

# **CBSE | DEPARTMENT OF SKILL EDUCATION**

## **CURRICULUM FOR SESSION 2023-2024**

### **Foundation Skills for Sciences (Pharmaceutical & Biotechnology)**

**(Subject Code - 421)**

#### **CLASS – IX & X**

#### **COURSE OVERVIEW:**

Life Sciences Sector is a key futuristic sector globally comprising of Pharmaceutical, Biotechnology and Medical Devices. The Indian life-sciences sector as world 3rd largest global player and with large Indian and MNC companies along with several medium and small companies together comprising of approximately 8000 active companies has seen a growth at 8 percent CAGR over the last 5 years and continue to have double digit growth projections for next five years. Sector is currently employing 10 Lacs workforce and despite of COVID-19 pandemic impact, is expected to create 6.3 Lacs new opportunities till 2026 in an optimal growth scenario.

#### **COURSE OUTCOMES:**

On completion of the course, students should be able to:

1. Apply effective oral and written communication skills to interact with people and customers;
2. Identify the principal components of a computer system;
3. Demonstrate the basic skills of using computer;
4. Demonstrate self-management skills;
5. Demonstrate the ability to provide a self-analysis in context of entrepreneurial skills and abilities;
6. Demonstrate the knowledge of the importance of green skills in meeting the challenges of sustainable development and environment protection;
7. Discuss Life Sciences Industry and Opportunities in Pharmaceutical and Biotechnology
8. Demonstrate different methods of Hygiene, cleaning and sanitization at workplace as well in class & laboratory
9. Adopt different environment sustainable best practices as habits
10. Follow Safety rules in case of any emergency, accident or disaster and best practices

11. Demonstrate Good Documentation Practice (GDP) and Data integrity for all Portfolio, practical file and classwork/homework

12. Demonstrate emotional stability and sensitivity towards genders, cultures and specially-abled persons.

### **COURSE REQUIREMENTS:**

The learner should have the basic knowledge of science.

### **COURSE DURATION:**

<b>Class IX</b>	200 hrs.
<b>Class X</b>	200 hrs.
<b>TOTAL</b>	<b>420 hrs.</b>

### **SCHEME OF UNITS**

<b>CLASS</b>	<b>THEORY</b>	<b>PRACTICAL</b>	<b>TOTAL</b>
<b>Class IX</b>	50 marks	50 marks	<b>100 marks</b>
<b>Class X</b>	50 marks	50 marks	<b>100 marks</b>

This course is a planned sequence of instructions consisting of units meant for developing employability and vocational competencies of students of Class IX & X opting for skill subject along with other education subjects.

The unit-wise distribution of hours and marks for Class IX & X is as follows:

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## Foundation Skills for Sciences (Pharmaceutical & Biotechnology)

(Subject Code - 421)

CLASS – IX (Session 2023-2024)

Total Marks: 100 (Theory-50 + Practical-50)

	UNITS	NO. OF HOURS		MAX. MARKS
<b>Part A</b>	<b>Employability Skills</b>			
	Unit 1: Communication Skills-I	15		2
	Unit 2: Self-management Skills-I	10		2
	Unit 3: Information & Communication Technology Skills-I	15		2
	Unit 4: Entrepreneurial Skills-I	10		2
	Unit 5: Green Skills-I	10		2
	<b>Total</b>		<b>60</b>	
<b>Part B</b>	<b>Subject Specific Skills</b>	<b>Theory</b>	<b>Practical</b>	
	<b>Unit 1:</b> About Life Sciences Industry and Opportunities in Pharmaceutical and Biotechnology	05	10	4
	<b>Unit 2:</b> Hygiene, cleaning and sanitization at workplace as well in class & laboratory	10	20	8
	<b>Unit 3:</b> Environment sustainable best practices	10	20	8
	<b>Unit 4:</b> Fundamentals of Environment, Health and Safety rules and best practices	10	20	8
	<b>Unit 5:</b> Data integrity at workplace and Good Documentation Practices	10	20	8
	<b>Unit 6:</b> Sensitivity with Gender Culture and People with Disability	05	10	4
	<b>Total</b>	<b>50</b>	<b>100</b>	
<b>Part C</b>	<b>Practical Work</b>			
	Practical File/ Student Portfolio			20
	Project Work/ Field Visit			10
	Demonstration of skill competency via Activities			10
	Viva			10
	<b>Total</b>			
	<b>Grand Total</b>		<b>210</b>	<b>100</b>

**NOTE:** Detailed Curriculum/ Topics to be covered under Part A: Employability Skills can be downloaded from CBSE website.

