CLASS XII

There will be two papers in the subject.

***Paper I:** Theory:*	*3 hours*	*... 70 marks*
***Paper II**: Practical:*	*3 hours*	*... 20 marks*
Project Work		*... 7 marks*
Practical File		*... 3 marks*

PAPER I –THEORY – 70 Marks

There will be one paper of 3 hours duration divided into two parts.

Part I (20 marks) *will consist of compulsory short answer questions, testing knowledge, application and skills relating to elementary/fundamental aspects of the entire syllabus.*

Part II (50 marks) *will be divided into three Sections A, B and C. Candidates will be required to answer* ***two*** *out of* ***three*** *questions from Section A (each carrying 5 marks),* ***two*** *out of* ***three*** *questions from Section B (each carrying 10 marks) and* ***two*** *out of* ***three*** *questions from Section C (each carrying 10 marks). Therefore a* ***total of six*** *questions are to be answered in Part II.*

All structures (internal and external) are required to be taught along with diagrams.

SECTION A

1. Origin and Evolution of Life

(i) Origin of life: living and non-living; chemical evolution; organic evolution - Oparin ideas, Miller-Urey experiments; interrelationship among organisms and evidences of evolution: morphological evidences - homology and analogy, vestigial organs, atavism; embryological, palaeontological (fossils) and biogeographical evidences, molecular (genetic) evidences.

Origin of life - Characteristics of living organisms, differences between living organisms and non-living objects in levels of organisation. Abiogenesis and Biogenesis, Effect of oxygen on evolution to show that reducing atmosphere is essential for a biotic synthesis. Important views on the origin of life – chemogeny, biogeny, cognogeny, modern concept of origin of life, Oparin Haldane theory, Definition of Protobionts (Liposomes, microspheres coacervates), vestigial organs, atavism, Miller and Urey experiment. ***Evidences of evolution:*** *Morphological evidences, definition and differences between homologous and analogous organs (two examples each from plants and animals).* ***Embryological evidences*** *– similarity in early development of vertebrate embryos, temporary embryonic structures, Theory of recapitulation – ontogeny recapitulates phylogeny, definition and differences between ontogeny and phylogeny.* ***Palaeontological evidence*** *– definition of fossils, difference between missing link and connecting link example of Archaeopteryx lithographica.* ***Biogeographical evidence*** *– Definition of biogeography, difference between continuous and discontinuous distribution.* ***Molecular (genetic) evidences*** *-for example genome similarity, universal genetic code, molecular homology, metabolic processes, ATP, nitrogenous wastes, blood groups; Darwin's finches (adaptive radiation).*

(ii) Theories of evolution: Lamarckism: evidences in favour of Lamarckism (giraffe's neck), criticism of Lamarckism; Darwinism: basic postulates of Darwinism, giraffe's neck, drawbacks of Darwinism, Neo-Darwinism (Modern Synthetic Theory); Hardy Weinberg's principle; variations: causes of variation, mutation, selected examples and types of natural selection (DDT resistance in mosquito, sickle-cell anaemia); artificial selection; adaptations. Human evolution: Dryopithecus, Australopithecus, *Homo erectus, Homo neanderthalensis, Cromagnon man* and *Homo sapiens*; differences between apes and man.

Lamarkism*: Brief idea of Lamarck's theory to be given for better understanding of evolution – evidences in favour of Lamarkism such as evolution of long neck giraffe to be discussed. Three examples favouring criticism of Lamarkism.* ***Darwinism****: salient features of Darwinism – example of giraffe's*

neck according to Darwinism, criticism of Darwinism. Examples of natural selection - resistance of mosquitoes to DDT, sickle cell anaemia, Lederberg's replica plating experiment. Types of natural selection (directional, disruptive and stabilising), differences between natural and artificial selection. ***Neo Darwinism*** *(Modern Synthetic Theory); Variation - causes of variation, De Vries theory of mutation – Definition of mutation, types of mutation – spontaneous and induced, Gene mutations (Frame-shift and substitution); role of mutation in evolution. Definition of gene pool, gene flow, genetic drift - Founder's effect, Bottle-neck effect and Hardy Weinberg's principle. Adaptation (mimicry).* ***Evolution of man*** *- three features of each of the ancestors Dryopithecus, Australopithecus, Homo erectus, Homo neanderthalensis, Cro-magnon man and Homo sapiens leading to man of today; Differences between apes and man, comparison and homology in chromosomes of apes and man, characters that have developed during human evolution.*

