

MP BOARD CLASS 12 BIOLOGY SYLLABUS

VI. *Sexual Reproduction*

Pollination and fertilisation in flowering plants.

Development of seeds and fruits.

Human reproduction: Reproductive system in male and female, menstrual cycle.

Production of gametes, fertilisation, implantation, embryo development, pregnancy and parturition.

Reproductive health – birth control, contraception and sexually transmitted diseases.

(Periods 35)

Key points for developing subject matter

- Plants show vegetative, asexual and sexual reproduction.
- In Angiosperms, the flowers contain the reproductive organs. They may be unisexual or bisexual.
- There are multitudes of ways of bringing together pollen and the carpel (pollination).
- In nature, pollination is subject to many uncertainties; often barriers to pollination and incompatibility have to be overcome for successful pollination and fertilisation.
- The male gametes are produced in the pollen tube, while the female gamete is produced in the embryo sac.
- Double fertilisation leads to the formation of embryo and the endosperm.
- The ovules in the ovary turn into seed after fertilisation. The ovary turns into a fruit.
- In animals, testes produce sperms and ovaries produce ova.
- Both male and female gametes production is under hormonal regulation; production of ova is a cyclic process.
- During fertilization, sperms migrate through the genital tract to fuse with the ova.
- The genetic makeup of the sperm determines the sex of the unborn child.
- The fertilised egg implants in the uterine wall where it remains connected with the mother till birth.
- The zygote undergoes cleavage, and then passes through different stages of development leading to the formation of three germinal layers.
- After completion of the gestation period, a fully developed baby is delivered.
- Contraceptive methods interfere with one or more of the following: gamete production, ovulation, sperm delivery, fusion of gametes and implantation. These methods of birth control thus help in family planning.
- In IVF the ova is fertilised using a donor sperm outside the body and the fertilised ova is implanted in the female body for further development.
- Abortion is legal, but not recommended for birth control; prenatal sex determination (usually associated with selective female foeticide) is illegal.
- Safe sex can help to prevent sexually transmitted diseases and AIDS.

Practicals

Study of flowers adapted to pollination by different agencies (wind, insects). Study of the reproductive parts of unisexual and bisexual flowers. Study of pollen germination on a slide and pollen tube growth on the stigma. Study of tissue sections of mammalian testis and ovary to identify stages of gamete development. Study fruits and seeds of any common fruit (e.g. legume) at different stages of development.

VII. Genetics and Evolution

Mendelian inheritance.

Chromosome theory of inheritance, deviations from Mendelian ratio (gene interaction- Incomplete dominance, co-dominance, complementary genes, multiple alleles).

Sex determination in human beings: XX, XY.

Linkage and crossing over.

Inheritance pattern of haemophilia and blood groups in human beings.

DNA: replication, transcription, translation.

Gene expression and regulation.

Genome and Human Genome Project.

DNA fingerprinting.

Evolution: Theories and evidences.

(Periods 45)

Key points for developing subject matter

- Plants and animals show Mendelian inheritance.
- Organisms may also show cytoplasmic inheritance.
- DNA carries information from one generation to the next.
- Human inheritance pattern can be exemplified by pattern of inheritance of blood groups and haemophilia.
- Genes on the same chromosomes show linkage and are inherited together unless crossing over occurs.
- The *Lac* operon exemplifies a typical model of gene regulation.
- Sequencing of Human DNA under the Human Genome Project aims at finding solutions for genetic disorders and several health problems.
- DNA fingerprinting is also used for identification and crime detection.
- Diversity in animals and plants arises out of variations in the genetic material.
- Mutation is an important source of variation.
- Further, variations in genetic material would affect the entire population over generations to give rise to new species and, therefore, lead to evolution.
- The process of evolution is explained by various theories (Lamarckism, Darwinism and Neo-Darwinism). Different types of evidences support the theories.

Practicals

Study mitosis in onion root tips and animal cells (grasshopper) and meiosis in onion buds and grasshopper testis (permanent slides). Stain tissue section for nucleic acids (aceto carmine stain). Study Mendelian inheritance using seeds of different colours/sizes of any plant. Prepare pedigree charts for genetic traits such as rolling of tongue, blood groups, widow's peak, colour blindness. Study analogous and homologous organs in various plants and animals.

VIII. *Biology and Human Welfare*

Animal husbandry.

Basic concepts of immunology, vaccines.

Pathogens, Parasites.

Plant breeding, tissue culture, food production.

Microbes in household food processing, industrial production, sewage treatment and energy generation.

Cancer and AIDS.

Adolescence and drug/alcohol abuse.

(Periods 35)

Key points for developing subject matter

- Traditionally farm animals have been bred for increased productivity, disease and pest resistance.
- The human body has its own defence mechanism.
- The defence system is constantly under attack from diverse sources – pollutants, chemicals and infectious organisms.
- Our body is capable of producing millions of types of antibodies to trap/remove and overcome the adverse effects of these foreign bodies/chemicals.
- However, against some infectious organisms we need to develop antibodies in advance, i.e. acquired immunity.
- Vaccination can help in developing immunity to specific diseases.
- Genetically engineered micro organisms are serving as bioreactors for production of vaccines and drugs.
- Infectious organisms like helminths (*Ascariasis, Filaria*), protozoa (*Amoebiasis, Malaria*), bacteria (*Typhoid, Pneumonia*), viruses (common cold, AIDS) and fungi (*Ring worm*) attacks specific systems of our body and produce characteristic symptoms.
- Each infectious organism, therefore, requires individual preventive measures.
- Some of these preventive measures demand improved personal hygiene and living conditions.
- Traditional plant breeding has been the method of creating varieties that are high on yield, resistance to pests and diseases and adapted to a given climatic condition. This has been the source of green revolution in India.
- New methods of propagation using tissue culture and genetic alteration using rDNA technology provide novel methods of crop improvement, horticulture, pest resistance.
- Microbes thrive by degradation/conversion of organic and inorganic compounds.