## DETAILS OF THE UNITS OF CLASS IX

Total Marks: 100 (Theory - 50 + Practical - 50)

### PART-A: EMPLOYABILITY SKILLS

S. No.	Units	Duration in Hours
1.	Unit 1: Communication Skills-I	15
2.	Unit 2: Self-management Skills-I	10
3.	Unit 3: Information and Communication Technology Skills-I	15
4.	Unit 4: Entrepreneurial Skills-I	10
5.	Unit 5: Green Skills-I	10
	<b>TOTAL DURATION</b>	<b>60</b>

**NOTE:** Detailed Curriculum/ Topics to be covered under Part A: Employability Skills can be downloaded from CBSE website.

### Part-B – SUBJECT SPECIFIC SKILLS

S. No.	Units	Duration in Hours
1.	Unit 1: About Life Sciences Industry and Opportunities in Pharmaceutical and Biotechnology	15
2.	Unit 2: Hygiene, cleaning and sanitization at workplace as well in class & laboratory	30
3.	Unit 3: Environment sustainable best practices	30
4.	Unit 4: Fundamentals of Environment, Health and Safety rules and best practices	30
5.	Unit 5: Data integrity at workplace and Good Documentation Practices	30
6	Unit 6: Sensitivity with Gender Culture and People with Disability	15
	<b>TOTAL DURATION</b>	<b>150</b>

## UNIT-1: About Life Sciences Industry and Opportunities in Pharmaceutical and Biotechnology

LEARNING OUTCOMES	THEORY	PRACTICAL
<b>1. Understanding the Life Sciences Industry</b>	<ol style="list-style-type: none"> <li>1. Define life sciences and explain its importance in society.</li> <li>2. Explain life sciences industry according to global and Indian context</li> <li>3. Identify the different sectors within the life sciences industry, including pharmaceuticals and biotechnology.</li> <li>4. Identify major components of the pharmaceutical industry</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify diverse career opportunities in the pharmaceutical and biotechnology sectors.</li> <li>2. Understand the required qualifications, skills, and educational pathways for different career options</li> </ol>
<b>2. Progression Opportunities</b>	<ol style="list-style-type: none"> <li>1. Overview of various career paths and higher education paths in the life sciences (pharmaceutical and biotechnology) field.</li> <li>2. Educational requirements and skills needed for different roles.</li> </ol>	<ol style="list-style-type: none"> <li>1. List down various career path that you find interesting in different sectors of Life sciences (pharmaceutical and biotechnology) field.</li> <li>2. List down various higher education path that you can choose for continuing your education in life sciences field.</li> </ol>

## UNIT 2: HYGIENE, CLEANING & SANITIZATION AT WORKPLACE

LEARNING OUTCOMES	THEORY	PRACTICAL
<b>1. Understand hygiene, cleaning, and sanitization in the workplace</b>	<ol style="list-style-type: none"> <li>1. Understanding the impact of cleanliness on health, well-being, and productivity in the workplace.</li> <li>2. Exploring the consequences of poor hygiene and sanitation practices.</li> </ol>	<ol style="list-style-type: none"> <li>1. Prepare a checklist of the hygiene standards required in the school area.</li> <li>2. Demonstrate how cleanliness help in preventing the spread of infections and diseases.</li> </ol>
<b>2. Personal Hygiene in the Workplace</b>	<ol style="list-style-type: none"> <li>1. Establishing habits for maintaining personal cleanliness and preventing the spread of germs.</li> <li>2. Exploring different cleaning methods, tools, and products for specific purposes.</li> </ol>	<ol style="list-style-type: none"> <li>1. Addressing personal hygiene challenges in the workplace, such as shared spaces and facilities</li> <li>2. Techniques for effective cleaning and sanitization, including proper application and contact times</li> </ol>