SECTION B

2. Multicellularity

A. Plants

(i) T. S of young dicot and monocot stem, T. S of young dicot and monocot root and V. S. of dicot and monocot leaf. Secondary growth in stem: brief idea of formation of secondary xylem and secondary phloem by cambium ring formation, annual rings.

Anatomical differences between dicot and monocot root, stem and leaf must be taught for better understanding. Students should be able to draw the T.S. of roots and stem and V.S. of monocot and dicot leaves showing cellular details. Difference between exarch and endarch xylem.

Basic idea of how secondary growth takes place in dicot stems (with the help of outline diagrams) and formation of annual rings. Activity of the cambium, formation of secondary tissues, differences between Heart wood and Sap wood. Definition of dendrochronology.

(ii) Absorption and movement of water in plants: diffusion, imbibition, osmosis, osmotic pressure, turgor pressure, wall pressure, water potential, diffusion pressure deficit. Mechanism of water absorption (active and passive absorption), root pressure, transpiration, transpiration pull theory for ascent of sap, mechanism of opening and closing of stomata (active potassium theory), guttation.

Characteristics of imbibition; factors affecting imbibition; importance of imbibition, characteristics and significance of diffusion; osmosis - endosmosis and exosmosis; significance of osmosis and turgidity - osmotic pressure, turgor pressure, wall pressure and diffusion pressure deficit should be explained. Students should know the significance of turgidity, plasmolysis, deplasmolysis and their practical utility, importance of water; active and passive absorption of water; apoplastic and symplastic movements, definition of water potential and its components viz. solute, matrix and pressure potential (Numerical problems based on this concept are not required). Root pressure – definition and experiment to demonstrate it. Explanation and definition of transpiration to give students a clear idea; significance of transpiration. Stomatal mechanism - K^+ transport mechanism. Mechanism of ascent of sap by cohesion – tension and transpiration pull theory. Guttation – definition, differences between transpiration and guttation. Function of stomata and hydathode.

(iii) Photosynthesis: ultra structure of chloroplast, photochemical and biosynthetic phases, absorption and action spectra, factors affecting photosynthesis, photophosphorylation; photorespiration, transport of solutes.

Photosynthesis and photorespiration.

Definitions and differences between absorption and action spectra.

Brief idea of photosynthetic pigments (difference between chlorophyll 'a'&'b', carotenoids and xanthophyll), ultra structure of chloroplast (with diagram) including role of quantasomes. photochemical

phase - pigment systems, cyclic and non-cyclic photophosphorylation (chemiosmotic hypothesis); biosynthetic phase - C_3 and C_4 cycles – graphic representation in correct sequence (carboxylation, glycolytic reversal and regeneration of pentose); Differences between C_3 and C_4 plants, C_3 and C_4 cycles, Photosystems I and II, cyclic and non-cyclic photophosphorylation. Photorespiration pathway in brief - explanation of how RuBP carboxylase acts as RuBP oxygenase. Kranz anatomy. Blackman's Law of limiting factors, factors affecting Photosynthesis. Translocation.

Transport of solutes and water; Evidences which indicate that downward movement of organic solutes takes place in phloem; girdling and tracer techniques, mechanism of translocation; mass flow hypothesis with diagram.

(iv) Reproduction and development in angiosperms: vegetative reproduction, structure of a typical flower, types of inflorescence (racemose and cymose), sexual reproduction: development of male and female gametophytes, placentation, pollination, fertilisation (Amphimixis) and formation of endosperm, embryo, seed and fruits (broadly classified). Apomixis, Polyembryony, Parthenocarpy. Significance of seed and fruit formation.

