

Biology

Code No. 314

Introduction

Biology is the science of life and the revised course includes both Classical and Modern Biology. The course content begins from Biodiversity classification; Structure and function of the living; their reproduction and development and also Genetics, Molecular Biology, Biotechnology and Immunology which are the modern fields of Biology. An exhaustive treatment of the environment in all its aspects is also contained in the curriculum and so are topics like some common human diseases and health and nutrition which are closely related to human welfare.

Rationale

Biology arose in a twofold manner - firstly, as a practicing art towards exploring and improving a variety of usable plant and animal products as well as towards maintaining good health; secondly, as an academic pursuit out of curiosity to know about humans and other living beings and to understand their position on the planet Earth. In other words, the storehouse of knowledge about living beings started building up only when humans were curious to know about life. The course in Biology helps us to respect and appreciate the great diversity of life at all its levels of organization and to understand the impact of progress in biology on our life style.

Biology is not merely a correlational science but also an experimental discipline, which deals with different tools and techniques. In most of the activities that we perform, biology has a role to play. Therefore, the present course aims at imparting biological knowledge vis-a-vis the ever growing human needs. Besides integrating the content and adequate depth into the subject recent advancements in concepts as well as emerging areas like Biotechnology and Immunology have also been introduced.

Objectives

After completing this course, the learner will be able to:

- acquire knowledge of biological terms, facts, concepts, principles and processes in order to understand the living world as a whole;
- appreciate diversity in the living world as also the interrelationships of various living organisms, ecological balance in nature, and the role of biology in human welfare;
- visualize the hazards of environmental pollution, and to create awareness for sustainable use of natural resources in the service of humankind;
- develop insight into the role and impact of Biology in various allied areas such as medicine, agriculture, forestry, biotechnology, veterinary sciences and pharmacology etc.; and
- develop interest in the living world with an aim to respect life.

Scope and job opportunity

This field has a large number of opportunities for employment, some of these are:

Indian Biologists have been pursuing research in the multifarious branches of Biology and we are proud of them. We hope that one day some of you learners will be well known biologists. Knowledge of Biology opens many avenues which you may select as a career. Once you are initiated into Biology and wish to pursue a course related to biology you have the following options:

- Teacher, Environmentalist, Research Scientist, Marine Scientist,
- Medicine, Paramedical Sciences such as Physiotherapy, Forensic Scientist
- Pharmacy, Food Technology, Nursing, Biotechnology,
- Microbiology, Bio-Chemistry and Bio-physics,
- Professionals in the field of Intellectual Property Rights for biologists looking after sanctuaries, zoos and Botanical gardens.

Eligibility conditions

Age: 15 years

Qualification: 10th pass

Medium of instruction: Hindi, English, Urdu, Bengali, Gujarati and Odia

Duration of the course: 1 Year

Weightage

Theory: 80 Marks

Practical: 20 Marks

Tutor Marked Assignments (TMA): 20% of the theory marks

Scheme of studies: Theory (240 hours), practical (30 hours), TMA (self paced)

Scheme of evaluation:

Mode of evaluation	Syllabus/Contents	Duration	Weightage
Tutor Marked Assignment (TMA)	All contents marked as TMA	Self paced	20%
Public/Final Examination	All contents marked as PE Practical	3 Hours(Theory) 3 Hours (Practical)	80%

Pass criteria: 33% in each component

Course content

S. No.	Module/Topics	Duration (in hours)	Module Approach/ Description	Description of practicals	Weightage (marks)
1.	<p>Module-I</p> <p>Diversity and Evolution of Life</p> <ol style="list-style-type: none"> 1. Origin and Evolution of Life and Introduction to Classification 2. The Kingdoms Monera, Protocista and Fungi 3. Kingdoms Plantae and Animalia 4. Cell - Structure and Function 5. Tissues and other Levels of Organization 	50	<p>This module would enable the learner to visualize the origin of life on earth and the vast diversity in the living world, and also to group them together at various classification levels. It also intends to stimulate our learner to understand the concepts and theories of evolution. The module also highlights the cell as the basic unit of life and its organization into various forms of tissues.</p>	<p>There are 15 exercises in the Biology Practical Manual. These 15 activities are distributed under three sections as:</p> <p>Exercise 1 Some common instruments</p> <p>Exercise2 (Slide mounting)</p> <ol style="list-style-type: none"> 2.1 Preparation of temporary mount of onion peel to observe and study epidermal cells 2.2 Preparation of temporary stained mount of human cheek cells. 2.3 Temporary stained preparation and study of striated muscle fibres in cockroach. <p>Exercise 3 Study of the microscopic anatomy (histology) of mammalian tissues and organs</p> <p>Exercise 4 Study of animal specimens and their classification to identify the characteristic features of sponge, earthworm, butterfly,</p>	12