<b>LEARNING OUTCOMES</b>	<b>THEORY</b>	<b>PRACTICAL</b>
<b>3. Waste Management and Disposal</b>	<ol style="list-style-type: none"> <li>1. Importance of proper waste management in maintaining cleanliness and preventing hazards.</li> </ol>	<ol style="list-style-type: none"> <li>1. Classifying different types of waste and understanding their appropriate disposal methods.</li> <li>2. Implementing waste segregation and recycling practices in the workplace.</li> </ol>
<b>4. Maintaining Cleanliness and Hygiene in the Workplace</b>	<ol style="list-style-type: none"> <li>1. Establishing routine cleaning schedules and responsibilities.</li> <li>2. Promoting cleanliness and hygiene awareness among colleagues.</li> </ol>	<ol style="list-style-type: none"> <li>1. Encouraging collaboration and teamwork in maintaining a clean and safe work environment.</li> <li>2. Monitoring and addressing hygiene and cleanliness issues promptly.</li> </ol>

### **UNIT 3: ENVIRONMENT SUSTAINABLE BEST PRACTICES**

<b>LEARNING OUTCOMES</b>	<b>THEORY</b>	<b>PRACTICAL</b>
<b>1. Introduction to Environmental Sustainability</b>	<ol style="list-style-type: none"> <li>1. Explain the concept and importance of environmental sustainability and its significance.</li> <li>2. Explain the interdependence between human activities and the environment</li> <li>3. Describe the possible actions to optimize energy consumption and minimize the energy wastage.</li> </ol>	<ol style="list-style-type: none"> <li>1. Create a checklist of energy conservation practices during and post-work.</li> </ol>
<b>2. Biodiversity Conservation and waste management</b>	<ol style="list-style-type: none"> <li>1. Understanding the importance of biodiversity in maintaining ecosystem balance.</li> <li>2. Describe the possible actions to minimize environmental pollution at work.</li> <li>3. Importance of proper waste management to minimize environmental pollution.</li> </ol>	<ol style="list-style-type: none"> <li>1. List down the threats to biodiversity, such as habitat loss, pollution, and climate change.</li> <li>2. Practices for waste reduction, segregation, and recycling.</li> <li>3. Demonstrate the environment sustainable waste disposal process</li> </ol>

## UNIT- 4: FUNDAMENTALS OF ENVIRONMENTAL HEALTH AND SAFETY RULES AND BEST PRACTICES

LEARNING OUTCOMES	THEORY	PRACTICAL
<b>1. Introduction to Environmental Health and Safety (EHS)</b>	<ol style="list-style-type: none"> <li>1. Understanding the importance of EHS in protecting human health and the environment.</li> <li>2. Exploring the relationship between human activities and their impact on EHS.</li> </ol>	<ol style="list-style-type: none"> <li>1. Demonstrate how to ascertain the breach of EHS protocols.</li> <li>2. Demonstrate how to communicate hazards, safety instructions and accidents to friends and classmates.</li> </ol>
<b>2. Environmental Hazards and Risks</b>	<ol style="list-style-type: none"> <li>1. Identifying common environmental hazards, such as air pollution, water contamination, and hazardous waste.</li> <li>2. Understanding the health risks associated with exposure to environmental hazards.</li> <li>3. Recognizing the importance of risk assessment and management in EHS.</li> </ol>	<ol style="list-style-type: none"> <li>1. Demonstrate health risks associated with exposure to environmental hazards.</li> <li>2. List down different environmental hazard.</li> </ol>

## Unit 5: DATA INTEGRITY AT WORKPLACE AND GOOD DOCUMENTATION PRACTICES

LEARNING OUTCOMES	THEORY	PRACTICAL
<b>1. Introduction to data integrity</b>	<ol style="list-style-type: none"> <li>1. Elaborate on what is data integrity and its importance in pharma and biotech industry</li> <li>2. Discuss strategies on assessing data integrity at workplace</li> <li>3. Explain metadata and risk management</li> </ol>	<ol style="list-style-type: none"> <li>1. Document all the chemicals used by you in the laboratory in a week</li> </ol>
<b>2. Describe ALCOA principles for maintaining data integrity</b>	<ol style="list-style-type: none"> <li>1. Discuss ALCOA principles of data integrity</li> <li>2. Discuss ALCOA PLUS principles</li> <li>3. Discuss GDP in life sciences sector</li> <li>4. Discuss how to maintain document files and records in line to ALCOA PLUS principles</li> </ol>	<ol style="list-style-type: none"> <li>1. Create a record of a lab experiment as per ALCOA PLUS principles</li> <li>2. Demonstrate GDP in practices for every lab practical and assignment and note down your learnings</li> </ol>