Natural vegetative propagation, advantages and disadvantages of vegetative reproduction. Structure of a typical flower, [symmetry (actinomorphic, zygomorphic), complete/ incomplete, non-essential whorls (calyx: gamosepalous, polysepalous, corolla: gamopetalous, polysepalous, perianth) essential whorls (androecium: cohesion - syngenesious, synandrous, monadelphous, diadelphous, polyadelphous; adhesion – epipetalous, epiphyllous; nature of attachment of anther to filament – dorsifixed, basifixed, adnate, versatile; number of lobes – monothecous, dithecous; Gynoecium: position of ovary – epigynous, hypogynous, perigynous, cohesion – apocarpous, syncarpous, number of locules – unilocular, bilocular, multilocular], types of inflorescence (racemose and cymose – definition and differences; subtypes not required). Types of pollination and adaptations in flowers pollinated by wind, water and insects. Advantages of self and cross-pollination. Contrivances for prevention of self-pollination. Development of male and female gametophytes to be taught with the help of diagrams. Structure of anatropous ovule (L.S.), types of placentation with diagrams. Events leading to fertilization should be discussed. Various ways of entry of pollen tube into the ovule (Porogamy, Chalazogamy and Mesogamy), definition of triple fusion, double fertilization and significance of double fertilization, changes after fertilization. Fruits to be classified into simple (dry and fleshy), aggregate and multiple. Apomixis, Polyembryony, Parthenocarpy to be explained briefly. Significance of seed and fruit formation.

(v) Differentiation and organ formation.

Embryo formation (monocot and dicot); types of endosperm (cellular, nuclear and helobial); changes in the ovule and ovary for seed and fruit formation.

B. Animals

Reproduction (human): internal structure of human testis and ovary, menstrual cycle, gametogenesis, embryonic development in mammals. Medical termination of pregnancy, infertility. Amniocentesis. Assisted reproductive technologies.

Organs of male and female reproductive system and their functions; internal structure of testis and ovary to be taught with the help of diagrams; gametogenesis- spermatogenesis and oogenesis; menstrual cycle - different phases and hormone action, Menarche and Menopause, capacitation, fertilisation, physio-chemical events during fertilisation, implantation, embryonic development up to blastocyst formation, foetal membranes (name and function), placenta and its functions. Parturition; lactation – hormonal control and importance. Definition of medical termination of pregnancy (MTP) and reasons for it; causes of infertility. Amniocentesis – role in detecting genetic defects. Assisted reproductive technologies: IVF, ZIFT, GIFT - Definition and application only.

SECTION C

3. Genetics

(i) Fundamentals of Genetics: concept of alleles: dominant and recessive; phenotype and genotype, homozygous and heterozygous, mono and dihybrid crosses.

Homologous chromosomes, autosomes and sex chromosomes; alleles – dominant and recessive; phenotype; genotype; homozygous; heterozygous, monohybrid and dihybrid crosses; back cross and test cross, definitions to be taught with simple examples using Punnett square.

(ii) Mendel's experiments with peas; Mendel's Principles of inheritance, incomplete dominance, co-dominance and multiple alleles, Polygenic inheritance, Pleiotropy.

Explanation of the terms heredity and variation; Mendel's Principles of inheritance; reasons for Mendel's success; incomplete dominance with examples from plants (snapdragon - Antirrhinum) and co-dominance in human blood group, multiple alleles – e.g. blood groups, polygenic inheritance with one example of inheritance of skin colour in humans (Students should be taught examples from human genetics through pedigree charts). Biological importance of Mendelism. Pleiotropy with reference to the example of Phenylketonuria (PKU).

(iii) Genes: packaging of hereditary material in chromosomes. Linkage and crossing over; mutation, sex determination and sex linkage, search for DNA as genetic material, central dogma; genetic code, protein synthesis. Human genome project. DNA finger printing.

