation D – Condensation	**ALLOW** ½ marks

And i. Nitrates wash in from B ii. Sewage treatment	

Level of response

Level	Description	Marks
4	Clear well-structured explanation linking human activities (4 to 5) and their consequences/ effects on the natural water cycle.	4
3	Clear description of relevant facts with some explanation of human activities (at least 2 to 3) disturbing the water cycle.	3
2	Description of the basic facts of water cycle with at least one human activity that has harmful effect on the water cycle.	2
1	Limited isolated descriptive points relevant to the topic	1
0	Nothing worthy of credit	0

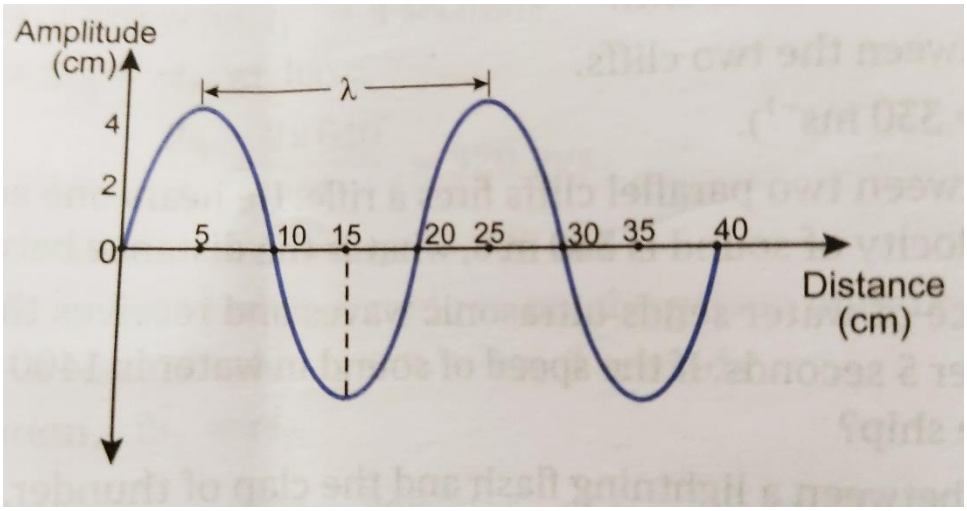
Science9RK5

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9RK51a		1			9.8.10 Describe how to measure the frequency, wavelength and amplitude of a given sound wave.	1
Science9RK51b		1				1
Science9RK51ci		1			9.5.12 Calculate frequency and speed of sound waves.	1
Science9RK51cii	1	1				2
Total marks	1	4				**5**

Item purpose

The question assesses … the student's understanding of sound wave& it's different characteristics with their measurement.

Source(s)



Source information: Copied from Exam Idea for class 9.

Question(s)

1 The diagram represents the waveform of a soundwave.

1 (a) Determine the amplitude of the wave.

(1 marks)

1 (b) Determine the wavelength of the wave.

(1 marks)

1 (c) The frequency of the wave is 200 Hz (200 waves per second)

i. Calculate the time period of **one** wave.

(1 marks)

ii. Using your answer in **(b)**, calculate the velocity of the wave in metres per second.

(3 marks)

(Total marks 6)

Mark scheme

1 (a) Determine the amplitude of the wave.	
Answer	Guidance
4 (cm);	
1 (b) Determine the wavelength of the wave.	

Answer	Guidance
20 (cm);	
1 (c)(i) The frequency of the wave is 200 Hz (200 waves per second) i. Calculate the time period of **one** wave.	
Answer	Guidance
(1/200=) 0.005 (s);	
1 (c)(ii) Using your answer in **(b)**, calculate the velocity of the wave in metres per second.	
Answer	Guidance
40 m/s (award all 3 marks); conversion of 20 cm to 0.2 m; substitution in v=f l **or** 200 x 20	**ALLOW** ecf using answer **(b)** **ALLOW** 2 marks for 4000 m/s

Science9TP3

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9TP3				1	9.9.7, 9.6.11	1

Item purpose

The question assesses the knowledge of biogeochemical cycles.

Question(s)

1 Which substance decreases during a fire?

A. Carbon dioxide
B. Nitrogen
C. Oxygen
D. Water vapour

(1 mark)

Mark scheme

1. Which substance decreases during a fire? A. Carbon dioxide B. Nitrogen C. Oxygen D. Water vapour	
Answer	Guidance
C. Oxygen	

Science9DT4

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9DT41a		1		1	9.3.12 Investigate and explain the use of fertilisers/manure and their impact on crop growth	2
Science9DT41bi		2			9.10.9 Identify positive and negative aspects of organic and intensive farming.	2
Science9DT41bii		1				1
Science9DT41biii		1				1
Science9DT41biv				2		2
Science9DT41ci	2				9.4.23 Explore how selective breeding can increase crop yields and create crops suitable to specific conditions	2
Science9DT41cii	2					2
Total marks	4	5		3		12

Item purpose

The question assesses the student's knowledge of the benefits and disadvantages of using manure and fertilizer. It also assesses the student's knowledge of the advantages of organic farming and selective breeding.

Source(s)

Question(s)

1 In an investigation a farmer cut the grass in two of his fields.

Then he treated one field of grass with fertiliser containing nitrates and other minerals.

He left the other field of grass untreated.

1(a) Explain why the farmer cut the grass in both fields but only treated one field with fertiliser.

(1 mark)

1(b) Three months later the farmer cut the grass in both fields again.

The yields were:

- Field with fertiliser 1.88 kg / m^2
- Field without fertiliser 1.37 kg / m^2

1(b)(i) Explain why the farmer calculated the yield in kg / m^2 instead of calculating the total yield from each field.

(2 marks)

1(b)(ii) Calculate the increase in yield per square metre.

(1 mark)

1(b)(iii) Using your answer in (b)(ii) calculate the percentage increase in yield due to adding fertiliser.

(1 mark)

1(b)((iv) State the conclusion that can be made from the farmer's data.

(2 marks)

1(c) Identify **one** positive and **one** negative aspect of:

1(c)(i) Organic farming

(2 marks)

1(c)(ii) Intensive farming

(2 marks)

(Total marks 12)

Mark scheme

1 (a) Explain why the farmer cut the grass in both fields but only treated one field with fertiliser.	
Answer	Guidance
So that he can **compare** both fields; and see **how much** difference the fertiliser made;	
1 (b)(i) Explain why the farmer calculated the yield in kg / m2 instead of calculating the total yield from each field.	
Answer	Guidance
Different sized fields; So **total** yield is not a fair/reliable comparison;	
1 (b)(ii) Calculate the increase in yield per square metre.	
Answer	Guidance
0.51 kg;	
1 (b)(iii) Using your answer in (b)(ii) calculate the percentage increase in yield due to adding fertiliser.	
Answer	Guidance
(0.51/1.37 =) 37%;	
1 (b)(iv) State the conclusion that can be made from the farmer's data.	
Answer	Guidance
Nitrates (and other minerals); Increase yield / make grass grow faster;	

1 (c)Identify **one** positive and **one** negative aspect of: (i) Organic farming	
Answer	Guidance
1. no pesticides / more biodiversity 2. lower yields / less profit / more land needed for agriculture / higher cost	
(ii) Intensive farming	
Answer	Guidance
Cheaper food / less land needed for agriculture / more profits for farmers / higher yields 1. Pesticides kill beneficial species / bioaccumulation / cause of eutrophication / less biodiversity	
	[Total: 12]

Science9DS3

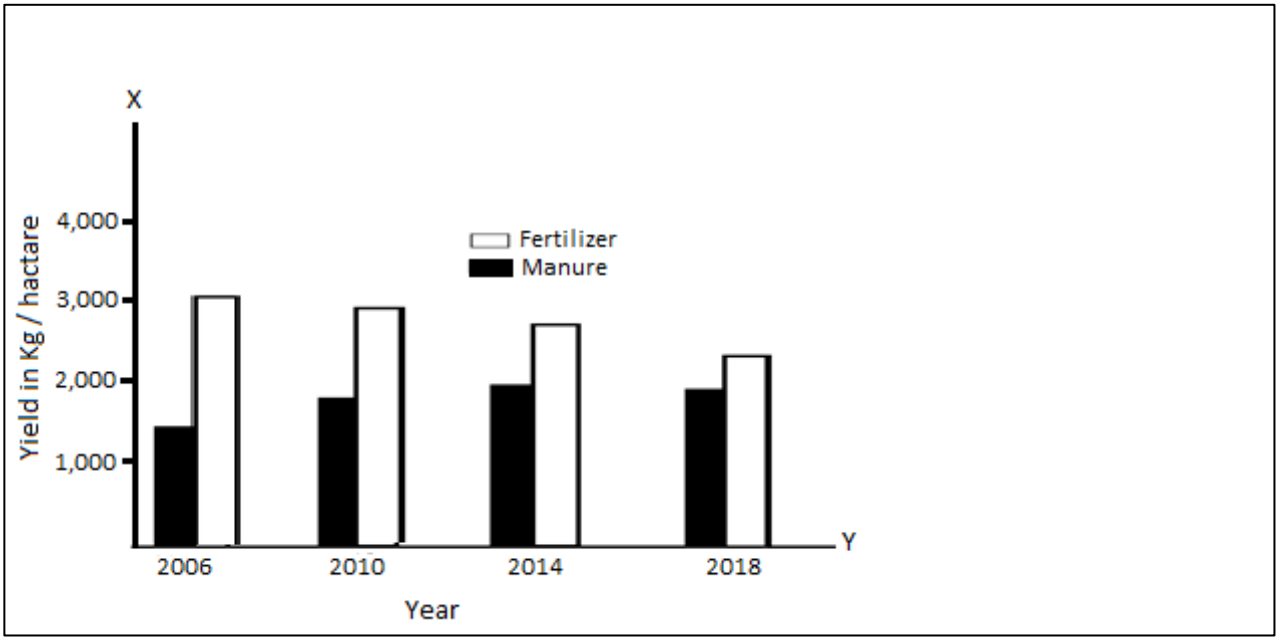
Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9DS31a			2		9.6.12 Analyse and interpret graphical data on crop yields in relation to nutrient levels.	2
Science9DS31b		2			9.4.25 Explain how the addition of ... natural manure .... change crop productivity ….	2
Science9DS31c	2			2	9.10.9 Identify positive and negative aspects of organic and intensive farming.	4
Total marks	2	2	2	2		8

Item purpose

The question assesses the students' understanding of the intensive and organic farming systems and disadvantages of intensive farming systems.

Source(s)

5	Intensive farming is an agricultural system that aims to maximize yields from available land through various means, such as heavy use of pesticides and chemical fertilizers. On the other hand, organic farming is a farming system with minimal or no use of chemical fertilizers. Both the farming systems differ in the yield produced, inputs required and effect on soil characteristics like water holding capacity, soil microorganisms, aeration etc. The graph given below shows the effect of organic manure and chemical fertilizers used in these two types of agriculture systems on the crop yield over a period of time.



Source information: Self-made graph and write-up.