				<p>apple snail, starfish, dogfish (<i>Scoliodon</i>) bonyfish (Rohu), toad, house lizard, pigeon and bat.</p> <p>Exercise 5</p> <p>Preparation of a slide of onion root tip for observation of stages of mitosis.</p>	
2.	<p>Module-II</p> <p>Forms and Functions of Plants and Animals</p> <p>6. Root System</p> <p>7. Shoot system</p> <p>8. Absorption, Transport and water Loss in Plants</p> <p>9. Nutrition in plants- Mineral Nutrition</p> <p>10. Nitrogen Metabolism</p> <p>11. Photosynthesis</p> <p>12. Respiration in Plants</p> <p>13. Nutrition and Digestion</p> <p>14. Respiration and Elimination of Nitrogenous Waste</p> <p>15. Circulation of Body Fluids</p> <p>16. Locomotion and movement</p>	70	<p>This module highlights the complex nature of the structure and function of the different organ systems in plants and animals with special emphasis on the life processes.</p>	<p>Exercise 2 (Slide mounting)</p> <p>2.4 Preparation of temporary mount of leaf epidermis to study the structure of stomata.</p> <p>2.5 Preparation and study of xylem and phloem from <i>cucurbita</i> stem</p> <p>Exercise 6</p> <p>Study of morphological modifications of plant parts like root, stem and leaf.</p> <p>Exercise 7</p> <p>To study the T.S. of dicot and monocot stems and roots from permanent slide.</p> <p>Exercise 8</p> <p>To study the structure and function of different parts of flowers (<i>China rose and Petunia</i>)</p> <p>Exercise 9</p> <p>(a) To study the physical</p>	26

	<p>17. Coordination and Control</p> <p>18. Homeostasis</p>			<p>properties of different soil samples</p> <p>(b) To study the water holding capacity of different soil samples</p> <p>Exercise 10</p> <p>Demonstration of osmosis by potato osmometer</p> <p>Exercise 11</p> <p>Determine the rate of photosynthesis in an aquatic plant (<i>Hydrilla</i> or <i>Elodea</i>)</p> <p>Exercise 12</p> <p>To demonstrate the release of CO₂ during germination of seeds.</p> <p>Exercise 13</p> <p>To study about the action of salivary amylase on starch</p>	
3.	<p>Module-III</p> <p>Reproduction and Heredity</p> <p>19. Reproduction in Plants</p> <p>20. Growth and Development in Plants</p> <p>21. Reproduction and Population Control</p> <p>22. Principles of Genetics</p> <p>23. Molecular Inheritance and Gene</p>	60	<p>This module is designed to highlight the diverse methods of reproduction in living beings from unicellular organisms to complex forms including humans. This module highlights the increase in human population all over the world</p>	<p>Exercise 14</p> <p>Study the structure and germination in gram and bean.</p>	22

	<p>Expression</p> <p>24. Genetics and Society</p>		<p>and also provides adequate information about the methods of family planning and birth control. The principles and mechanisms of heredity in determining the characteristics of organism have also been discussed in this module.</p>		
4.	<p>Module- IV</p> <p>Environment and Health</p> <p>25. Principles of Ecology</p> <p>26. Conservation and Use of Natural Resources</p> <p>27. Pollution</p> <p>28. Nutrition and Health</p> <p>29. Some Common Human Diseases</p>	50	<p>This module emphasizes the basic understanding of rules governing the interrelationships in a biotic community. It brings out the basic principle of conservation by pointing out that conservation of natural resources would brighten the prospect of future of humankind. This module aims to create an idea about healthy living. It also</p>	<p>Exercise 15</p> <p>To study the special adapting features in some plants and animals</p>	13

			<p>imparts knowledge regarding role of proper and balanced diet to prevent nutritional deficiency diseases. The types, causes and modes of transmission of human diseases are discussed</p>		
5.	<p>Module- V Emerging Areas in Biology 30. Biotechnology 31. Immuno biology: An Introduction</p>	10	<p>This module has been included in the Biology course to familiarize the learners with the importance of the new emerging areas of biology like Biotechnology and Immunology which have an impact on human lifestyles.</p>		07