Chromosomal theory of inheritance; chromosomes in eukaryotic organisms, Structure of eukaryotic chromosome with reference to nucleosome, autosomes and sex chromosomes (sex determination in humans, birds and honey bees), sex-linked inheritance - with reference to Drosophila (wings & eyes), and man (haemophilia & colour blindness), Definition of linkage, complete and incomplete linkage – definition and example of fruit fly, crossing over - definition, mechanism and significance; mutation: definition and types – spontaneous and induced, point mutation; search for DNA as genetic material - Griffith's experiment, Hershey and Chase's experiment; replication of genetic material (role of enzymes, namely DNA polymerase and ligase), helicase, Messelson and Stahl's experiment, properties of genes such as ability to replicate, chemical stability, mutability and inheritability, gene expression in prokaryotes; Lac Operon in E. coli; central dogma – concept only; reverse transcription (basic idea only), genetic code – essential features, definition of codon. Protein synthesis - transcription and translation in prokaryotes. Intron, exon, cistron, recon and muton (definitions only).

Human genome project: goal; methodologies [Expressed Sequence Tags (EST), Sequence Annotation], salient features and applications. DNA finger printing – technique, application and ethical issues to be discussed briefly.

(iv) Recombinant DNA technology and its applications.

Tools for Recombinant DNA technology. Restriction enzymes, Gene amplification by PCR technique, DNA insertion by vectors [plasmids (pBR322 and Ti-plasmid of Agrobacterium), bacteriophage, Bacterial artificial chromosome (BAC), yeast artificial chromosome (YAC)] and other methods (electroporation, microinjection, gene gun), selection methods (antibiotic resistance and Blue-White selection), regeneration of recombinants, RNA interference (definition and application).

Applications of recombinant DNA technology: In human health – production of insulin, vaccines and growth hormones, gene therapy. In industry – production of expensive enzymes, strain improvement to scale up bioprocesses, bioreactors (structure and use of simple stirred-tank bioreactor). In agriculture – GM crops by transfer of genes for nitrogen fixation, herbicide-resistance and pest-resistance including Bt crops. Transgenic animals – significance (study of disease, biological products, chemical safety testing, vaccine safety), Ethical issues. GMO with special reference to Bt crops. Biosafety issues: biopiracy and patents – definition and two examples of each.

4. Applications of Biology

(i) Crop improvement: methods of crop improvement: selection, hybridisation, plant breeding, plant introduction, tissue culture; single cell protein; biofortification; biopesticides.

A brief reference to green revolution. Plant breeding, introduction, definition of selection (types not required) and techniques of hybridisation. Definition of heterosis, protoplast culture and protoplasmic fusion. Applications of tissue culture to be discussed; *single cell protein – source and significance*; *biofortification: meaning and its role in improving food production. Definition and brief idea of Integrated Pest Management (IPM); Biopesticides: definition, importance and two examples (Bioinsecticides e.g. Bacillus thuringiensis, Bioherbicides e.g. Cochineal insect).*

(ii) Biotic community: intraspecific and interspecific relationship, commensalism, predation, scavenging, parasitism, symbiosis, biotic stability, biotic succession and ecological adaptations.

Trophic organisation, stratification, dominance, variety of species; interactions – Intraspecific such as mating behaviour, parental care, communication, animal societies, altruism; Interspecific – positive e.g. commensalism, scavenging, symbiosis, proto-co-operation and negative e.g. predation, parasitism with examples of each. Biotic stability: should be taught with examples to show that the larger the number of diverse forms, more stable is the community. Succession: definition to explain the meaning, kinds of succession and significance of ecological succession. Definition of ecological adaptations, classification into hydrophytes, mesophytes, xerophytes, osmoregulators, osmoconformers with an example of each.

(iii) Biodiversity today: importance of biodiversity, types of biodiversity, genetic conservation, gene banks and cryopreservation. Loss of biodiversity - threatened, endangered and extinct species. Strategies for conservation of biodiversity – in-situ and ex-situ.

Importance of biodiversity, Few examples of each type of biodiversity - species, ecosystem and genetic.