Question(s)

1 Fig. 1 shows the effect of chemical fertilizers and organic manure on crop yield.

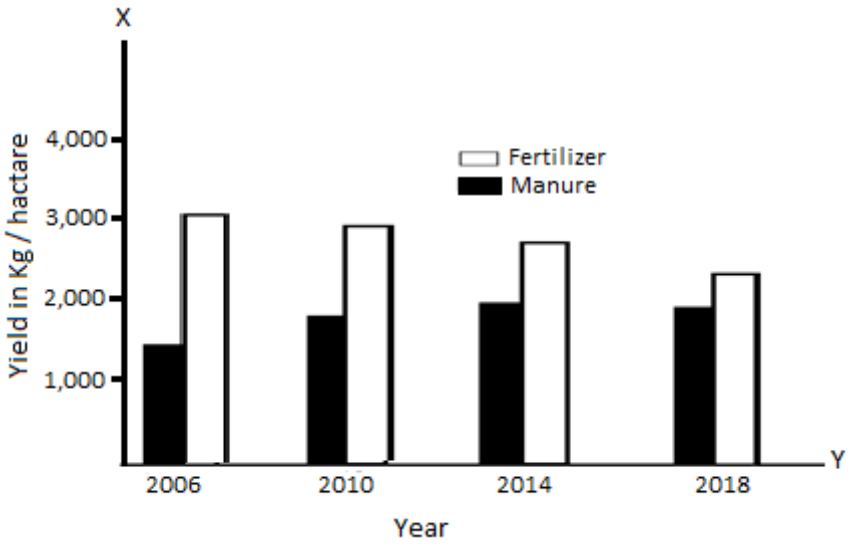


Fig. 1

1 (a) Describe the trends in crop yields between 2006 and 2018.

(2 marks)

1 (b) Explain the effect of adding manure on the water holding capacity of:

i. Sandy soil
ii. Clay soil

(2 marks)

1 (c) Explain **two** harmful effects of intensive farming practice.

(4 marks)

(Total marks 8)

Mark scheme

1 (a) Describe the trends in crop yields between 2006 and 2018.	
Answer	Guidance
increasing yield when manure is used; Decreasing yield when fertiliser is used;	
1 (b) Explain the effect of adding manure on the water holding capacity of: i. Sandy soil ii. Clay soil	
Answer	Guidance
(sandy) increases; (clay) decreases / improves drainage;	
1 (c) Explain **two** harmful effects of intensive farming practice.	

Answer	Guidance
Indicative Science: • killing of beneficial soil microorganisms • reduced recycling of nutrients. • decreases fertility • decreases aeration. • fertilizers washed away leads to water pollution and eutrophication. • soil prone to erosion due to the lack of organic matter. • excessive pesticides and herbicides used in intensive farming often lead to bio-accumulation • (...and cause) toxicity in non-target species. • Residues of chemicals left in crops affect human health causing diseases like cancer, congenital abnormalities etc. • Intensive farming requires lots of inputs in terms of use of chemicals, machinery, human labour etc. which increases net cost of farming.	

Science9DT5

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9DT51a		3			9.3.11 Explain how selective breeding in plants and animals is used to improve quality, yield and manage diseases.	3
Science9DT51b				2	9.12.5 Understands the benefits and risks of vaccination and the misinformation which exists about vaccination.	2
Total marks						5

Item purpose

The question assesses the student's knowledge of benefits of selective breeding and risks and benefits associated with vaccination.

Source(s)

Question(s)

1 Red Sindhi cattle are widely kept for milk production in India.

Jersey cattle are a British breed, also kept for milk production.

1(a) Suggest why some farmers are cross breeding Red Sindhi with Jersey cattle.

(3 marks)

1(b) Bovine virus diarrhoea (BVD) is a common disease affecting cattle.

BVD can be prevented by vaccinating cattle.

(2 marks)

Suggest **two** reasons why some farmers do **not** vaccinate their cattle against this disease.

(Total 5 marks)

Mark scheme

1(a) Suggest why some farmers are cross breeding Red Sindhi with Jersey cattle.	
Answer	Guidance
Idea that offspring will be adapted to **local** (abiotic) environmental conditions (e.g. Hot/humid climate) **or** (biotic) pathogens/disease vectors (e.g. mosquito); **AND** any **two** from: To improve quality (of milk / cheese / meat); To improve yield; To improve disease resistance;	**ALLOW** Local breeds pass on resistance to diseases (to offspring) **ALLOW** longer period of milk production
1(b) Suggest two reasons why some farmers do not vaccinate their cattle against this disease.	

Any **two** from: • belief that the vaccine will cause infection; • the vaccine (protocol) is complex to administer; • the vaccine (program) may be too expensive for them; • lack of information about the benefits of vaccines; • misinformation about the safety of vaccines • difficulty of access of vaccinators to rural locations; • difficulty of gaining agreement between members of the farming family; • AVP;	

Science9ML3

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
SCIENCE9ML31a	1	2			9.3.12 Investigate and explain the use of fertilisers/manure and their impact on crop growth.	3
SCIENCE9ML31b		2			9.3.14 Assess the benefits and drawbacks of organic farming vs intensive farming	2
SCIENCE9ML31ci	1					1
SCIENCE9ML3cii	1					1
SCIENCE9ML31d		2		1	9.3.13 Explain methods of protection from pests and diseases, both biological and chemical.	3
Total marks	3	6		1		10

Item purpose

The question assesses the student's ability to analyse the effect of manures and chemical fertilisers.

Questions

1 A farmer spreads 500kg of fertiliser on his fields.

He does this **every** year.

(a) Explain why the farmer needs to spread 500 kg of fertiliser every year. (3 marks)

(b) A scientist finds fertiliser in a river a long way from the farm.

Explain how fertiliser can get into the river. (2 marks)

(c) The fertiliser contains nitrates.

(i) How will this affect the plants in the river **at first**? (1 mark)

(ii) State **one** other source of nitrates. (1 mark)

(d) The farmer also spreads fungicide on his crops. This treatment is expensive.

Suggest and explain why the farmer uses fungicide.

(1 mark)

(Total 10 marks)

Mark scheme

1 (a) Explain why the farmer needs to spread 500 kg of fertiliser every year.	
Answer	Guidance
Nutrients absorbed by crops / depleted by crop growth; Some nutrients lost / washed out of soil; Not enough nutrients to maintain yield;	
1 (b) Explain how fertiliser can get into the river.	
Answer	Guidance
It dissolves in (rain) water; and is absorbed **through** the soil;	
1 (c)(i) How will this affect the plants in the river **at first**? (c)(ii) State **one** other source of nitrates.	

Answer	Guidance
(c)(i) Increased / rapid growth; (c)(ii) Manure / sewage / food processing waste;	
1 (d) Suggest and explain why the farmer uses fungicide.	
Answer	Guidance
To prevent disease; Disease caused by fungi; The value of the crop is (much) more than the cost of the treatment;	

Science9TP4

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9TP4 1a	2				9.7.10 Explain the relationship between force and motion using Newton's Laws of Motion, and Action and Reaction forces.	2
Science9TP4 1b	2				9.7.11 Explain the concept of inertia of a body and relate Inertia to acceleration and mass.	2
Science9TP4 1c	1	1			9.5.6 Use F=ma in calculations in linear systems to calculate resultant forces acting on and acceleration of objects.	2
Science9TP4 1d			3	1	9.1.10 Identify acceleration, deceleration and constant velocity	4
Science9TP4 1e	2	2			9.8.6 Describe how to measure force applied to an object using a Newton meter 9.1.11 Describe the difference between mass and weight	4
Total marks	**7**	**3**	**3**	**1**		**14**

Item purpose

The question assesses the student's understanding of force and motion, and how these concepts can be related in real life as per explanation of these concepts given by Newton's laws of motion.

Question(s)

1 This question is about forces and motion.

1(a) Complete this sentence to describe Newton's First Law.

An object in constant _____ remains in _____

motion unless a resultant _____ acts on it.

(2 marks)

1(b) Newton's First Law is also called the law of inertia.

Explain inertia using the terms mass and velocity.

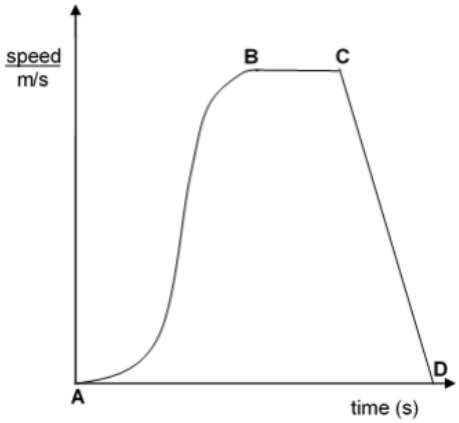
(2 marks)

1(c) An object of mass 50 kg accelerates at 3 m/s^2.

Calculate the force applied to the object.

(2 marks)

1(d) Fig. 1 is the speed-time graph of a journey.



(4 marks)

Fig. 1

Describe the journey between point A and point D.

1(e) Fig. 2 is a diagram of a newton meter used to measure forces such as weight.

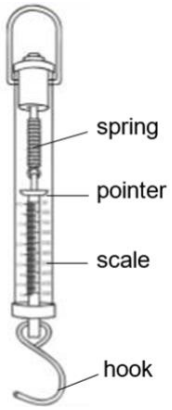


Fig. 2

Describe how the newton meter is used to measure the weight of an object and explain the difference between mass and weight.

(4 marks)

(Total marks 14)

Mark scheme

<table>
<tr><td colspan="2">1 (a) Complete this sentence to describe Newton’s First Law.
An object in constant _____ remains in _____
motion unless a resultant _____ acts on it.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>Motion; constant; force;</td><td></td></tr>
<tr><td colspan="2">1 (b) Explain inertia using the terms mass and velocity.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>More mass more inertia;
More inertia more resistance to a change in velocity;</td><td></td></tr>
<tr><td colspan="2">1 (c) Calculate the force applied to the object.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>If answer with unit = 150 N award 3 marks.
Recall of F = ma or 50 x 3;
Answer: 150;</td><td></td></tr>
<tr><td colspan="2">1 (d) Describe the journey between point A and point D.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>A-B – acceleration;
B-C – constant speed;
C-D – deceleration;
Detail in description – e.g.
A-B non-uniform acceleration
increasing rate of acceleration from A
decreasing rate of acceleration towards B
more time for speed to change between A and B than C and D</td><td></td></tr>
</table>

1 (e) Describe how the newton meter is used to measure the weight of an object and explain the difference between mass and weight.	
Answer	Guidance
Method of using newton meter • Suspend object from hook • Read the scale at the position of the pointer Difference between mass and weight • Mass – amount of matter in an object • Weight – the action of a gravitational field on mass	

Science9PK2

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9PK2	1				9.1.9 Identify balanced and unbalanced forces.	1

Item purpose

The question assesses the understanding ability of a student to identify balanced and unbalanced forces acting on the objects in daily to day life.

Source(s)

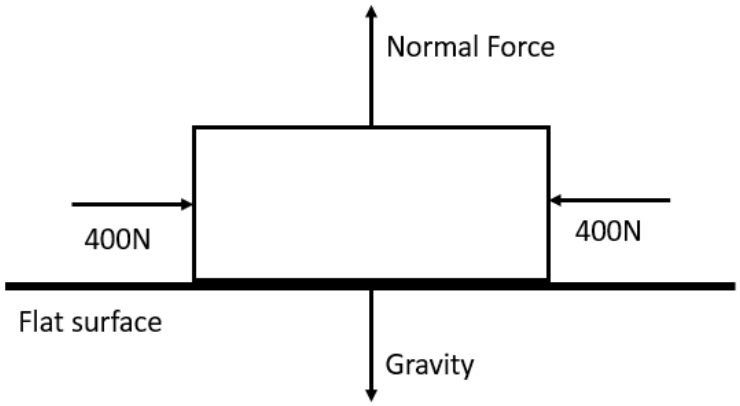


Fig.1

Question(s)

1 In Fig. 1. balanced forces are acting on the wooden box.

Define Balanced Force.

