PAPER II

PRACTICAL WORK – 15 Marks

1) **Taxonomy**: Study floral characteristics through dissection of flowers, drawing floral formula and diagrams of following families:

(i) Malvaceae: type – China rose / Hollyhock.

(ii) Leguminosae: subfamily – Papilionaceae – type – Sweet pea/ Pea/ Bean/ *Sesbania*/ *Clitoria* (single flower).

(iii) Solanaceae: type – *Petunia* / *Datura* / Brinjal Flower / *Solanum nigrum*.

(iv) Liliaceae: type – Onion or Amaryllidaceae – type – Lily/Spider lily/ Tiger lily/ Tube rose/ *Gladiolus*.

Floral characteristics should be explained by dissection of flowers. Students should be taught how to cut vertical section of the flower and draw accurately labelled diagrams. The technique of drawing floral diagrams with the ***mother axis in the right position is necessary.*** *Floral formula should be correctly written. Identification of the correct family giving reasons, technique of cutting T.S. and L.S of ovary should be explained and accordingly correct labelled-diagram should be drawn.*

Students should know the examples of plants (belonging to each family) which are of economic importance. The examples of common names of plants must be supported with correct scientific names as well.

NOTE: In the examination, candidates will be tested on <u>any one</u> of the above families.

2) **Simple biochemical and physiological experiments**

(i) Study of arrangement/distribution of stomata in dicot and monocot leaves.

(ii) Study of soils from ***two different sites***.

Collect soil samples from two different areas and make a comparative study of their texture, moisture content, humus content, water holding capacity and pH.

- ***Guidelines for collection of soil samples:***
- *Texture - loamy, sandy and clayey soil.*
- *Moisture content – Soil samples are to be collected from a dry place and a wet place. Alternatively, samples of soil can be dried to different degrees in oven/by keeping in sun.*
- *Humus Content – Collect one sample from roadside/barren land and one sample from garden/cultivated field.*
- *Water holding capacity – Pour given amount of water in known weight of soil sample and record the volume of water retained by the soil sample.*
- *pH – Add water to the soil sample and test with pH paper.*

Students should be taught to set up and demonstrate the experiments with correct diagram of the setup, record their observations methodically and give conclusions. This will give a clear idea of the physiological processes. Questions can be asked based on the above physiological processes studied.

(iii) To study the effect of enzyme action at three different temperatures and pH on starch solution.

Effect of enzyme (amylase/ diastase) action at three different temperatures (low- below 10°C, optimum - 37°C and high – above 70°C) and pH (acidic, neutral and basic) on starch solution.

(iv) To isolate DNA from available plant material.

Isolation of DNA from spinach leaves, green pea seeds, pulp of banana and papaya.

Take half a ripe and peeled banana into a beaker and add 50 ml of extraction fluid (1.5gm table salt +10 ml liquid detergent +90 ml distilled water). Place the beaker in a water bath set at 60 °C for 15 minutes. Stir gently with a glass rod. Filter 5ml of cooled content into a clean test tube and add 5ml of cold 90% ethanol. DNA molecules separate out and appear as white fibres.

3) Slide preparation

(i) Germination of pollen grain in a nutrient medium.

(ii) T.S. of ovary of any locally available flower, to show marginal / axile placentation.

(iii) T.S. of a hydrophyte stem.

(iv) T.S. of a xerophytic leaf (*Nerium).*

(v) L.S. of monocot and dicot seed (soaked seeds of maize/wheat, pea/ bean.)

The technique of staining and mounting neatly should be explained. Students should also know how to make labelled outline diagrams. They should also be taught to identify the mount under low/ high power of microscope. ***Two*** *identifying features of the above need to be mentioned.*

4) Spotting: (three minutes to be given for each spot which includes identification, drawing a labelled diagram and writing at least two identifying characteristics).

NOTE: <u>Spotting must be done on a separate answer sheet during examination, which should be handed over to the Examiner immediately after spotting</u>.

(i) Identify and comment on the following:

(a) T.S. of ovary of mammal (Permanent slide).

(b) T.S. of testis of mammal (Permanent slide).

(c) Germinating pollen grain (slide/chart).

(d) T.S. of ovary to show the type of placentation (marginal, axile, basal (LS), parietal).

(e) T.S. of blastula / blastocyst of a mammal (chart/ slide).

(f) Whole mount of *Plasmodium* sporozoite (slide /chart).

(g) Whole mount of *Entamoeba histolytica* trophozoite (slide/chart).

(h) Preserved specimen/ chart/ model of *Ascaris.*

(ii) Comment upon ecological adaptations of plants and animals.

Models/ virtual images/ charts of one plant and one animal found in xeric and aquatic habitats. Examples: Hydrilla, cactus, fish and camel.

. (iii) Flowers adapted to pollination by different agencies – insect and wind.

Students should be able to identify the type of pollination of the given flower, draw the diagram of the flower and ***give two reasons*** *for the type of pollination. Example: Hibiscus and grass.*

Students should be taught how to identify, draw, label and give significantly visible characteristics as observed, of each spot, in a given time of three minutes. 'T.S.', 'model', 'whole mount', 'chart', 'image' of the specimen should be mentioned as a part of identification.

PROJECT WORK AND PRACTICAL FILE – 15 Marks

Project Work – 10 Marks

The project work is to be assessed by a Visiting Examiner appointed locally and approved by the Council.