## UNIT 6: SENSITIVITY WITH GENDER, CULTURE and PEOPLE with DISABILITY

<b>LEARNING OUTCOMES</b>	<b>THEORY</b>	<b>PRACTICAL</b>
1. <b>Gender Sensitivity, Cultural Sensitivity and Diversity</b>	<ol style="list-style-type: none"><li>1. Discuss the concept of gender, diversity of cultures and its social construction.</li><li>2. Recognizing gender stereotypes and their impact on individuals.</li></ol>	<ol style="list-style-type: none"><li>1. Demonstrate appropriate verbal and nonverbal communication that is respectful of gender, religion, disability, etc.</li><li>2. Promote intercultural understanding and respect.</li></ol>
2. <b>Explain the importance of sensitivity towards people with disability.</b>	<ol style="list-style-type: none"><li>1. Explain the need for sensitivity towards people with disabilities.</li><li>2. Explain the correct ways of communication and collaboration with people with disabilities in compliance with the legal framework.</li><li>3. Identify stereotypes and prejudices associated with people with disabilities and their negative consequences.</li></ol>	<ol style="list-style-type: none"><li>1. Prepare a list of gender-neutral communication terms.</li></ol>



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## Foundation Skills for Sciences (Pharmaceutical & Biotechnology)

(Subject Code - 421)

CLASS – X (Session 2023-2024)

Total Marks: 100 (Theory-50 + Practical-50)

	UNITS	NO. OF HOURS for Theory and Practical		MAX. MARKS for Theory and Practical	
<b>Part A</b>	<b>Employability Skills</b>				
	Unit 1: Communication Skills-II	15		2	
	Unit 2: Self-management Skills-II	10		2	
	Unit 3: Information and Communication Technology Skills-II	15		2	
	Unit 4: Entrepreneurial Skills-II	10		2	
	Unit 5: Green Skills-II	10		2	
	<b>Total</b>		<b>60</b>		<b>10</b>
<b>Part B</b>	<b>Subject Specific Skills</b>		<b>Theory</b>	<b>Practical</b>	
	Unit 1: Fundamental of Scientific Sales and Marketing	10	20		8
	Unit 2: Standard operating procedures and fundamental elements of quality	10	10		5
	Unit 3: Handling glassware in laboratory	5	15		7
	Unit 4: Chemical storage and handling in laboratory	10	10		5
	Unit 5: Fundamental science for medicine manufacturing	10	20		8
	Unit 6: Fundamental of Innovation and Research to resolve real life problems	15	15		7
	<b>Total</b>		<b>60</b>	<b>90</b>	<b>40</b>
<b>Part C</b>	<b>Practical Work</b>				
	Practical File/ Student Portfolio			20	
	Project work/Field Visit			10	
	Demonstration of skill competency via activities			10	
	Viva			10	
	<b>Total</b>				<b>50</b>
	<b>Grand Total</b>		<b>210</b>	<b>100</b>	

## DETAILED CURRICULUM/TOPICS FOR CLASS X

### Part-A: EMPLOYABILITY SKILLS

S. No.	Units	Duration in Hours
1.	Unit 1: Communication Skills-II	15
2.	Unit 2: Self-management Skills-II	10
3.	Unit 3: Information and Communication Technology Skills-II	15
4.	Unit 4: Entrepreneurial Skills-II	10
5.	Unit 5: Green Skills-II	10
	<b>TOTAL DURATION</b>	<b>60</b>

**NOTE:** For Detailed Curriculum/ Topics to be covered under Part A: Employability Skills can be downloaded from CBSE website.

### Part-B – SUBJECT SPECIFIC SKILLS

S. No.	Units	Duration in Hours
1.	Unit 1: Fundamental of Scientific Sales and Marketing	30
2.	Unit 2: Standard operating procedures and fundamental elements of quality	20
3.	Unit 3: Handling glassware in laboratory	20
4.	Unit 4: Chemical storage and handling in laboratory	20
5.	Unit 5: Fundamental science for medicine manufacturing	30
6.	Unit 6: Fundamental of Innovation and Research to resolve real life problems	30
	<b>TOTAL DURATION</b>	<b>150</b>