(1 mark)

Mark scheme

1. In Fig. 1.2. Balanced forces are acting on the wooden box. Define Balanced Force.	
Answer	Guidance
Equal in size **and** opposite in direction;	

Science9SD1

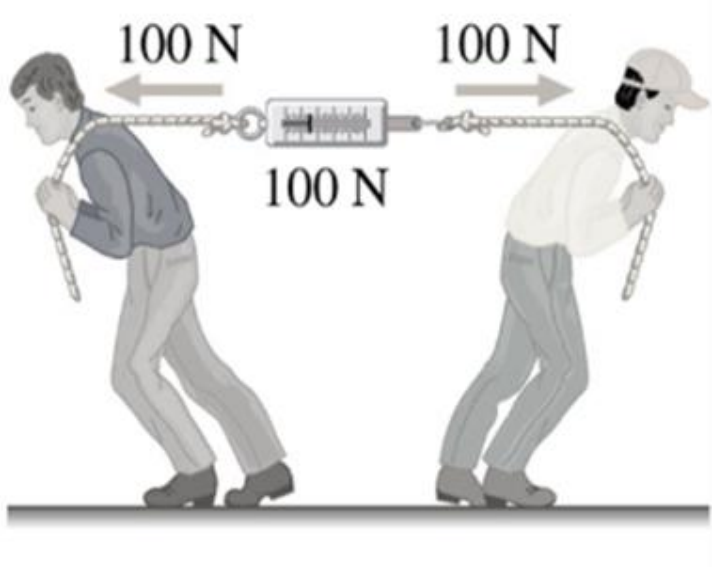
Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9SD1	1				9.1.9 Identify balanced and unbalanced forces.	1

Item purpose

The purpose of the item is to assess whether students understand the concept of balanced force and unbalanced force.

Source(s)

Class IX NCERT Textbook



Source information: NCERT Class IX Textbook

Question(s)

1 Explain why the reading on the force-meter is a constant 100N.

(1 mark)

Mark scheme

1. Explain why the reading on the force-meter is a constant 100N	
Answer	Guidance
Balanced forces **or** forces are equal in size and opposite in direction;	

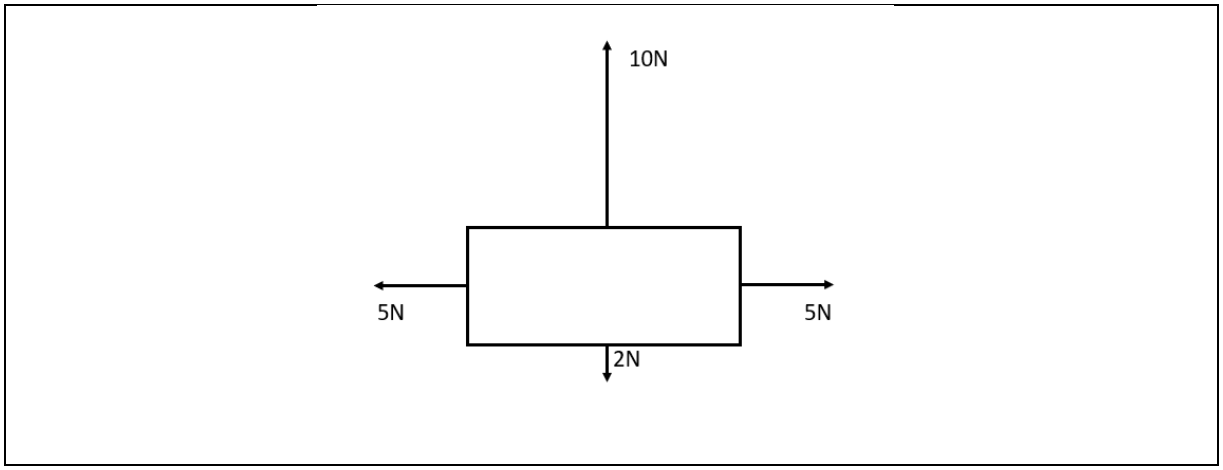
Science9RK1

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9RK1		1			9.1.9 Identify balanced and unbalanced forces.	1

Item purpose

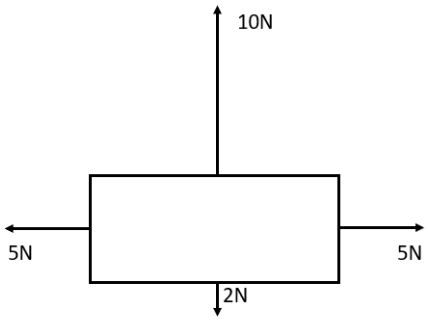
The question assesses … The ability of the student to understand the concept of balanced and unbalanced forces and their measurement.

Source(s)



Question(s)

1 The diagram shows the forces acting on a body.



What is the resultant force?

A. 8 N upwards
B. 11 N upwards and to the left
C. 11 N upwards and to the right
D. 22 N

(1 mark)

Mark scheme

1. The diagram shows the forces acting on a body.	
Answer	Guidance
A	

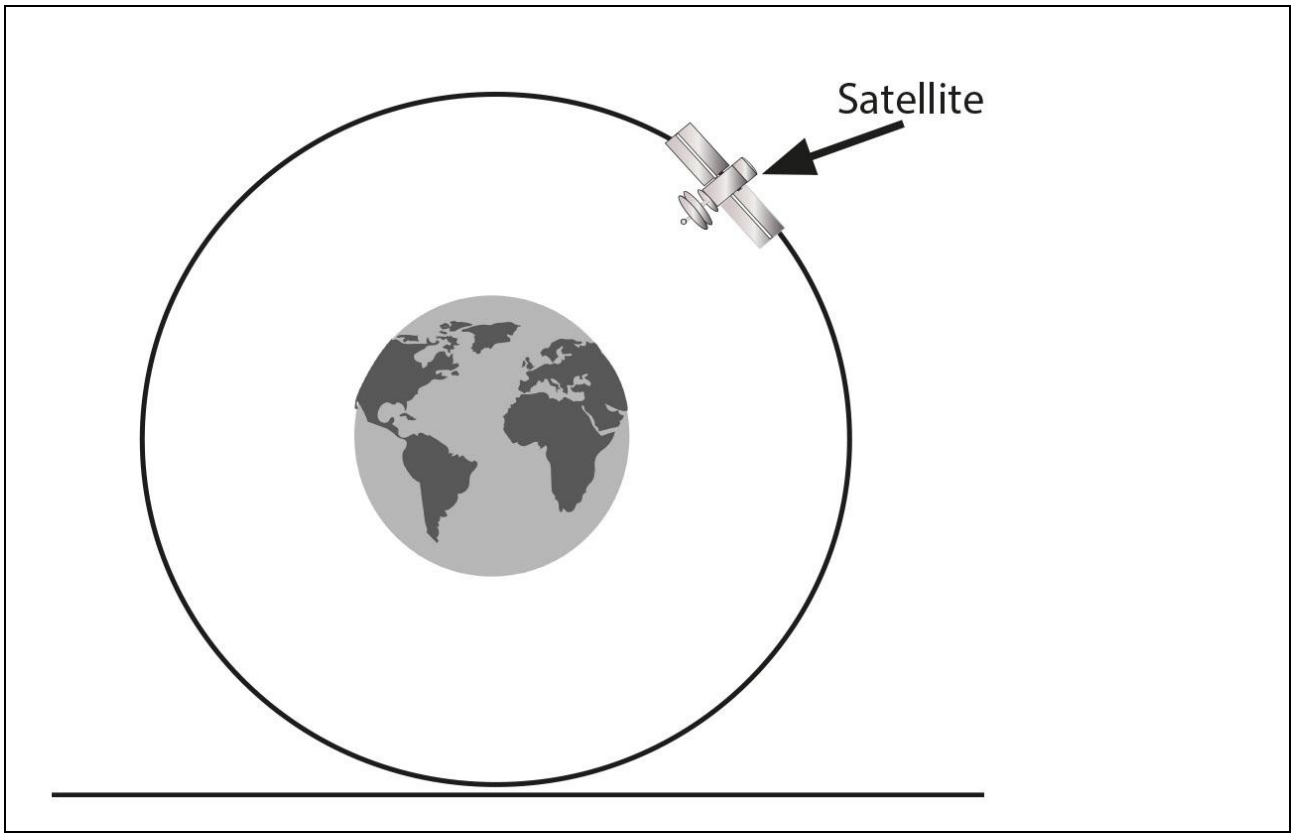
Science9RK3

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9RK31a	2				9.10.7. Explain how circular motion occurs.	2
Science9RK31bi		1			8.2.19 Describe the motion of celestial bodies (comets and the 8 planets) in terms of orbits made possible by speed and by gravitational forces.	1
Science9RK31bii		1			9.10.7 Work done in the process of uniform circular motion	1
Science9RK31biii		4			9.7.15 Identify and explain kinetic and potential energy and how one can be transformed into the other	4
Total marks	2	6				**8**

Item purpose

The question assesses the student's knowledge of uniform circular motion and the cause of motion.

Source(s)



Question(s)

1 The diagram shows a satellite travelling in uniform circular motion around the Earth.

1 (a) Explain what is meant by the term uniform circular motion.

(2 marks)

1 (b) iv. The satellite is kept in orbit by a force.
On the diagram draw an arrow to show the direction of this force.

(1 mark)

v. State and explain whether this force does any work on the satellite.

(1 mark)

vi. Explain why this force does **not** affect the energy of the satellite.

(4 marks)

(Total marks 8)

Marks scheme

1 (a) Explain what is meant by the term uniform circular motion.	
Answer	Guidance
constant speed; changing direction;	**IGNORE** moving in a circle
1 (b)(i) The satellite is kept in orbit by a force. On the diagram draw an arrow to show the direction of this force.	
Answer	Guidance
from centre of satellite to centre of Earth;	
1 (b)(ii) State and explain whether this force does any work on the satellite.	
Answer	Guidance
(No) because force is perpendicular to the motion of the satellite **OR** there is no movement in the direction of the force;	
1 (b)(iii) Explain why this force does **not** affect the energy of the satellite.	

Answer	Guidance
no kinetic energy change; because constant speed; no (gravitational) potential energy change; because constant distance/height;	

Level of response

Level	Description	Marks
4	Clear well structured explanation linking effects to causes or underpinning theory.	4
3	Clear description of relevant facts with some explanation relating effects to causes or underpinning theory.	3
2	Description of the basic facts but no link of effects to causes or underpinning theory.	2
1	Limited isolated descriptive points relevant to the topic	1
0	Nothing worthy of credit	0

Science9SD5

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9SD51a		4			9.2.14 Explain how to design and conduct an experiment to verify the laws of reflection of sound.	4
Science9SD51b		2			9.7.16 Sound: Explain how reflection of sound causes an echo and this is the principle behind sonar.	2
Total marks		6				**6**

Item purpose

The question assesses the understanding of Sound wave, its range of frequency, its propagations. & reflection of sound & application.

Source(s)

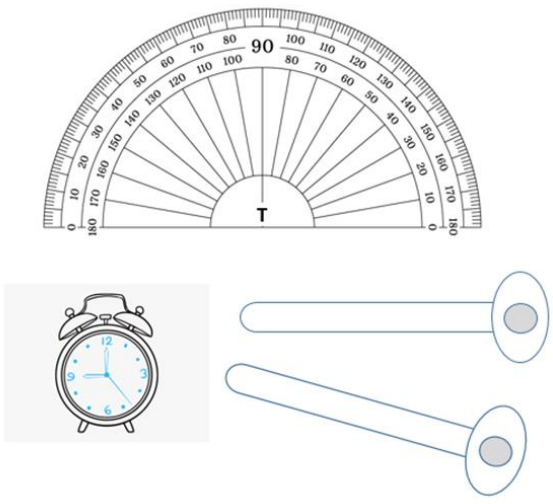


Figure 1

Figure 2

Source information: Class IX NCERT Textbook Chapter 11- Work and Energy

Oswal books Class IX Science

Science for 9 Class Part I Physics by Lakhmir Singh & Manjit Kau

Question(s)

1(a) Describe an experiment using the apparatus shown in **Fig. 1** to verify

the laws of reflection of sound.

You are provided with:

- An alarm clock
- A large protractor
- Tubes fitted with earpieces

(4 marks)

1(b) On Fig. 2 draw arrows to show how the ship uses sonar to detect the shoal of fish.