The candidate is to creatively execute **one** project/assignment on an aspect of biology. Preference is to be given to investigatory projects. Teachers may assign or students may choose any **one** project of their choice. Students can choose any other project besides the ones indicated in the list. Following is **only a suggestive** list of topics:

(i) Genetic disorders

(ii) Gene therapy

(iii) Human Genome Project

(iv) DNA fingerprinting

(v) Bio-piracy

(vi) Cancer.

(vii) AIDS/Hepatitis.

(viii) Drug addiction and community.

(ix) Role of micro-organisms in industry.

(x) Human population.

(xi) Mendelian Inheritance

(xii) Environmental resistance.

(xiii) Traditional and modern methods: Study of a few traditional methods of pest deterrence vis-a-vis modern methods of pest control - viability of traditional methods in today's scenario and limitations and dangers of modern methods.

(xiv) Role of agrochemicals in increasing food production.

Suggested Evaluation Criteria for Project Work:

Format of the Project:

– Content
– Introduction
– Presentation (graphs, tables, charts, newspaper cuttings, diagrams, photographs, statistical analysis if relevant)
– Conclusion/ Summary
– Bibliography

Practical File – 5 Marks

The Visiting Examiner is required to assess students on the basis of the Biology Practical file maintained by them during the academic year.

Each practical done during the year, needs to be recorded by the student in the Practical file and the same must be checked, signed and dated by the teacher.

SCIENTISTS AND THEIR CONTRIBUTIONS:

1. Oparin: Coacervates, Conditions on primitive earth were favourable for chemical evolution
2. Stanley Miller & Harold Urey: Recreated probable conditions on primitive earth
3. Ernst Haeckel: Proposed the recapitulation theory
4. Charles Darwin: Natural Selection
5. Lamarck: Inheritance of acquired characters
6. Hugo de Vries: Mutation
7. T. R. Malthus: Theory of Human Population Growth/ Essays on population
8. Alec Jeffrey: DNA finger printing
9. Temin and Baltimore: Reverse transcription.
10. Jacob, Monad and Lwoff: proposed Lac operon.
11. Watson and Crick: Structure of DNA
12. Nirenberg and Khorana: Genetic code
13. Benzer: Cistron, recon, muton
14. Gregor Mendel: Father of genetics
15. Sutton and Boveri: Chromosomal theory of inheritance
16. Hugo de Vries, Correns and Tschermack: Rediscovered Mendelism
17. T H Morgan: Linkage
18. P Maheshwari: Plant tissue culture
19. Henking: Discovered X-chromosome
20. F. Meischer: Isolated nucleic acid from pus cells, called Nuclein
21. Chargaff: Rule of equivalence in DNA structure
22. F. Griffith: Transformation in bacteria
23. Avery, MacLeod and McCarty: DNA is the genetic material
24. Hershey and Chase: DNA is the genetic material
25. Meselson and Stahl: Semi-conservative replication of DNA
26. G. Gamow: Triplet nature of codons
27. S Ochoa: discovered polynucleotide phosphorylase
28. Wallace: divided the Earth into biogeographical regions
29. M S Swaminathan: Green revolution in India
30. H Boyer: discovered Restriction Enzyme
31. S Cohen: method to transfer plasmid DNA in host cells
32. R. Mishra: Father of Indian Ecology
33. E. Wilson: coined the term Biodiversity
34. P Ehrlich: Rivet Popper Hypothesis
35. Sanger: DNA/Protein sequencing

LIST OF ABBREVIATIONS TO BE STUDIED

1. ADA- Adenosine Deaminase
2. CMI- Cell Mediated Immunity
3. CNG- Compressed Natural Gas
4. CPCB- Central Pollution Control Board

5. DDT – Dichloro diphenyl trichloro ethane
6. DFC- Detritus Food Chain
7. EFB- European Federation of Biotechnology
8. EST- Expressed Sequence Tags
9. ET- Embryo Transfer
10. GFC- Grazing Food Chain
11. GMO- Genetically Modified Organism
12. GPP- Gross Primary Productivity
13. hnRNA - Heterogeneous Nuclear Ribo Nucleic Acid
14. IARI- Indian Agricultural Research Institute
15. IMR- Infant Mortality Rate
16. IRRI- International Rice Research Institute
17. ICSI - Intra Cytoplasmic Sperm Injection
18. IUCD/IUD – Intra uterine contraceptive device
19. IUCN- International Union for Conservation of Nature and Natural Resources
20. IUI- Intra Uterine Insemination
21. IUT- Intra Uterine Transfer
22. JFM- Joint Forest Management
23. LAB- Lactic Acid Bacteria
24. MALT- Mucosal Associated Lymphoid Tissue
25. MMR- Maternal Mortality Rate
26. MOET- Multiple Ovulation Embryo Transfer Technology
27. NACO- National AIDS Control Organisation
28. NPP- Net Primary Productivity
29. PID- Pelvic Inflammatory Diseases
30. PKU- Phenyl ketonuria
31. RCH- Reproductive and Child Health Care Programmes
32. SCID – Severe Combined Immuno Deficiency
33. SNPs - Single Nucleotide Polymorphisms
34. snRNA- Small Nuclear Ribo Nucleic Acid
35. sRNA - Soluble Ribo Nucleic Acid
36. SSBP – Single Strand Binding Protein
37. UTR - Untranslated Region
38. VNTRs - Variable Number of Tandem Repeats