## UNIT 1: Fundamental of Scientific Sales and Marketing

LEARNING OUTCOMES	THEORY	PRACTICAL
1. Introduction to Sales and Marketing	<ol style="list-style-type: none"> <li>1. Understanding the concepts of sales and marketing</li> <li>2. Differentiating between sales and marketing</li> <li>3. Exploring the importance of sales and marketing in business</li> <li>4. Overview of the scientific approach in sales and marketing</li> </ol>	<ol style="list-style-type: none"> <li>1. Conducting a market research project</li> </ol>
2. Market Research and consumer Behavior	<ol style="list-style-type: none"> <li>1. Understanding the role of market research in sales and marketing</li> <li>2. Conducting surveys and interviews</li> <li>3. Factors influencing consumer behavior</li> <li>4. Understanding consumer needs and want</li> </ol>	<ol style="list-style-type: none"> <li>1. Collecting and analyzing data</li> <li>2. Analyzing consumer buying decisions based on case studies</li> <li>3. Developing marketing strategies based on consumer behavior analysis</li> </ol>
3. Marketing Mix , Advertising and Promotion	<ol style="list-style-type: none"> <li>1. Introduction to the marketing mix (4Ps: Product, Price, Place, Promotion)</li> <li>2. Introduction to advertising and promotion</li> <li>3. Types of advertising media and Creating effective advertisements</li> </ol>	<ol style="list-style-type: none"> <li>1. List down different Creating effective advertising techniques</li> <li>2. Developing and implementing a digital marketing campaign using social media and other digital platforms</li> </ol>

## UNIT 2: Standard operating procedures and fundamental elements of quality

LEARNING OUTCOMES	THEORY	PRACTICAL
1. Standard Operating Procedures(SOP) and its importance	<ol style="list-style-type: none"> <li>1. Discuss standard operating procedures in life sciences sector</li> <li>2. Discuss SOP development process and framework</li> <li>3. Explain with the help of example how SOPs help finding of what, why, how, when and who of a process</li> <li>4. Discuss the types of SOP and maintenance with time</li> </ol>	<ol style="list-style-type: none"> <li>1. Demonstrate how to prepare SOP</li> </ol>

2. Identify fundamental elements of Quality Assurance	<ol style="list-style-type: none"> <li>1. Discuss the role of Quality assurance in life sciences sector</li> <li>2. Elaborate on QMS (quality management system)</li> <li>3. Explain the use of quality manual in pharmaceutical industry</li> <li>4. Discuss organizational structure and responsibility</li> </ol>	<ol style="list-style-type: none"> <li>1. Make a flowchart of your responsibility as a quality assurance person</li> <li>2. Create a checklist for quality assurance in your lab</li> </ol>
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### UNIT 3: Handling glassware in laboratory

LEARNING OUTCOMES	THEORY	PRACTICAL
1. Glassware in life sciences industry / science labs	<ol style="list-style-type: none"> <li>1. Discuss the types of glassware used in pharma, biotech industry/ science lab</li> <li>2. Discuss class A and class B glassware</li> <li>3. Explain the process of glassware and their advantages in life sciences industry</li> </ol>	<ol style="list-style-type: none"> <li>1. List down different glassware used in pharmaceuticals industry</li> <li>2. List down importance of each glassware in school lab</li> </ol>
2. Handling of glassware	<ol style="list-style-type: none"> <li>1. Explain the need of proper handling of glassware</li> <li>2. Discuss SOP for glassware handling</li> <li>3. Discuss labeling and proper storage of glassware</li> <li>4. Discuss GDP for glassware devices</li> <li>5. Discuss glassware handling while heating and cooling</li> <li>4. Explain the glassware cleaning SOPs</li> </ol>	<ol style="list-style-type: none"> <li>1. Demonstrate how to handle glassware devices as per SOP.</li> <li>2. Demonstrate how to identify class A and class B glassware mix-up</li> </ol>

### Unit 4: Chemical storage and handling in laboratory

LEARNING OUTCOMES	THEORY	PRACTICAL
1. Chemical storage techniques	<ol style="list-style-type: none"> <li>1. Elaborate on different types of chemicals used in pharmaceuticals and biotechnology industry</li> <li>2. Discuss labeling and storage of chemicals</li> <li>3. Elaborate on handling hazardous chemicals with safety and precautions</li> </ol>	<ol style="list-style-type: none"> <li>1. Prepare a list of all the chemicals used in your laboratory</li> <li>2. Check if the labeling is proper or not</li> </ol>

2. Chemical handling	<ol style="list-style-type: none"> <li>1. Discuss chemical handling according to SOP</li> <li>2. Explain documentation practices for reagents and stocks used</li> <li>3. Handling of chemicals with proper safety as per the respective SDS</li> <li>4. Describe destruction procedure of laboratory reagents and acids</li> </ol>	<ol style="list-style-type: none"> <li>1. Prepare two separate list of hazardous and non-hazardous chemicals</li> <li>2. Check the status label on the containers for the correct product name, batch number, container number etc.</li> </ol>
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### Unit 5: Fundamental science for medicine manufacturing