Causes and implications of loss of biodiversity. Categorizing species in different groups like - threatened, endangered and extinct - definition and examples of plants and animals.

Looking at various in-situ and ex-situ strategies for their efficacy and viability: In-situ - protected areas: biosphere reserves, national parks, wildlife sanctuaries; Hotspots and red data book. Ex-situ - captive breeding, zoo, botanical gardens. Definitions and examples of each of the above.

Only a brief understating of the following is required:

A general idea that species share a common gene pool and represent the lowest taxonomic group. Definition of genetic conservation, gene bank, cryopreservation and genetic erosion; factors affecting genetic erosion.

(iv) Biofertilisers: green manure, nitrogen fixation – symbiotic and non-symbiotic organisms, nitrogen cycle.

Green manures – definition and types; reasons for preference of biofertilisers over chemical fertilisers should be discussed. Differences between green manure and bio fertilizers. Brief idea of nodule formation, biological nitrogen fixation, non-symbiotic nitrogen fixation and symbiotic nitrogen fixation (such as Rhizobium and Azospirillum). Role of cyanobacteria such as Azolla, Anebena, Nostoc; importance of leghaemoglobin pigment. Role of bacteria and cyanobacteria in improving soil fertility. Nitrogen cycle.

(v) Human Diseases: Body's defence mechanisms: (specific and non-specific); immune disorders (SCID and AIDS); allergies, interferons. Communicable diseases: causative agent, symptoms and prevention of

the following: bacterial diseases (typhoid and pneumonia), viral diseases (common cold, swine flu and dengue), protozoal (malaria, and amoebiasis), fungal (ringworm), helmintic (ascariasis, and filariasis); sexually transmitted diseases (STD). Non-communicable diseases: cancer (types, causes, diagnosis and treatment); human genetic disorders: (haemophilia, thalassaemia, Down's syndrome, Klinefelter's syndrome, Turner syndrome). Rh factor incompatibility – during transfusion and pregnancy. Genetic counselling; a brief idea of stem cells, organ transplants and immunosuppression.

Skin, blood vessels, WBC, antibodies to be discussed as non-specific defence mechanisms; Humoral and cell-mediated immune system; antibody and antigen; structure of a typical antibody molecule, types of antibodies (IgG, IgA, IgM, IgD and IgE: only their roles), cells of the immune system and difference between them; difference between B cells and T cells. mechanism of action of T cells to antigens; Interferons, differences between antibodies and interferons, brief idea of SCID and AIDS – causative agent (HIV), modes of transmission, symptoms, replication of retrovirus in the infected human cell (including diagram) and prevention; diseases should be discussed on basis of causative agent, symptoms and prevention. Allergies and allergens – definitions and general symptoms of allergies.

Communicable and Non-communicable diseases; modes of transmission, sexually transmitted diseases (STD) – gonorrhoea and syphilis – causative agents and prevention; - bacterial diseases (typhoid and pneumonia), viral diseases (common cold, swine flu and dengue), protozoa (malaria, and amoebiasis), helminthes (ascariasis, and filariasis); fungal (ringworm); Cancer – (types, causes, diagnosis and treatment, definition of Metastasis).

Human genetic disorders: (haemophilia, thalassaemia, Down's syndrome, Klinefelter's syndrome, Turner syndrome). Rh factor incompatibility – role of Rh factor in blood transfusion and pregnancy; brief idea of genetic counselling, role of genetic counsellor.

Organ transplants and role of immunosuppressants. A brief idea of the role of stem cells in medical treatment.

(vi) Adolescent issues: alcoholism and drugs.

Adolescent issues:

Alcoholism – reasons for addiction and its effects on health).

Drugs: Types of drugs such as opioids, cannabinoids and barbiturates – reasons for addiction, examples and effect of each on human health.

Prevention and control of Alcohol and drug abuse.

(vii) Biomedical Engineering: (only applications) Instruments – ECG, EEG, CT scan, ultrasound, MRI, pacemakers, implants, dialysis, external prosthesis.