(2 marks)

(Total marks 6)

Mark scheme

1 (a) Describe an experiment using the apparatus shown in Fig. 1 to verify the laws of reflection of sound.	
Answer	Guidance
• Place alarm clock at specified angle; • Align tube 1 with clock and point T • Place end of tube 2 at point T and rotate about point T (in the same plane); • When the sound is heard through the second tube the angles of incidence and reflection will be equal;	**ALLOW** centre of protractor **ALLOW** the angles will be equal
1 (b) On Fig. 2 draw arrows to show how the ship uses sonar to detect the shoal of fish.	
Answer	Guidance
Arrow with direction from boat to shoal; **reflection** arrow from shoal to boat;	**ALLOW** vertical arrows **IGNORE** angles

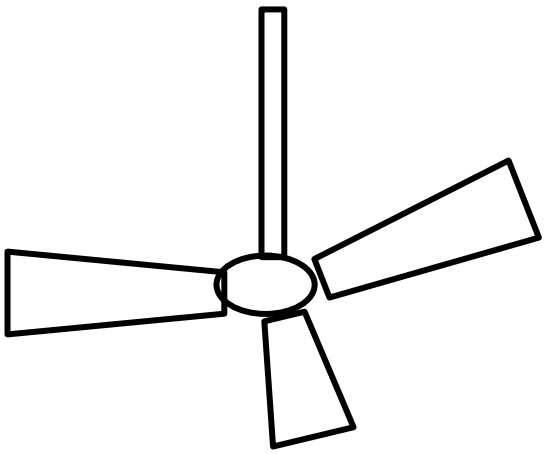
Science9PK1

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9PK1	1				9.4.10 Explains the law of conservation of energy and energy transformations.	1

Item purpose

The question assesses the student's understanding of energy conversions which occur in daily life.

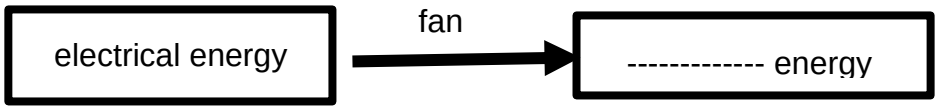
Source(s)



Question(s)

1 The above figure is a diagram of an electric fan.

Complete the energy flow diagram to show the useful energy transferred by the fan.



(1 mark)

Mark scheme

1. Complete the energy flow diagram to show the useful energy transferred by the fan.	
Answer	Guidance
kinetic / mechanical energy;	

Science9SD3

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9SD31a		2			9.4.8 Explains motion of an object in terms of the forces acting on the object.	2
Science9SD31b	2				9.4.10 Explains the law of conservation of energy and energy transformations	2
Science9SD31c		1	2	1	9.4.10 Explains the law of conservation of energy and energy transformations	4
Total marks	2	3	2	1		**8**

Item purpose

The question assesses the students' understanding of the concept of Law of conservation of energy and ability of students to apply the same in daily life situation.

Source(s)

Class IX NCERT Textbook Chapter 11- Work and Energy
A Students guide to Newton’s laws of Motion by Sanjoy Mahajan- Cambridge University Press
Oswal books Class IX Science
Science for 9 Class Part I Physics by Lakhmir Singh & Manjit Kaur

Question(s)

1 A simple pendulum is released at position A and swings to position C as shown in **Fig. 1**

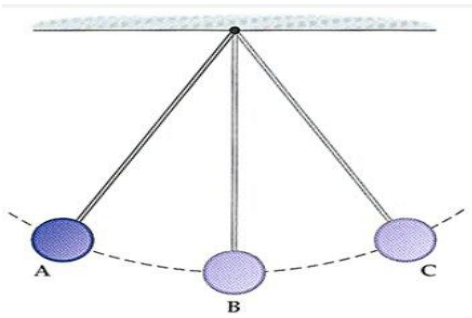


Fig. 1

One complete oscillation is when the pendulum swings from A to C and then returns to A.

1(a) Explain, in terms of forces, why the pendulum begins to move.

(2 marks)

1(b) Describe the transfer of energy between A and B.

(2 marks)

1(c) At position C, the pendulum changes direction and returns towards position A.

The pendulum does **not** reach its original starting position A.

Fig. 2 shows how the amplitude of the oscillation decreases with each oscillation.

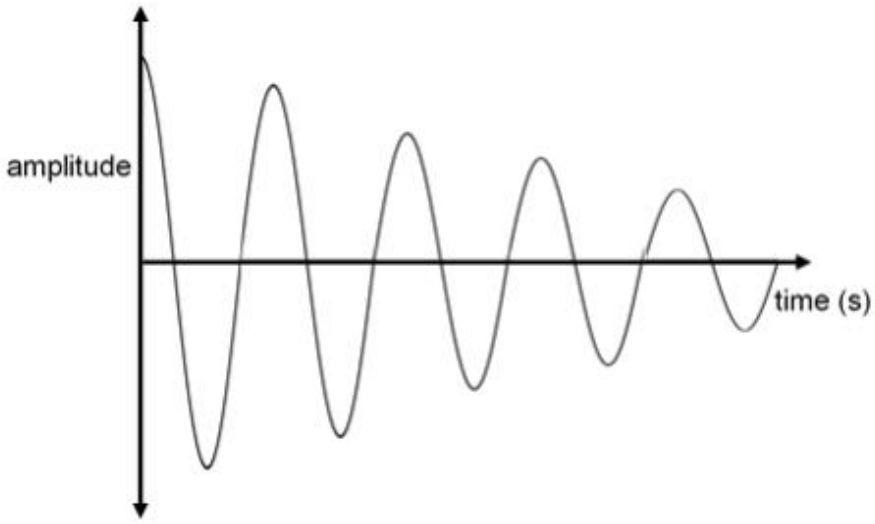


Fig. 2

On **Fig. 2**, label the starting position Point A.

Describe and explain the oscillation of the pendulum

.

(4 marks)

(Total marks 8)

Mark scheme

<table>
<tr><td colspan="2">1 (a) Explain, in terms of forces, why the pendulum begins to move.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>Unbalanced force / resultant force;

Gravitational force;</td><td>ALLOW gravity</td></tr>
<tr><td colspan="2">1 (b) Describe the transfer of energy between A and B.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>From gravitational potential energy;

to kinetic energy;</td><td></td></tr>
<tr><td colspan="2">1 (c) Describe and explain the oscillation of the pendulum.</td></tr>
<tr><td>Answer</td><td>Guidance</td></tr>
<tr><td>Descriptions:

• ‘A’ labelled at top of first wave crest;
• Amplitude decreases;
• Frequency constant;
• Five full oscillations shown;

Explanations:

• Friction (with air) / air resistance;
• Energy transferred as heat / thermal energy;</td><td>ALLOW 3 max. if no explanations

ALLOW ‘lost’ for transferred</td></tr>
</table>

Science9SD2

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9SD2	1	2			9.4.8 Explains motion of an object in terms of the forces acting on the object.	3

Item purpose

The purpose of the item is to assess whether students understand Newton's Second Laws of Motion and apply the same to study the motion of a body under the application of Force.

Source(s)

Class IX NCERT Textbook

A Students guide to Newton's laws of Motion by Sanjoy Mahajan- Cambridge University Press

Oswal books Class IX Science

Balanced force - Bing images

Question(s)

1 Fig.1 shows two trolleys accelerating towards each other.

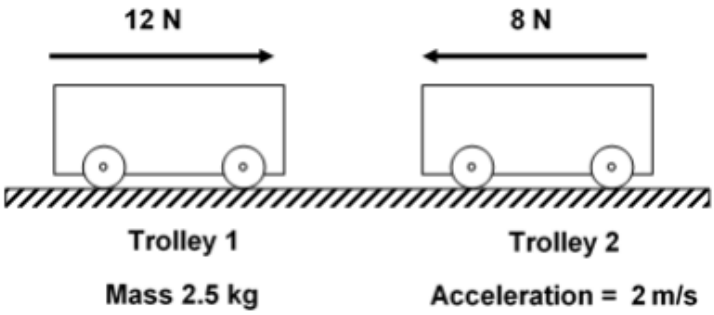


Fig. 1

Calculate:

i. The acceleration of Trolley 1

…..... m/s^2

ii. The mass of Trolley 2

…..... kg

(3 marks)

Mark scheme

1. Calculate: i. The acceleration of Trolley 1 ii. The mass of Trolley 2	
Answer	Guidance
If final answers are 4.8 and 4 award 3 marks Recall of F = ma; One substitution in a rearranged equation: 1 - 12/2.5 **or** 8/2 ;	

Science9RK2

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9RK2		1			9.5.10. Calculate the work done by a force.	1

Item purpose

The question assesses the ability of the student to understand the concept of work and its measurement.

Question(s)

1 A force of 20 N acts on a body.

The body moves 2 m in the direction of the force.

What is the work done by the force?

A. 10 J
B. 40 J
C. 10 W
D. 40 W

(1 mark)

Mark scheme

1. What is the work done by the force? A. 10 J B. 40 J C. 10 W D. 40 W	
Answer	Guidance
B	Award 1 mark for option B. For other option, no mark.

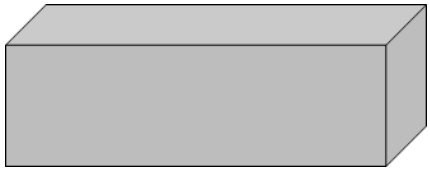
Science9PK3

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9PK3a	1				9.8.5 Describe how to measure the mass and volume of an object (in order to calculate density)	1
Science9PK3b			2			2
Science9PK3c	1	1			9.5.9 Calculate the density of an object.	2
Total marks	2	1	2			**5**

Item purpose

The question assesses the ability of a student to perform an experiment to find the mass and volume of a given regular object to calculate density.

Source(s)



brick

Question(s)

1 Sheela does an experiment to calculate the density of a rectangular brick.

1 (a) Name the laboratory apparatus Sheela uses to measure the mass of the brick.

(1 mark)

1 (b) Describe **one** way of measuring the volume of rectangular brick.

(2 marks)

1 (c) **Table 1** shows Sheela's results:

Mass of brick	500 g
The volume of the brick	20 cm^3

Table 1

Calculate the density of the brick.

(2 marks)

(Total marks 5)

Mark scheme

1. 1 (a) Name the laboratory apparatus Sheela uses to measure the mass of the brick.	
Answer	Guidance
Balance / weighing scales	
1 (b) Describe **one** way of measuring the volume of rectangular brick.	
Answer	Guidance
Measure length, width, height; Multiply l x w x h; **Or** Immerse in calibrated water container (e.g. measuring cylinder); Final – initial reading;	
1 (c) Calculate the density of the brick.	
Answer	Guidance
If final answer with unit = 25 g/cm^3 award 2 marks m/v or 500/20; 25 g/cm^3;	

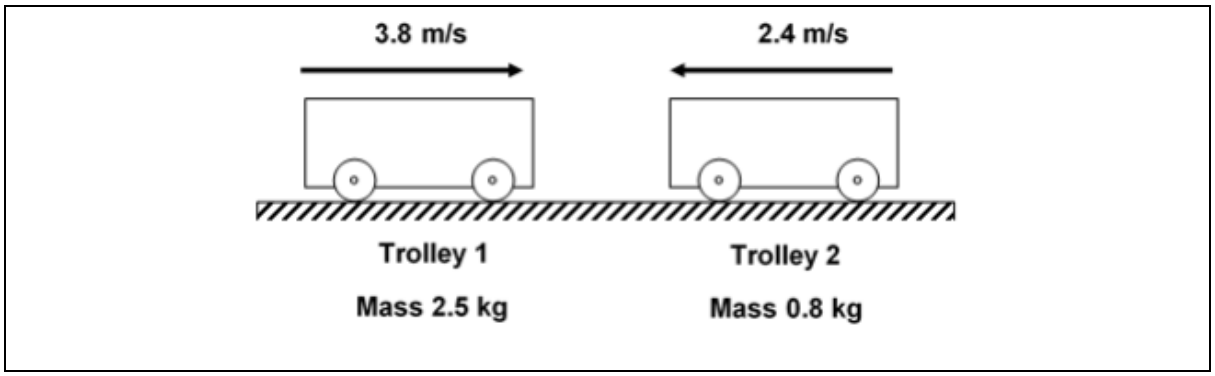
Science9PK4

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9PK41a	1	1			9.5.7 Calculate the momentum of an object.	2
Science9PK41bi		4			9.5.7 Calculate the momentum of an object.	4
Science9PK41bii	1	3			9.7.12 Explain momentum in terms of force and velocity and conservation of momentum when objects collide.	4
Science9PK41c		2			9.7.11 Explain the concept of inertia of a body and relate Inertia to acceleration and mass.	2
Total marks	2	10				12

Item purpose

The questions assess the ability of the students to understand the concept of Inertia, momentum and Law of conservation of momentum and its application in day-to-day life.