LEARNING OUTCOMES	THEORY	PRACTICAL
1. Introduction to Medicine Manufacturing and Chemistry of Medicines	<ol style="list-style-type: none"> <li>1. Overview of the pharmaceutical industry and medicine manufacturing processes</li> <li>2. Basic principles of organic chemistry related to medicine manufacturing</li> </ol>	1. List down few manufacturing industries.
3. Manufacturing Processes and Regulatory Requirements	<ol style="list-style-type: none"> <li>1. Overview of different manufacturing processes</li> <li>2. Introduction to regulatory authorities and their roles in medicine manufacturing</li> <li>3. Good Manufacturing Practices (GMP) in production</li> </ol>	1. Analyzing real-world case studies related to medicine manufacturing
4. Pharmaceutical Industry Trends and Future Developments	<ol style="list-style-type: none"> <li>1. Current trends and advancements in medicine manufacturing</li> <li>2. Emerging technologies and their impact on the pharmaceutical industry</li> </ol>	<ol style="list-style-type: none"> <li>1. Future prospects and challenges in the field</li> <li>2. Exploring career opportunities in medicine manufacturing</li> </ol>

## UNIT 6: Fundamental of Innovation and Research to resolve real life problems

LEARNING OUTCOMES	THEORY	PRACTICAL
1. Introduction to Innovation and Research	<ol style="list-style-type: none"> <li>1. Understanding the concepts of innovation and research</li> <li>2. Exploring the importance of innovation and research in problem-solving</li> <li>3. Identifying real-life problems and challenges</li> </ol>	<ol style="list-style-type: none"> <li>1. Identifying and analyzing real-life problems in the local community or school</li> <li>2. Conducting surveys, interviews, or observations to gather data</li> </ol>
2. Research Design and Methodology	<ol style="list-style-type: none"> <li>1. Introduction to research design and methodology</li> <li>2. Different types of research (qualitative, quantitative, mixed-methods)</li> </ol>	<ol style="list-style-type: none"> <li>1. Developing research plans and selecting appropriate research methods</li> <li>2. Designing questionnaires or interview guides for data collection</li> </ol>
3. Innovation Process	<ol style="list-style-type: none"> <li>1. Understanding the innovation process and its stages</li> <li>2. Idea generation techniques (brainstorming, mind mapping, etc.)</li> <li>3. Evaluating and selecting ideas for implementation</li> </ol>	<ol style="list-style-type: none"> <li>1. Conduct Brainstorming and generating innovative ideas to address identified problems</li> </ol>
4. Intellectual Property and Patenting	<ol style="list-style-type: none"> <li>1. Introduction to intellectual property rights</li> <li>2. Understanding patents and their significance in innovation</li> </ol>	<ol style="list-style-type: none"> <li>1. Conducting research to identify existing patents related to innovative solutions</li> </ol>

## **CLASSROOM ACTIVITIES**

Classroom activities are an integral part of this course and interactive lecture sessions, followed by discussions should be conducted by trained teachers. Teachers should make effective use of a variety of instructional or teaching aids, such as audio-video materials, colour slides, charts, diagrams, models, exhibits, hand-outs, online teaching materials, etc. to transmit knowledge and impart training to the students.

## **PRACTICAL WORK IN LABORATORY/WORKSHOP**

Practical work may include but not limited to hands-on-training, simulated training, role play, case based studies, exercises, etc. Equipment and supplies should be provided to enhance hands-on learning experience of students. Only trained personnel should teach specialized techniques. A training plan that reflects tools, equipment, materials, skills and activities to be performed by the students should be submitted by the teacher to the Head of the Institution.

## **FIELD VISITS/ EDUCATIONAL TOUR (Virtual/Physical)**

In field visits, children will go outside the classroom to obtain specific information from experts or to make observations of the activities through virtual. A checklist of observations to be made by the students during the field visits should be developed by the teachers for systematic collection of information by the students on the various aspects. Principals and Teachers should identify the different opportunities for field visits within a short distance from the school or through virtual.