Students should know one application of each of the instruments mentioned above. Details are not required.

(viii) Human population: population growth curves, causes of increase in population.

Definition of the following terms: biotic potential, environmental resistance and carrying capacity; population: demography, birth rate, death rate, age distribution – pyramids for human population.

Types of growth curves; S and J shaped along with equations for the same, causes and consequences of population growth and measures to control population (natural and artificial).

(ix) Animal Husbandry: Dairy farm management, poultry farm management, apiculture, pisiculture.

Brief idea of inbreeding, out-breeding, cross-breeding and artificial insemination, Multiple Ovulation Embryo Transfer Technology (MOET). Advantages of artificial insemination; measures for proper maintenance of dairy farms and poultry farms.

Apiculture and Pisiculture – definition, brief idea and advantages of each.

PAPER II

PRACTICAL WORK – 20 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) Compositae: type – Sunflower/ Cosmos/ Marigold (with single whorled ray florets)/ Dahlia/ Zinnia.

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

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

   (v) Liliaceae: type – Onion or Amarallydaceae –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 should be taught. 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 be taught 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.

2) **Simple biochemical and physiological experiments-**

   (i) Study of imbibition in raisins/seeds.

   (ii) Demonstration of plasmolysis (using *Rhoeo* leaf and onion bulb).

   (iii) Demonstration of osmosis in living plant cells (potato osmoscope).

   (iv) Demonstration of unequal transpiration in leaves.

   (v) Study of arrangement/distribution of stomata on isobilateral and dorsiventral leaves.

   (vi) To demonstrate the effect of different intensities of light on photosynthesis.

   (vii) Separation of plant pigments (from different types of leaves) by chromatography.

   (viii) To demonstrate that oxygen is evolved during photosynthesis.

   (ix) Effect of different carbon dioxide concentrations on the rate of photosynthesis.

   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.

3) **Slide preparation-**

   (i) T.S. of dicot root.

   (ii) T.S. of monocot root.

   (iii) T.S. of dicot stem.

   (iv) T.S. of monocot stem.

   (v) Germination of pollen grain.

   The technique of staining and mounting neatly should be explained. Identification of the mount under the microscope should be taught. Students must know the use of low power and high power microscope. They should also know how to make labelled diagram showing cellular details. Identifying features of the above should also be mentioned.

4) **Spotting: (Three minutes to be given for each spot which includes identification, drawing a labelled diagram and writing 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 monocot and dicot stem (Permanent slide).

(b) T.S. of monocot and dicot root (Permanent slide).

(c) T.S. of monocot and dicot leaf (Permanent slide).

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

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

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

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

(h) *Plasmodium sporozoite* (slide/chart).

(i) *Entamoeba histolytica trophozoite* (slide/chart).

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.', 'L.S.', 'model', 'whole mount', 'chart' of the specific specimen should be mentioned as a part of identification.

(ii) Students should identify, draw and comment on:

(a) Different types of inflorescence: fresh specimen, model or a chart (labels covered) – basic racemose example gladiolus, basic cymose example jasmine / *Calotropis/ Dianthus* and capitulum example marigold.

Students should be able to identify the type of inflorescence, draw its diagram and write two identifying characteristics of the specimen.

(b) 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.

(iii) Comment on experimental set up studied in physiology.

(a) Osmosis

(b) Transpiration

(c) Photosynthesis

(d) Transpiration pull.

Students should identify (aim of the experiment), draw a labelled diagram of physiological set-up and write observation and inference of the experiment within the allotted time i.e., 3 minutes.

PROJECT WORK AND PRACTICAL FILE – 10 Marks

Project Work – 7 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. 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) Diabetes.

(ii) Cancer.

(iii) AIDS/Hepatitis.

(iv) Drug addiction and community.

(v) Endocrine glands.

(vi) Role of micro-organisms in industry.

(vii) Human population.

(viii) Mendelian Inheritance

(ix) Environmental resistance.

(x) 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.