Source(s)



Question(s)

1 Trolley 1 of mass 2.5 kg moves at a constant speed of 3.8 m/s.

1(a) Calculate the momentum of Trolley 1. State the unit.

(3 marks)

1(b) Trolley 2 of mass 0.8 kg moves at a constant speed of 2.4 m/s straight towards Trolley 1 as shown in **Fig. 1**.

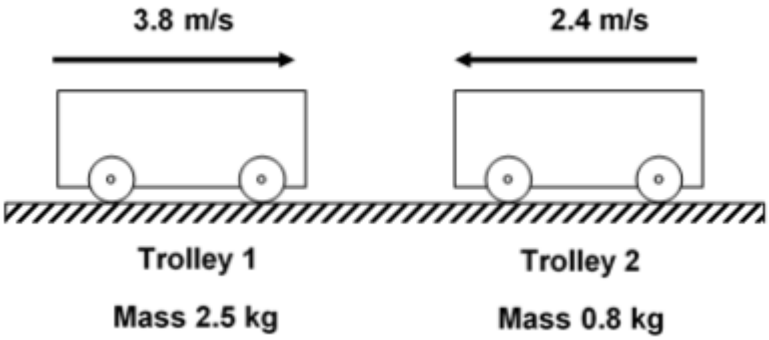


Fig. 1

The two trolleys impact and stick together.

1(b)(i) A teacher says that the velocity of the joined-up trolleys after the impact is 2.3 m/s.

Using a set of calculations, show that the teacher is correct.

(4 marks)

1(b)(ii) The impact takes 0.15 seconds.

Calculate the average force acting on Trolley 2 during the impact.

(4 marks)

1(c) Both trolleys are now stationery.

Explain which trolley has the most inertia.

(1 mark)

(Total marks 12)

Mark scheme

1 (a) Calculate the momentum of Trolley 1. State the unit.	
Answer	Guidance
Recall: P = m x v or 2.5 x 3.8 9.5; Kg m/s;	
1 (b)(i) Using a set of calculations, show that the teacher is correct.	

Answer	Guidance
1. P of Trolley 2 (-2.4 x 0.8 =) 1.92; 2. Pre-collision Total P (9.5 - 1.92 =) 7.58; 3. Post-collision Total P = 7.58 **and** post-collision Total m = 3.3kg; 4. 7.58/3.3 = 2.3 (m/s)	**ALLOW** max 3 marks if student adds 9.5 and 1.92 but the rest of the calculation is consistent.
1 (b)(ii) Calculate the average force acting on Trolley 2 during the impact.	
Answer	Guidance
If final answer with unit = 25 N award 4 marks (P of Trolley 2 post-collision = 2.3 x 0.8) 1.84; ΔP of Trolley 2 = -1.92 - 1.84 = -3.76; F = ΔP / t or -3.76/0.15; 25;	**ALLOW** max 3 if ΔP = 0.08
1 (c) Explain which trolley has the most inertia.	
Answer	Guidance
Trolley 1 because it has more mass;	

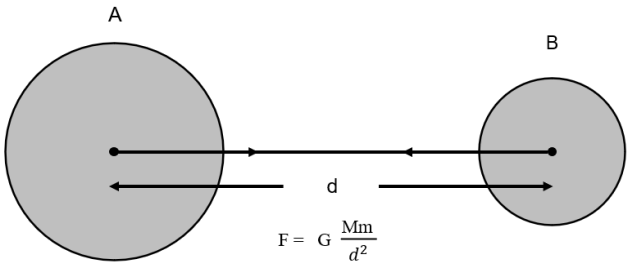
Science9NB3

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9NB3a	4				9.7.13 Explain the force of gravity covering the Universal Law of Gravitation,	4
Science9NB3b	2				9.7.13 force of gravitation of the earth (gravity), acceleration due to gravity;	2
Total marks	6					6

Item purpose

The question assesses … the students' knowledge of universal law of gravitation and its variation by varying the mass and distance between the bodies. Acceleration due to gravity. And how universal law of gravitation is applicable to heavenly bodies.

Source(s)



Question(s)

1 The diagram shows the equation for universal gravitation where:

F is a force,

M is the mass of body A,

m is the mass of body B and

d is the distance between them.

G is the universal gravitational constant.

1 (a) Describe and explain the relationships between *F*, *M*, *m* and *d.*

(4 marks)

1 (b) On Earth *F* is approximately 10 N/kg and is denoted by '*g*'.

Describe **two** differences between g and G.

(2 marks)

(Total marks 6)

Mark scheme

1 (a) Describe and explain the relationships between *F*, *M*, *m* and *d*.	
Answer	Guidance
(*F* is due to) attraction between masses; gravitational attraction; *F* increases with mass; *F* decreases with the square of the distance;	**ALLOW** *F* decreases with distance.
1 (b) Describe **two** differences between g and G.	
Answer	Guidance

Any **two** from: 'g' varies / G is constant; 'g' is a vector / G is a scalar; 'g' and G have different units;	**ALLOW** 2 marks for G = N m^2/kg^2 **and** g = m/s^2

Level of response

Level	Description	Marks
4	Clear well structured explanation linking effects to causes or underpinning theory.	4
3	Clear description of relevant facts with some explanation relating effects to causes or underpinning theory.	3
2	Description of the basic facts but no link of effects to causes or underpinning theory.	2
1	Limited isolated descriptive points relevant to the topic	1
0	Nothing worthy of credit	0

Science9TP1

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9TP1		1			9.7.7, 9.8.4	1

Item purpose

The question assesses the knowledge of the concept of displacement.

Question(s)

1 Asha starts cycling around a circular track of length 100 m.

She completes one revolution every 40 seconds.

Calculate her displacement from her starting position after 4 minutes.

A. 0 m
B. 2.5 m
C. 2400 m
D. 4000 m

(1 mark)

Mark scheme

1 (a) Asha is cycling on a square track of side 100m. She completes one revolution in 40 seconds. Calculate her displacement after 4 minutes?	
Answer	Guidance
A	

Science9TP2

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9TP2	1				9.7.7	1

Item purpose

The question assesses the knowledge of rest and motion.

Question(s)

1 A body, whose position does not change with respect to its surroundings, is said to be in a state of:

A. Acceleration
B. Motion
C. Rest
D. Vibration

(1 mark)

Mark scheme

1 A Body whose position with respect to surroundings does not change is said to be in a state of: A. Acceleration B. Motion C. Rest D. Vibration	
Answer	**Guidance**
C. Rest	

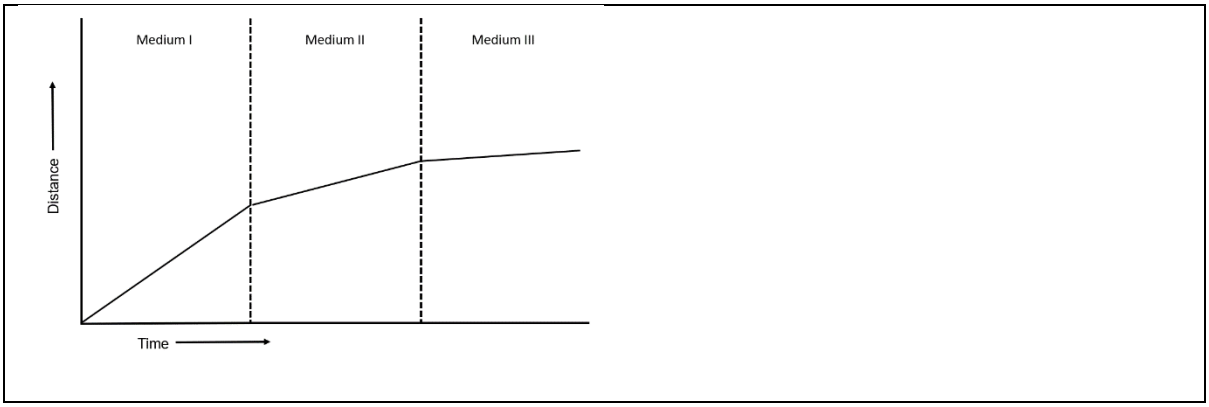
Science9NB2

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9NB2			1		9.7.16 Sound: Explain how the speed of sound varies,	1

Item purpose

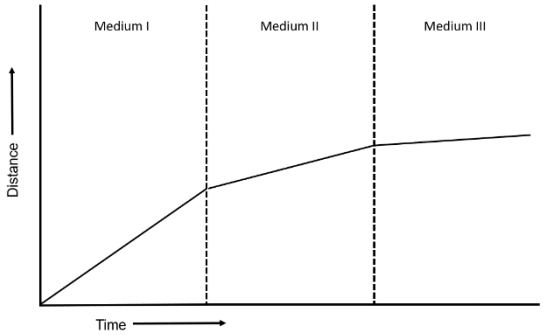
The question assesses the ability of the student to interpret the speed of sound in different media.

Source



Question(s)

1 (a) The graph shows how the speed of a sound changes as it travels through medium I, then medium II and then medium III.



What are the media?

A. Gas, liquid and solid
B. Liquid, gas and solid
C. Solid, gas and liquid
D. Solid, liquid and gas

(1 mark)

Mark scheme

1. The graph shows how the speed of a sound changes as it travels through medium I, then medium II and then medium III.	
Answer	Guidance
D	

Science9PS1

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9PS1	1				9.1.1 Definition of matter as solid, liquid and gas and the characteristics of each: shape, volume density and particle diagrams.	1

Item purpose

The question assesses whether students understand and identify matter on the basis of their characteristics like density.

Source(s)

Question(s)

1 A block of wood has weight W and density ρ. The gravitational field strength is g.

Which expression gives the volume of the block?

A. $W \rho g$

B. $W \rho / g$

C. $W g / \rho$

D. $W / \rho g$

(1 mark)

Mark scheme

1 Which expression gives the volume of the block? A. $W \rho g$ B. $W \rho / g$ C. $W g / \rho$ D. $W / \rho g$	
Answer	Guidance
D	

Science9TS1

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9TS1	1				9.1.1 Definition of matter as solid, liquid and Gas and their characteristics such as shape and volume	1

Item purpose

The question assesses students' understanding of the states of matter on the basis of characteristics such as shape and volume.

Question(s)

1 The state of matter which has no fixed shape and no fixed volume is

A. Gas
B. liquid
C. Solid

(1 mark)

Mark scheme

1 The state of matter which has no fixed shape and no fixed volume is A. Gas B. liquid C. Solid	
Answer	**Guidance**
A	

Science9PS2

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9PS2	1				9.1.2 Define substances as elements, compounds and mixtures.	1

Item purpose

The question assesses the students' understanding of the concept towards the classification of matter on the basis of their composition.