## **SKILL ASSESSMENT (PRACTICAL)**

Assessment of skills by the students should be done by the assessors/examiners on the basis of practical demonstration of skills by the candidate, Practical examination allows candidates to demonstrate that they have the knowledge and understanding of performing a task. This will include hands-on practical exam and viva voce. For practical, there should be a team of two evaluators. The same team of examiners will conduct the viva voce.

**Project Work** (individual or group project) is a great way to assess the practical skills on a certain time period or timeline. Project work should be given on the basis of the capability of the individual to perform the tasks or activities involved in the project. Projects should be discussed in the class and the teacher should periodically monitor the progress of the project and provide feedback for improvement and innovation. When the class returns after the field visit (Virtual/Physical), each group might be asked to use the information that they have gathered to prepare presentations or reports of their observations. Project work should be assessed on the basis of practical file or student portfolio.

**Viva voce** allows candidates to demonstrate communication skills and content knowledge. Audio or video recording can be done at the time of viva voce. The number of external examiners would be decided as per the existing norms of the Board and these norms should be suitably adopted/adapted as per the specific requirements of the subject. Viva voce should also be conducted to obtain feedback on the student's experiences and learning during the project work/ (Virtual/Physical) field visits.

Assessment of skills by the students should be done by the assessors/examiners on the basis of practical demonstration of skills by the candidate. Practical examination allows candidates to demonstrate that they have the knowledge and understanding of performing a task. This will include hands-on practical exam and viva voce. For practical, there should be a team of two evaluators. The same team of examiners will conduct the viva voce.

**Student Portfolio** is a compilation of documents that supports the candidate's claim of competence. Documents may include reports, articles, photos of products prepared by students in relation to the unit of competency.

#### **LIST OF EQUIPMENT AND SUPPORT MATERIAL:**

The tools, equipment and materials required for training are quite expensive, therefore; only basic tools, equipment and accessories should be procured by the Institution so that the routine tasks can be performed by the students regularly for practice and acquiring adequate practical experience.

1. Color-coded waste bin bag
2. Color-coded waste container
3. CO2 Type Fire Extinguisher,
4. ABC Type Fire Extinguisher
5. Personal Protective Equipment
6. Gowning material
7. Cleaning agents (soap/alconox etc.)
8. Glassware for cleaning
9. Half Face Mask
10. Gloves (Nitrile, {Heat, acid, chemical} resistant, washing etc.)



## TEACHER'S/ TRAINER'S QUALIFICATION AND GUIDELINES:

Qualification and other requirements for appointment of vocational teachers/trainers on contractual basis should be decided by the State/UT. The suggestive qualifications and minimum competencies for the vocational teacher should be as follows:

QUALIFICATION	MINIMUM COMPETENCIES	AGE LIMIT
Graduation in Sciences (as per CBSE guidelines for 9 <sup>th</sup> Class teacher with relevant Subjects) related from a recognized Institute /University, with at least 1 year work/ teaching experience	Effective communication skills (oral and written) Basic computing skills.	18-above years (as on Jan. 01(year). Age relaxation to be provided as per Govt. rules.
Post-graduation in Sciences (as per CBSE guidelines for 9 <sup>th</sup> Class teacher with relevant Subjects) related from a recognized Institute /University, with at least 1 year work/ teaching experience	Effective communication skills (oral and written) Basic computing skills.	18-above years (as on Jan. 01(year). Age relaxation to be provided as per Govt. rules.

Vocational Teachers/Trainers form the backbone of Vocational Education being imparted as an integral part of *Samagra Shiksha*. They are directly involved in teaching of vocational subjects and also serve as a link between the industry and the schools for arranging industry visits (Virtual or Physical), On-the- Job Training (OJT) and placement. These guidelines have been prepared with an aim to help and guide the States in engaging quality Vocational Teachers/Trainers in the schools. Various parameters that need to be looked into while engaging the Vocational Teachers/Trainers are mode and procedure of selection of Vocational Teachers/Trainers, Educational Qualifications, Industry Experience, and Certification/Accreditation. The State may engage Vocational Teachers/Trainers in schools approved under the component of Vocationalisation of Secondary and Higher Secondary Education under RMSA in the following ways:

- (i) directly as per the prescribed qualifications and industry experience suggested by the PSS Central Institute of Vocational Education (PSSCIVE), NCERT or the respective Sector Skill Council (SSC) OR (ii) through accredited Vocational Training Providers accredited under the National Quality Assurance Framework (NQAF\*) approved by the National Skill Qualification Committee on 21.07.2016. If the State is engaging Vocational Teachers/Trainers through the Vocational Training Provider (VTP), it should ensure that VTP should have been accredited at NQAF Level 2 or higher.