- These characteristics of microbes can be exploited to produce household products (yoghurt/vinegar), for industrial production, treatment of sewage and energy generation.
- Diseases like cancer and AIDS – the major cause of death in the modern world – need adequate preventive/control measures.
- Some people who are unable to handle the emotional stress and strain of growing up find apparent relief in actions like drug and alcohol consumption; in reality a non-solution since it leads to severe repercussions like physiological and emotional disorders.

Practicals

Exercise on controlled pollination – emasculation, tagging and bagging. Identify common disease causing organisms such as *Ascaris*, *Entamoeba*, *Plasmodium*, ring worm. Comment on the symptoms of the diseases that they cause.

IX. Biotechnology and its Applications

Recombinant DNA technology.

Applications in Health, Agriculture and Industry.

Genetically modified (GM) organisms; biosafety issues.

Insulin and Bt cotton.

(Periods 30)

Key points for developing subject matter

- DNA is a long polymer that can be edited by cutting and joining in any desired way. The edited DNA molecule (recombinant DNA) can be reintroduced into microbes, animals or plants to create genetically modified (GM) organisms or transgenics.
- rDNA technology is the very basis of many applications in biotechnology – for example to produce desired drugs and for gene therapy.
- rDNA technology has also played a major role in production of GM foods which have the advantage of high yields, pest and disease resistance.
- Use of GM food and crops has raised several questions regarding its bio-safety from the point of human consumption, environment and other social issues.
- A combination of classical breeding with rDNA technology and genetic modification has great potential for animal breeding.
- While cloning has been in use for plants since several decades, use of the technique in animals, particularly human cloning, raises several ethical and other issues.
- rDNA technology (gene therapy) can provide effective remedies for several genetic disorders.
- Bioreactors have been developed for production of vaccines and drugs.

Practicals

Stain tissue section for nucleic acids (aceto-carmin staining). Make a model of DNA. Observe the quality and shelf life etc of fruits/seeds available in the market.

X. Ecology and Environment

Ecosystems: Components, types and energy flow.

Species, population and community.

Ecological adaptations.

Centres of diversity and conservation of biodiversity, National parks and sanctuaries.

Environmental issues.

(Periods 35)

Key points for developing subject matter

- The living organisms in their environment form a structural and functional unit in terms of energy flow (ecological pyramids).
- The biotic and abiotic components within an ecosystem interact with each other.
- Several types of ecosystems can be classified and identified in nature depending on the climate, habitat, energy flow pattern and the physiognomy.
- In nature, organisms do not occur singly but exist as populations and communities.
- Plants and animals are adapted to their habitats such as in deserts and in water.
- Several factors affect biodiversity including natural and anthropogenic activities.
- In India, women have played a major role in conservation of plants, animals and natural resources.
- The need of the present day is to conserve biodiversity for a sustainable living; several conservation methods have been adopted.
- Conservation of biodiversity may be *in situ* or *ex situ*.
- The 'Silent Valley' as a case study, to understand the value of environmental impact assessment and the role of peoples' participation.
- Introduction to the idea that new products, processes and ideas related to biodiversity can be patented (Intellectual Property Rights, IPR).
- Pollution, deforestation, global warming, ozone layer depletion, underground water level and threat to biodiversity (with special reference to wild life) are some among many environmental concerns.

Practicals

Collect soils from different sites and study them for texture, moisture content and pH. Correlate with the kinds of plants found in them. Study plants and animals found in dry and aquatic conditions. Collect water from any water bodies around you and study them for pH, clarity, and presence of any living organisms. Study the amount of SPM (suspended particulate matter) in air at two widely separated sites.

LIST OF PRACTICALS CLASS XII

1. Study of the reproductive parts of different flowers.
2. Study of flowers adapted to pollination by different agencies (wind, insect).
3. Study of per cent pollen germination on a slide.

4. Study pollen tube growth on the stigma.
5. Study fruits and seeds of any common fruit (e.g. legume) at different stages of development.
6. Study and identify stages of gamete development in t.s.testis and t.s. ovary.
7. Study mitosis in onion root tips (preparation).
8. Study meiosis in onion bud cells and grasshopper testis (permanent slides).
9. Study of t.s. of blastula through permanent slide.
10. Study Mendelian inheritance using seeds of different colours/size of any plant.
11. Prepare pedigree charts for genetic traits such as rolling of tongue, blood groups, widows's peak, colourblindness.
12. Exercise on controlled pollination – emasculation, tagging and bagging.
13. Stain tissue section for nucleic acids (aceto carmine stain).
14. To identify common disease causing organism like *Ascaris*, *Entamoeba*, *Plasmodium*, ring worm. Comment on the symptoms of the diseases that they cause.
15. Collect and study soil from different sites and study them for texture and moisture content.
16. Study the pH and water holding capacity of soil. Correlate with the kinds of plants found in them.
17. Study plants and animals found in dry conditions. Comment upon on their adaptations/ ecosystems.
18. Study plants and animals of aquatic conditions. Comment upon on their adaptations/ ecosystems.
19. Collect water from different water bodies around you and study them for pH, clarity and presence of any living organisms.
20. Study the amount of suspended particulate matter in air at the two widely different sites.
21. Study of plant population density by quadrat method.
22. Study of plant population frequency by quadrat method.
23. Study analogous and homologous organs in various plants and animals.

PROJECT REPORT

Students are also expected to carry out one investigatory project that would engage them for about a week in actual experimentation. They would be expected to submit a project report of the same that would include a presentation of the results obtained in their investigation.