Question(s)

1 Define a compound.

(1 mark)

Mark scheme

1 Define a compound.	
Answer	Guidance
two or more elements, chemically combined /bonded (in a fixed proportion by mass);	

Science9ND1

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9ND1a		2			9.6.1 Draw and label structure of atoms 9.6.2 Draw atomic shell models for different elements up to number 20 in the periodic table	2
Science9ND1b		2				2
Science9ND1c				2	9.10.1 Identify the atomic structure from atomic mass and atomic number (up to number 20 in the periodic table)	2
Total marks		4	2			**6**

Item purpose

The purpose of the item is to assess whether students understand and can interpret an electronic configuration and use one to calculate valence electron and then link it to calculate valency and atomic no.

Question(s)

1 The electronic configuration of element X is 2.

The electronic configuration of element Y is 2,8,2.

1(a) State the valence number of electrons of:

Element X _____

Element Y _____ (2 marks)

1(b) State the valency of:

Element X _____

Element Y _____

(2 marks)

1(c) Identify and describe element X and element Y.

(2 marks)

(Total marks 6)

Mark Scheme

2. 1 (a) State the valence number of electrons of: Element X _____ Element Y _____	
Answer	Guidance
X – 2; Y – 2;	

1 (b) State the valency of: Element X _____ Element Y _____	
Answer	Guidance
X – 0; Y – 2;	
1 (c) Identify and describe element X and element Y.	
Answer	Guidance
Magnesium **and** metal / group 2; Helium **and** non-metal / noble gas / group 8;	

Science9RK6

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9RK6		2			9.10.2 Derive the formula of a compound from given valency data	2
Total marks		2				2

Item purpose

The question assesses the understanding of students to derive the formula from given valency data

Question(s)

1 The ions formed by some metals and non-metal compounds are shown.

K^+ Mg^{2+} Al^{3+} F^- O^- SO_4^{2-}

CO_3^{2-}

Na^+ B^{3+} Cl^- N^- NO^{3-} CO_3^{2-}

NH_4^+

Use this information to derive the chemical formula of:

A. sodium carbonate
B. ammonium sulphate (2 marks)

Mark Scheme

1 Use this information to derive the chemical formula of: A. sodium carbonate B. ammonium sulphate	
Answer	Guidance
(a) Na_2CO_3 (1) (b) $(NH_4)_2SO_4$ (1)	

Science9RK10

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Sience9RK10	3				9.11.1	3
Total marks	3					**3**

Item purpose

The question assesses the student's ability to describe scientific discoveries

Question(s)

1 Describe the features of Rutherford's model of the atom.

(3 marks)

Mark scheme

Point based

1 (a) Describe the features of Rutherford's model of the atom.	
Answer	Guidance
Any **three** from: positively charged central nucleus; almost all the mass of an atom is in the nucleus; nucleus is very small compared to the size of the atom; electrons orbit the nucleus;	Accept only the correct answer

Science9TS2

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9TS2	1				9.2.1 How to prepare true solution of common salt sugar and alum.	1

Item purpose

The question assesses students' understanding of the practical skills to prepare true solutions and observe the outcomes.

Question(s)

1 A student mixes sugar, salt and alum in water.

Which conclusion about the mixture is correct?

A. It can be filtered
B. It is homogenous
C. It shows the Tyndall Effect
D. It is unstable

(1 mark)

Mark scheme

1 A student mixes sugar, salt and alum in water. Which conclusion about the mixture is correct? A. It can be filtered B. It is homogenous C. It shows the Tyndall Effect D. It is unstable	
Answer	Guidance
B	

Science9PS3

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9PS31a	1				9.9.1 Explain **how to separate mixtures** of solids **using differences in solubility**.	1
Science9PS31b		2			9.5 Using data and calculating concentration of the solution by using mass by mass percentage method.	2
Science9PS31c	3				9.2.1 Explain how to distinguish between the salt, sand and Strach solution on the basis of: • transparency • filtration • Stability	3
Science9PS31d		4			9.3.3 Explain how mixtures of liquids can be separated using paper chromatography.	4
Total marks	4	6				**10**

Item purpose

The questions assess the students understanding the concept of different types of solutions, their properties, calculating concentration, distinguishing different types of solutions on the basis of given criteria, practical skills of separation techniques of separating components of mixtures.

Source(s)

Question(s)

1

1 (a) A student accidentally mixed iron filings and sulfur powder in lab.

How should he separate the sulfur from the mixture?

A. Add boiling Water
B. Add carbon disulphide
C. Add cold Water
D. Add warm water

(1 mark)

1 (b) A solution contains 30g of sugar dissolved in 370g of water.

Calculate the concentration of this solution using the mass by mass percentage method.

(2 marks)

1 (c) Solutions of salt, sand and starch solution are given to students in chemistry lab. Explain how the students can tell which solution is which using these criteria:

- Transparency
- Filtration criteria
- Stability

(3 marks)

1 (d) Draw a diagram to show how the dyes in black ink are separated by paper chromatography?

(4 marks)

(Total marks 10)

Mark scheme

1 (a) A student accidentally mixed iron filings and sulphur powder in lab. How should he separate the sulphur from the mixture? A. Add boiling Water B. Add carbon disulphide C. Add cold Water D. Add warm water

Answer	Guidance
Carbon disulphide (1)	

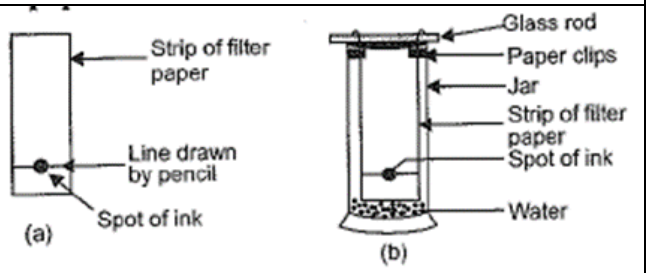
1 (b) A solution contains 30g of sugar dissolved in 370g of water. Calculate the concentration of this solution using the mass-by-mass percentage method.

Answer	Guidance
(Mass of solute ÷ Mass of solution) x 100 or 30 ÷ (370+30) x 100 or 30 ÷ 400 x 100; = 7.5%;	2 marks for correct answer without workings.

1 (c) Solutions of salt, sand and starch solution are given to students in chemistry lab. Explain how the students can tell which solution is which using these criteria: • Transparency • Filtration criteria • Stability

Answer	Guidance
Transparency (1) • Salt solution- Transparent • Sand solution - Opaque • Starch solution - Translucent Filtration criteria (1) • Salt solution- no residue • Sand solution- residue in filter • Starch solution- residue in filter Stability (1) • Salt solution- stable • Sand solution- unstable • Starch solution- stable	Accept in either tabular form or separately. 1 mark for each correct identification.

1 (d) Draw a diagram to show how the dyes in black ink are separated by paper chromatography?

Answer	Guidance
Diagram showing chromatography paper with: • Base line drawn and labelled pencil; • Solvent labelled e.g., water level below pencil line; • Ink spot labelled on base line; • At least 2 spots above base line showing vertical separation of dyes;	

Science9TS3

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 Marks	Content Reference(s)	Marks
Science9TS3 a	2				9.9.1 Explain how to separate mixtures of solids using differences in solubility	2
Science9TS3 b	2				9.9.2 Explain how to separate liquids using distillation and fractional distillation	2
Science9TS3 c		2			9.2.1 colloidal solutions of milk in water and suspension of chalk in water and distinguish between these on the basis of stability	2
Science9TS3 d		2			9.5.1 Calculate RMM from RAM and formulae of a compound	2
Total marks	4	4				8

Item purpose

The question assesses the students understanding of the concept of different types of separation techniques used to separate mixtures, properties of solutions, colloids and suspension, calculating RMM from RAM and formulae of a compound.

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Question(s)

1 (a) *Roohi while working with a project accidently mixed common salt to the bowl with sand. Which processes do you think she will use to separate both sand and salt?*

(2 marks)

1 (b) Explain why we can use Fractional Distillation method to separate Ethanol and water.

(2 marks)

1 (c) Joy took two test tubes A and B with water and added milk and chalk powder to each one separately. After some time he observed that particles of a colloidal solution of Milk did not settle down when left undisturbed, while in the case of a suspension of chalk they do. Give reasons.

(2 marks)

1 (d) The Relative formula mass of a Compound with the formula $M_2 SO_4$ is 152. Calculate the Relative Atomic mass of the element M
(Relative atomic mass of O is 16 and S is 32)

(2 marks)

(Total marks 8)

Mark scheme

Point based

1 (a) Roohi while working with a project accidently mixed common salt to the bowl with sand. Which processes do you think she will use to separate both sand and salt?	
Answer	Guidance

1. Filtration and evaporation (2) or 2. Make aqueous solution of sand and salt mixture and filter the content. Salt dissolved in water gets filtered and sand remains undisturbed (1) Heat the Salty water and using evaporation method water vaporizes leaving the salt behind (1)	2 marks for correct answer-Filtration and evaporation with or without explanation. 1 mark for either of the correct answer/ correct explanation
1 (b) Explain why we can use Fractional Distillation method to separate Ethanol and water.	
Answer	Guidance

We can use Fractional Distillation because the boiling points of Ethanol (78%) and water(100%) are different (1) difference in their boiling points helps Ethanol vaporize earlier than water (1)	2 marks for correct answer with both the points mentioned correctly Temperatures given for the liquids is indicative. There is no need to mention them. 1 mark for either of the correct point
1 (c) Joy took two test tubes A and B with water and added milk and chalk powder to each one separately. After some time he observed that particles of a colloidal solution of Milk did not settle down when left undisturbed, while in the case of a suspension of chalk they do. Give reasons.	
Answer	Guidance

The colloidal particles are smaller and not heavy. ... (1) Whereas particles of suspension are larger, heavy and have less movement, thus settle down due to gravity. (1)	2 marks for correct answer with both the points mentioned correctly 1 mark for either of the correct point
1 (d) The Relative formula mass of a Compound with the formula MSO_4 is 152. Calculate the Relative Atomic mass of the element M (Relative atomic mass of O is 16 and S is 32)	
Answer	Guidance

Let the RAM of Element M be x Given: Relative formula Mass of MSO_4 =152 x + 32 +64 = 152 (1) x + 96 =152 x = 152—96 x = 56 (2)	2 marks for correct answer with no workings 1 mark for correct formulae to calculate RFM either in symbols or in figures even if answer is incorrectly calculated

Science9RK9

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9RK9		3			9.3.3 Explain how mixtures of liquids can be separated using paper chromatography, distillation and fractional distillation	3
Total marks		3				3

Item purpose

The question assesses the of students understanding on chromatography as a separating technique

Question(s)

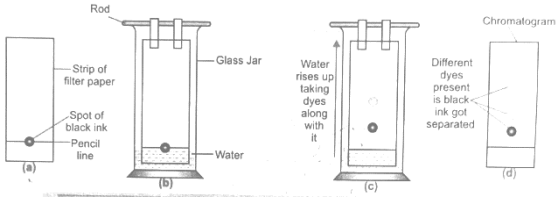
1 You are given a sample of ink made from a mixture of coloured dyes.

Describe the technique used to separate the coloured dyes.

(3 marks)

Mark scheme

Point based

1 (a) You are given a sample of ink made from a mixture of coloured dyes. Describe the technique used to separate the coloured dyes.	
Answer	Guidance
Chromatography; Solvent moves up (chromatography) paper taking dyes with it; Different colours deposit at different heights;	**ALLOW** marks from a labelled diagram 

Science9MB1

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9MB1		1			9.4.2, Use atomic structure and periodic table position to explain valency and reactivity of elements and **construct simple chemical formulae of compounds using valency information.**	1

Item purpose

The question assesses the students' understanding to construct simple chemical formulae of compounds using valency information.