*\* The National Quality Assurance Framework (NQAF) provides the benchmarks or quality criteria which the different organizations involved in education and training must meet in order to be accredited by competent bodies to provide government-funded education and training/skills activities. This is applicable to all organizations offering NSQF-compliant qualifications*

The educational qualifications required for being a Vocational Teacher/Trainer for a particular job role are clearly mentioned in the curriculum for the particular NSQF compliant job role. The State should ensure that teachers / trainers deployed in the schools have relevant technical competencies for the NSQF qualification being delivered. The Vocational Teachers/Trainers

preferably should be certified by the concerned Sector Skill Council for the particular Qualification Pack/Job role which he will be teaching. Copies of relevant certificates and/or record of experience of the teacher/trainer in the industry should be kept as record.

To ensure the quality of the Vocational Teachers/Trainers, the State should ensure that a standardized procedure for selection of Vocational Teachers/Trainers is followed. The selection procedure should consist of the following:

- i. Written test for the technical/domain specific knowledge related to the sector;
- ii. Interview for assessing the knowledge, interests and aptitude of trainer through a panel of experts from the field and state representatives; and
- iii. Practical test/mock test in classroom/workshop/laboratory. In case of appointment through VTPs, the selection may be done based on the above procedure by a committee having representatives of both the State Government and the VTP. The State should ensure that the Vocational Teachers/Trainers who are recruited should undergo induction training of 20 days for understanding the scheme, NSQF framework and Vocational Pedagogy before being deployed in the schools. The State should ensure that the existing trainers undergo in-service training of 5 days every year to make them aware of the relevant and new techniques/approaches in their sector and understand the latest trends and policy reforms in vocational education. The Head Master/Principal of the school where the scheme is being implemented should facilitate and ensure that the Vocational Teachers/Trainers:
  - a. Prepare session plans and deliver sessions which have a clear and relevant purpose and which engage the students;
  - b. Deliver education and training activities to students, based on the curriculum to achieve the learning outcomes;
  - c. Make effective use of learning aids and ICT tools during the classroom sessions;
  - d. Engage students in learning activities, which include a mix of different methodologies, such as project-based work, team work, practical and simulation-based learning experiences;
  - e. Work with the institution's management to organize skill demonstrations, site visits, on job trainings, and presentations for students in cooperation with industry, enterprises and other workplaces;
  - f. Identify the weaknesses of students and assist them in upgradation of competency;
  - g. Cater to different learning styles and level of ability of students;
  - h. Assess the learning needs and abilities, when working with students with different abilities
  - i. Identify any additional support the student may need and help to make special arrangements for that support;
  - j. Provide placement assistance

Assessment and evaluation of Vocational Teachers/Trainers is very critical for making them aware of their performance and for suggesting corrective actions. The States/UTs should ensure that the performance of the Vocational Teachers/Trainers is appraised annually. Performance based appraisal in relation to certain pre-established criteria and objectives should be done periodically to ensure the quality of the Vocational Teachers/Trainers. Following parameters may be considered during the appraisal process:

1. Participation in guidance and counselling activities conducted at Institutional, District and State level;
2. Adoption of innovative teaching and training methods;
3. Improvement in result of vocational students of Class X;
4. Continuous up gradation of knowledge and skills related to the vocational pedagogy, communication skills and vocational subject;
5. Membership of professional society at District, State, Regional, National and International level;
6. Development of teaching-learning materials in the subject area;
7. Efforts made in developing linkages with the Industry/Establishments;
8. Efforts made towards involving the local community in Vocational Education;
9. Publication of papers in National and International Journals;
10. Organization of activities for promotion of vocational subjects;
11. Involvement in placement of student's /student support services.

## **CAREER OPPORTUNITIES**

Life Sciences is a sector which has huge career opportunities to different age group of people irrespective of gender, race and religion. Following career opportunities are available in this field. Students can make their career in any field based on their interest and suitability.

- Sales & Marketing
- Pharmacovigilance
- Research & Development
- Bioinformatics
- Clinical Trial
- Manufacturing
- Biologist/ Biotechnologist
- Pharmacist
- Regulatory affair
- Clinical researcher
- Quality analyst/ assurance

# CAREER PROGRESSION AND HIGHER EDUCATION VERTICAL INTEGRATION OF THE COURSE