(xi) 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, handmade diagrams, photographs, statistical analysis if relevant)
- Conclusion/ Summary
- Bibliography

Projects should be handwritten by the candidate. Written pages should not exceed 15-20 pages.

Practical File – 3 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.

(The Visiting Examiner will assess the Practical File on the basis of the above).

SCIENTISTS AND THEIR CONTRIBUTIONS:

1. Lederberg – Chemogeny, Biogeny, & Cognogeny
2. Oparin – Coacervates, Conditions on primitive earth were favourable for chemical evolution
3. Stanley Miller & Harold Urey – Recreated probable conditions on primitive earth
4. Sydney Fox – Microspheres
5. Andreas Wagner – Obtained the fossil of Archaeopteryx lithographica
6. Ernst Haeckel – Proposed the recapitulation theory
7. Charles Darwin – Natural Selection
8. Lamarck – Inheritance of acquired characters
9. Hugo de Vries – Mutation
10. Raymond Dart – Discovered the fossil of Australopithecus
11. Mac Gregor – Discovered the fossil of Cromagnon man
12. Meyer – Coined the term "Diffusion Pressure Deficit"
13. Kramer – Active & Passive absorption of water by roots
14. Dixon & Jolly – Cohesion – Tension & Transpirational pull
15. Levitt – Active K^+ ion Transport mechanism of opening & closing of stomata
16. Munch – Mass Flow Hypothesis
17. Robert Hill – Photolysis of water
18. Ruben & Kamen – Oxygen comes from water in photosynthesis
19. M. D. Hatch & C. R. Slack – Proposed C_4 cycle
20. Blackman – Principle of Limiting Factors
21. Calvin – C_3 cycle
22. Decker – Photorespiration
23. Rudolph Camerarius – First to describe sexual reproduction in plants
24. Leeuwenhock – Reported Polyembryony
25. Gustafon – First to induce parthencarpy
26. P. K. Sethi – Prosthesis
27. Spallanzani – Artificial Insemination / disproved abiogenesis
28. John Otto – Reported Haemophilia
29. Ronald Ross – Malarial parasite life cycle in mosquito
30. Karl Landsteiner – Rh factor / blood groups (ABO system)
31. T. R. Malthus – Theory of Human Population Growth
32. Alec Jeffrey – DNA finger printing
33. Godfrey Hounsfield – First invented C T Scan
34. G. Nawaschin – Double Fertilization
35. John Ray – Introduced the term 'species'
36. Temin and Baltimore – Reverse transcription.
37. H.G. Khorana – deciphered genetic code.
38. Jacob, Monod and Lwoff – Proposed Lac operon.

LIST OF ABBREVIATIONS TO BE STUDIED:

1. DPD – Diffusion Pressure Deficit
2. HIV – Human Immunodeficiency Virus
3. RuBP – Ribulose Biphosphate (or Bisphosphate)
4. PGA – Phosphoglyceric Acid
5. RUBISCO – Ribulose Biphosphate (or Bisphosphate) Carboxylase Oxygenase
6. IPM – Integrated Pest Management
7. EEG – Electroencephalogram
8. DDT – Dichloro diphenyl trichloro ethane
9. ECG – Electrocardiogram
10. C. T. Scan – Computed Tomographic Scanning
11. IUCD – Intra uterine contraceptive device
12. SCID – Severe Combined Immuno Deficiency
13. NADP – Nicotinamide Adenine dinucleotide phosphate
14. STD – Sexually Transmitted Disease
15. MRI – Magnetic Resonance Imaging
16. MTP – Medical Termination of Pregnancy
17. IVF – In vitro fertilization
18. ZIFT – Zygote Intrafallopian Transfer
19. GIFT – Gamete Intrafallopian Transfer
20. PEP – Phosphoenol pyruvate
21. rDT – Recombinant DNA Technology
22. SCP – Single Cell Protein
23. BAC – Bacterial Artificial Chromosome
24. YAC – Yeast Artificial Chromosome
25. SSBP – Single Strand Binding Protein