Question(s)

1 Determine the molecular formula of the compound formed by A^{2+} and B^{3-}

(1 mark)

Mark scheme

1 Determine the molecular formula of the compound formed by A^{2+} and B^{3-}	
Answer	**Guidance**
A_3B_2;	

Science9RK8

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9RK8		2			9.5.1 Calculate RMM from RAM and formulae of a compound	2
Total marks		2				**2**

Item purpose

The question assesses the students' understanding of calculations based on molecular formula.

Question(s)

1 Calculate the relative formula mass of magnesium bicarbonate C2H2MgO6
[Ar: Mg, 24; H, 1; C, 12; O, 16;]

(2 marks)

Mark scheme

1 (a) Calculate the relative formula mass of magnesium bicarbonate C2H2MgO6 [Ar: Mg, 24; H, 1; C, 12; O, 16;]	
Answer	Guidance
(C_2 H_2 Mg O_6) 24 + 2 + 24 + 96; 146;	**ALLOW** 1 mark for minor error in calculation

Science9RK7

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9RK7		1			9.6.1	1
Total marks		1				1

Item purpose

The question assesses the students' understanding of distribution of electrons according to Bohr's model of an atom.

Question(s)

1 Draw a diagram of Bohr's model of an atom.

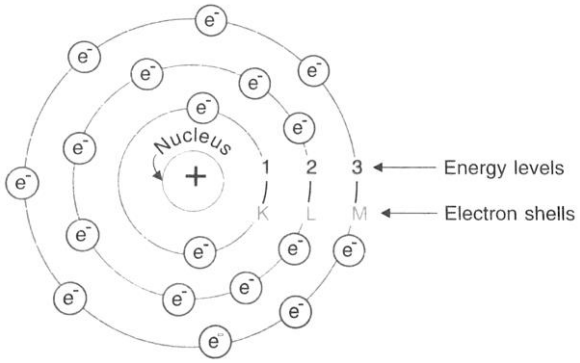
Your diagram must include a nucleus and three electron shells.

Each electron shell must show the maximum number of electrons it can carry.

(1 mark)

Mark scheme

Point based

1 (a) Draw a diagram of Bohr's model of an atom. Your diagram must include a nucleus and three electron shells. Each electron shell must show the maximum number of electrons it can carry.	
Answer	Guidance
	**IGNORE** K L M **ALLOW** x or dots for electrons

Science9MB2

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9MB2	1				9.7.1 Describe the structure of atoms – electrons, protons, neutrons, isotopes and isobars.	1

Item purpose

The question assesses the students understating of basic nature of subatomic particles and their arrangement in an atom.

Question(s)

1 The nucleus of an atom has positive charge because of:

A. Neutrons
B. Protons
C. Both neutrons and protons
D. Both electrons and protons

(1 mark)

Mark scheme

Answer	Guidance
B	

Science9ML4

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
SCIENCE9ML41a	2				9.1.4 **Classification** ... **binomial classification**.	2
SCIENCE9ML41bi	1				9.1.6 Monera, Protista, Fungi and major groups of plants - Thallophyta, Bryophyta, Pteridophyta, Gymnosperms and Angiosperms with salient features.	1
SCIENCE9ML41bii	1					1
SCIENCE9ML41biii	1					1
Total marks	5					5

Item purpose

The question assesses the student's understanding of the concept of binomial nomenclature and also understanding and able to identify the features of different groups of plant kingdom.

Question(s)

1 ***Homo sapiens* is the scientific name of human beings.**

1(a) **In binomial classification, what is the term "homo" and what is the term "sapiens"**

(2 marks)

1(b) ***Chlorophyta ulva* has undifferentiated roots, stems and leaves.**

1(b)(i) **To which major plant group does this plant belong?**

(1 mark)

1(b)(ii) **Name the undifferentiated structure in this plant**

(1 mark)

1(b)(ii) **Give the common name of one of these plants.**

(1 mark)

(Total 5 marks)

Mark scheme

Point based

1 (a) In **binomial classification, what is the term "homo" and what is the term "sapiens"**	
Answer	Guidance
Homo = genus; sapiens = species;	
1 (b)(i) To **which major plant group does this plant belong?**	
Answer	Guidance
Thallophyta / thallophytes;	
1(b)(ii) Name the undifferentiated structure in this plant	
Answer	Guidance
Thallus;	
1(b)(iii) Give the common name of one of these plants.	
Answer	Guidance
algae;	

Science9DT2

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9DT2	1				9.1.6 ...and major groups of plants -... , Bryophyta, ... with salient features.	1

Item purpose

The question assesses the student's knowledge of the salient features of Kingdom Plantae.

Source(s)

Question(s)

1 Which major plant group has only stem and leaf-like structures in their plants?

A. Bryophyta
B. Gymnospermae
C. Pteridophyta
D. Thallophyta

(1 mark)

Mark scheme

1 Which major plant group has only stem and leaf-like structures in their plants? A. Bryophyta B. Gymnospermae C. Pteridophyta D. Thallophyta	
Answer	Guidance
A	

Science9ML1

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
SCIENCE9ML1	1				9.1.6 Monera, Protista, Fungi and major groups of plants - Thallophyta, Bryophyta, Pteridophyta, Gymnosperms and Angiosperms with salient features.	1

Item purpose

The question assesses the student's understanding of salient features of different plant groups.

Question(s)

1 Which of the following produces seeds?

A. Funaria
B. Marsilea
C. Marchantia
D. Pinus

(1 mark)

Mark scheme

1 Which of the following produces seeds? A. Funaria B. Marsilea C. Marchantia D. Pinus	
Answer	Guidance
D	

Science9ML5

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
SCIENCE9ML51a	2				9.4.4 Health and its failure: Describe infectious and non-infectious diseases, their causes and manifestation – **coronary heart disease, asthma, cancer, malaria, polio, measles, Cholera, AIDS, gonorrhoea, the common cold**.	2
SCIENCE9ML51b	1				9.1.8 Classification of diseases as infectious and non-infectious	1
SCIENCE9ML51c	2				9.1.8 Classification of diseases as infectious and non-infectious	2
Total marks	5					5

Item purpose

The question assesses the ability of the students to identify diseases, causes and their treatment. Also, it will be able to differentiate between infectious and non-infectious diseases.

Question(s)

1 Left untreated, cholera can be fatal within hours.

1(a) Describe one cause and one symptom of cholera.

(2 marks)

1(b) Explain why cholera is an infectious disease.

(1 mark)

1(c) Give one example of a non-infectious disease and its cause.

(2 marks)

(Total marks 5)

Mark scheme

1 (a) Describe one cause and one symptom of cholera	
Answer	Guidance
Cause: Idea of contaminated water e.g., water containing untreated sewage; Symptom: diarrhoea / nausea /dehydration;	**ALLOW** drinking untreated/dirty water containing cholera-causing bacteria
1 (b) Explain why cholera is an infectious disease	
Answer	Guidance
Transmission by a pathogen / bacteria	**IGNORE** virus
1 (c) Give one example of a non-infectious disease and its cause.	
Answer	Guidance
Valid example; Valid cause;	e.g. cancer – smoking CHD – obesity Diabetes – diet / genetic (predisposition)

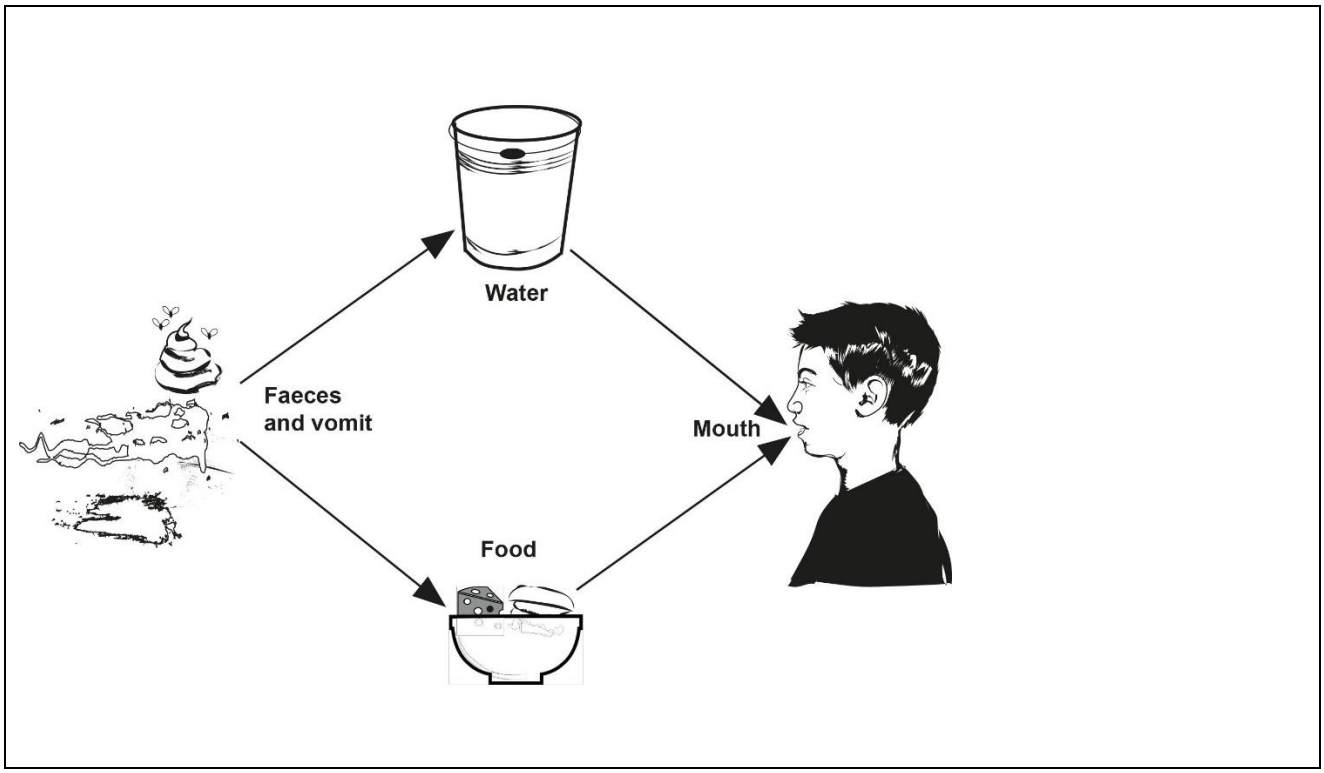
Science9DS4

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9DS41a	1				9.4.5 Describe diseases caused by microbes (Virus, Bacteria and Protozoans) and their prevention.	1
Science9DS41b	2				9.3.5 Explain how infectious diseases can be controlled using basic hygiene measures, antibiotics and vaccinations	2
Science9DS41c		2			9.9.3 Identify actions to prevent spread of disease	2
Science9DS41d	3				9.7.4 Describes the differences between prokaryotic and eukaryotic cells and organisms.	3
Science9DS41e	1	2			9.12.4 Understands how disease is transmitted	3
Total marks	7	4				11

Item purpose

The question assesses the students understanding of the diseases transmitted by faecal oral mode, action of antibiotics and characteristics of prokaryotic and eukaryotic cell.

Source(s)



Question(s)

1 Disease transmission is a process by which a pathogen spreads and causes infection in a person. It can be direct or indirect.

The above figure shows the transmission of a pathogen which causes diarrhoea.

1(a) Give one example of a **viral** disease that is transmitted in the way shown in Fig. 1. (1 mark)

1(b) Describe **two** ways in which the transmission of disease is reduced using basic hygiene. (2 marks)

1(c) Explain why killing houseflies can reduced the transmission of disease in the way shown in Fig. 1.

(2 marks)

1(d) Diarrhoea is caused by both bacteria and protozoa.

Describe three differences between the cells of these organisms.

(3 marks)

1(e) State and explain **one** medical treatment for bacterial infection.

(3 marks)

(Total marks 11)

Mark scheme

1 (a) Give one example of a **viral** disease that is transmitted in the way shown in Fig. 1.	
Answer	Guidance
Hepatitis / Polio;	
1 (b) Describe two ways in which the transmission of disease is reduced using basic hygiene.	
Answer	Guidance
Any **two** from: • Wash hands with soap • disposal of sewage. • Chemical treatment of drinking water • food storage e.g freezing / refrigeration / air-tight containers. • Use of detergents in cleaning • Use of anti-bacterial agents in cleaning	

1 (c) Explain why killing houseflies can reduced the transmission of disease in the way shown in Fig. 1.

Answer	Guidance
Houseflies transfer the pathogen to humans; Less houseflies, less transfer of pathogens;	

1 (d) Diarrhoea is caused by both bacteria and protozoa.

Describe three differences between the cells of these organisms.

Answer	Guidance
Any **three** from: • Bacteria do not have a well-defined nucleus / protozoans have a well-defined nucleus. • Bacteria do not have membrane / protozoans have membrane • Bacteria have one chromosome / protozoans more than one chromosome. • Bacteria have cell walls / protozoans no cell wall.	

1 (e) State and explain **one** medical treatment for bacterial infection.

Answer	Guidance
Antibiotic / name antibiotic; Bacteria have biochemical pathways; Blocked by antibiotic;	

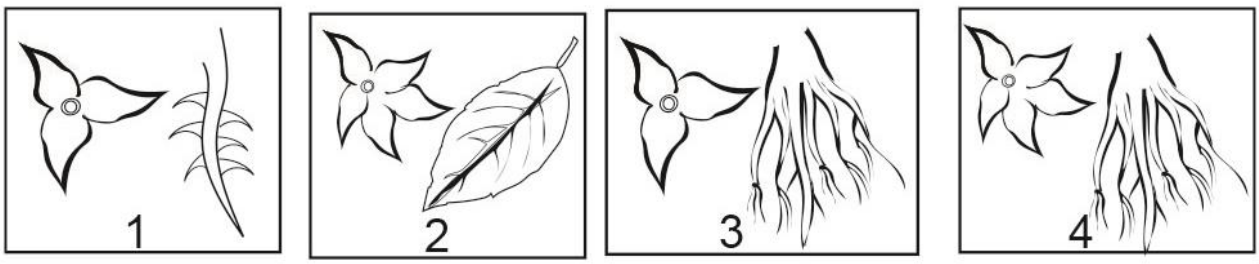
Science9DS1

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9DS1	1				9.2.9 Study the external features of root, stem, leaf and flower of monocot and dicot plants	1

Item purpose

The question assesses the students' understanding of the morphological features of monocot and dicot plants.

Source(s)



Question(s)

1 Four figures showing the external features of monocot and dicot plants are given below.

Observe the figures and answer the following question.

Which diagram shows the features of a dicot plant?

A. Diagram 1
B. Diagram 2
C. Diagram 3
D. Diagram 4

(1 mark)

Mark scheme

1. Observe the figures given above and answer the following question. Which diagram shows the features of a dicot plant? A. Diagram 1 B. Diagram 2 C. Diagram 3 D. Diagram 4	
Answer	Guidance
B	

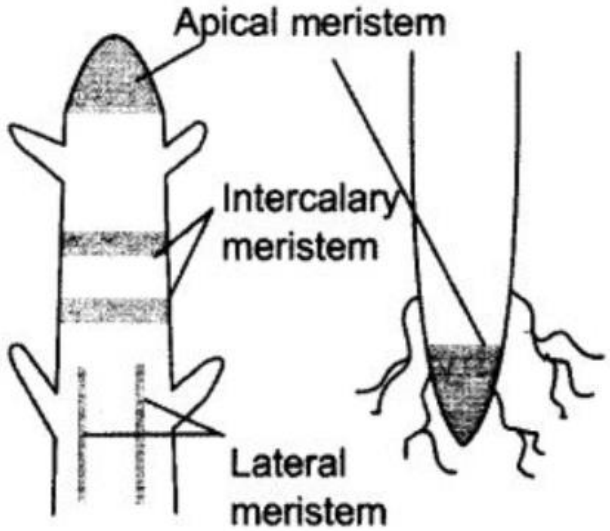
Science9DS2

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9DS2	1				9.4.3 Explain the **structure and functions** of …. plant tissues: meristematic tissues in plants	1

Item purpose

The question assesses the students' understanding of location of meristematic tissue in a plant.

Source(s)



Source information: NCERT Exemplar

Question(s)

1 Observe the figure given above and answer the question that follows.

What is the main function of meristematic tissue?

A. Growth
B. Photosynthesis
C. Respiration
D. Transpiration

(1 mark)

Mark Scheme

1. Observe the figure given above and answer the question that follows. What is the main function of meristematic tissue? A. Growth B. Photosynthesis C. Respiration D. Transpiration	
Answer	Guidance
A. Growth	

Science9DT1

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9DT1	1				9.4.3 **Explain the structure and functions of** ……plant tissues: •……collenchyma tissues in plants	1

Item purpose

The question assesses the student's knowledge of the functions of the different types of simple permanent plant tissues.

Source(s)

Question(s)

1 Which tissue prevents the branches of a tree from breaking during a storm?

E. Aerenchyma
F. Collenchyma
G. Parenchyma
H. Sclerenchyma

(1 mark)

Mark scheme

1 Which tissue prevents the branches of a tree from breaking during a storm? A. Aerenchyma B. Collenchyma C. Parenchyma D. Sclerenchyma	
Answer	Guidance
B.	

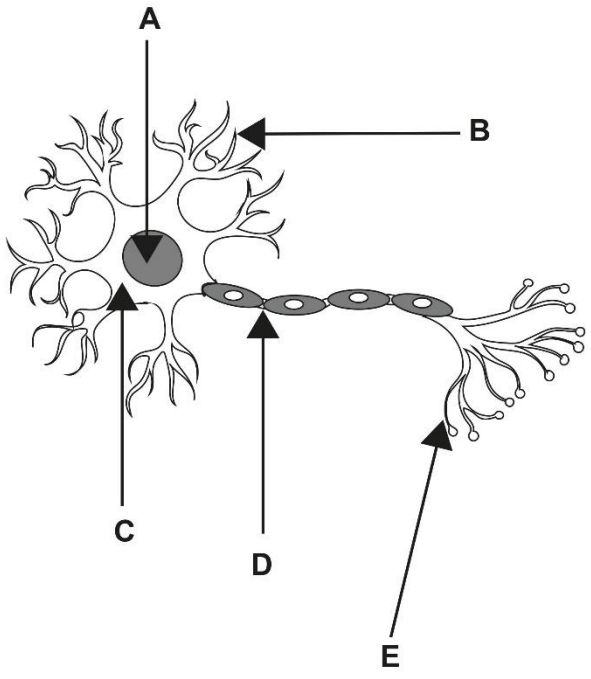
Science9ML2

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9ML2	1				9.6.5 Draw labelled diagrams of: • parenchyma, collenchyma and sclerenchyma tissues in plants • striped, smooth and cardiac muscle fibres and nerve cells in animals	1

Item purpose

The question assesses student's ability to identify the different parts of nerve cells.

Source(s)



Question(s)

1 A diagram of a neuron is shown.

Which row is the correct labeling for the parts B, C, D and E?

A.	B – Nerve ending	C – Cell body	D – Axon	E – Dendrite
B.	B – Dendrite	C – Axon	D – Cell body	E – Nerve ending
C.	B – Nerve ending	C – Cell body	D – Dendrite	E –. Axon
D.	B – Dendrite	C – Cell body	D – Axon	E – Nerve ending.

(1 mark)

Mark scheme

1 Which row is the correct labeling for the parts B, C, D and E?

A.	B – Nerve ending	C – Cell body	D – Axon	E – Dendrite
B.	B – Dendrite	C – Axon	D – Cell body	E – Nerve ending
C.	B – Nerve ending	C – Cell body	D – Dendrite	E –. Axon
D.	B – Dendrite	C – Cell body	D – Axon	E – Nerve ending.

Answer	Guidance
D	

Science9DT3

Item identity	AO1 marks	AO2 marks	AO3 marks	AO4 marks	Content Reference(s)	Marks
Science9DT31a	1				9.7.4 Describes the differences between prokaryotic and eukaryotic cells and organisms	1
Science9DT31b	3				9.6.5 Draw labelled diagrams of nerve cells in animals	3
Science9DT31c		4			9.7.6 Explain cell structures and their functions: cell membrane and cell wall, ... chloroplast, vacuoles, nucleus.	4
Total marks	4	4				8

Item purpose

The question assesses a student's knowledge of the basic structure of a cell and the function of its organelles, and differences between the structure of a eukaryotic and prokaryotic cell. It also assesses the skill of representing the nerve cell through a labelled diagram.

Source(s)

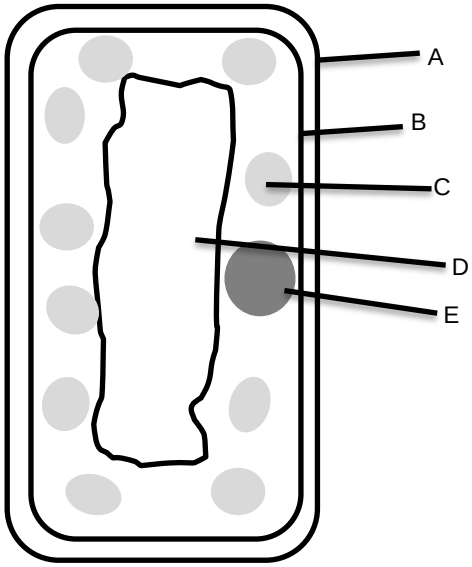


Figure 1

Source information: book/journal, author, publisher, website link etc.

Question(s)

1

1(a) Which structure is **only** present in a eukaryotic cell?

A. Cytoplasm
B. Nucleus
C. Ribosomes
D. Vacuoles

(1 mark)

1(b) Draw and label a diagram of a nerve cell.

(3 marks)

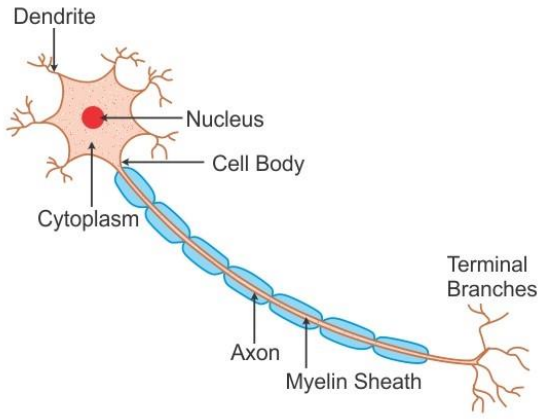
1(c) **Fig. 1** shows a plant cell.

Name the parts of the cell labelled **A** to **E** and describe their functions.

(4 marks)

(Total marks 8)

Mark scheme

1 (a) Which structure is only present in a eukaryotic cell?	
Answer	Guidance
B. Nucleus (1)	Accept only the correct answer.
1 (b) Draw and label a diagram of a nerve cell.	
Structure (as shown in guidance); Labels: Any **three** from: Axon Dendrite Nucleus Cytoplasm Myelin sheath Cell body Terminal branches	

1 (c) Fig. 1 shows a plant cell.	
Name the parts of the cell labelled A to E and describe their functions. Indicative points: • D nucleus • – stores DNA / controls functions E vacuole • – stores sap / food • A cell wall • – rigidity B cell membrane • – diffusion in/out of cell • C chloroplast • – traps light/photosynthesis	Award 2 marks for 3 or more structures identified Award 2 marks for 3 or more functions described