DEPARTMENT OF BIOTECHNOLOGY

School of Biosciences & Biotechnology
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Syllabus for Entrance Test to Masters Programme in Biotechnology - 2021

General Biology

- Classification of plants and animals; binomial nomenclature, taxonomic ranks, type concept.
- General account of viruses, bacteria, mycoplasma and cyanobacteria; economic importance of bacteria, bacteria as indicators of pollution, bacteria in industry and agriculture; life cycle of bacteriophage – temperate and lysogenic cycle.
- Structure, formation and functions of cell wall and plasma membrane – the lipid bilayer structure, fluid mosaic model, its functions; cell organelles: structure and functions of endoplasmic reticulum, Golgi bodies, plastids, mitochondria and lysosomes; ultrastructure of nuclear membrane; organisation and functions of nucleolus, chromosome structure, importance of centromere and telomeres; primary and secondary constrictions; polytene, lampbrush and supernumerary chromosomes.
- Organisation of DNA in prokaryotic and eukaryotic genomes, role of histones; nucleosome model. DNA structure, types (A, B, C, Z), replication and functions; satellite and repitive DNA, genetic code, transcription, regulation of gene expression in prokaryotes and eukaryotes, inducible and repressible systems.
- Mendelian laws of inheritance; sex chromosomes, sex determination, barr body, Lyon's hypothesis, sex linked inheritance (eye colour in *Drosophila* sp and haemophilia in man); cytoplasmic inheritance – maternal effect on shell

coiling in snails (*Lymnaea*), kappa particles in *Paramaecium*.

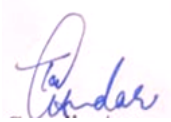
- ATP – the biological energy currency, aerobic and anaerobic respiration, Kreb's cycle, electron transport mechanism (chemi – osmotic theory), biofertilizers, nitrogen fxation.
- Darwin's theory of natural selection, Neo – Darwinism – modern concept of organic evolution and speciation: gene mutation and recombination as a source of variations, molecular mechanisms of mutations. isolation mechanisms and their role inspeciation.
- Environmental biology: ecosystems, communities, ecological mechanisms,ecological pyramids.

Botany

- Characteristic features of Papilionaceae, Solanaceae, Asteraceae, Apiaceae, Poaceaeand Liliaceae; economically important taxa of these families
- Alteration of generation; reproductive biology, development of micro - and megasporesin angiosperma, double fertilization; parthenocarpy, apomixis and parthenogenesis.
- Stem and root anatomy, position and activity of various meristems, stomatal types,stellar evolution, secondary growth, lenticels and bark.
- Water relations of a plant cell; mineral nutrition, photosynthesis and respiration –mechanism; enzymes – classification and kinetics.

Zoology

- General classification, characteristic features of non – chordates and chordates; structure, reproduction and life history of the following types: *Amoeba, Monocystis, Plasmodium, Paramaecium, Sycon, Hydra, Obelia, Fasciola, Taenia, Ascaris, Neries, Pheretima,* Leech, Prawn, Scorpion, Cockroach, a bivalve, a snail, *Balanglossis,* an ascidian and *Amphioxus*.
- Comparative anatomy of vertibrates: integument, endoskeleton, locomotory organs, digestive system, respiratory system, heart and circulatory system, urinogenital system and sense organs, elementary physiology of digestion,



excretion, respiration, blood, mechanism of circulation with special reference to man, nerve impulse, conduction and transmission across synaptic junction.

- Embryology: gametogenesis, fertilization, cleavage, gastrulation, early development and metamorphogenesis of frog, ascidian and retrogressive metamorphosis; neotony, development of foetal membrane in chick and mammals

Biotechnology

- Genetic engineering; definition, tools of genetic engineering; enzymes: types and properties; polymerases, ligases, kinases, phosphatases, endo - and exonucleases, DNAase, RNAse and proteinases; cloning vectors; plasmids, cosmids and phages; genomic and cDNA library construction; immuno – diffusion and immuno – electrophoresis, immuno – blot, ELISA, RIA, monoclonal antibodies, blood products, vaccines and harmones, transgenic technology, transgenics as factories for production of useful marketable products.

- Gene transfer, vector mediated and vector less gene transfer; major genes transferred through genetic engineering; applications of genetic engineering, production of transgenic plants and animals (golden rice, Bt cotton, Bt maize, GM soyabeans, GM tomato, fish, pig, goat, cow and sheep).

Chemistry

- Chemistry of atoms, molecules, bonds and solutions; chemical and ionic equilibria; thermodynamics, conductivity and electrolysis; periodic table; mechanism and types of organic reactions, chemistry of hydrocarbons, organic acids, nitrogen containing compounds, halogen derivatives, aldehydes, ketones, oils, fats and polymers.

Agriculture

- Man’s dependence on agriculture: origin of agriculture, Vavilovian centres of origin; origin, cultivation and pathogens of rice, wheat and maize, Rabi and

Kharif crops of India; plant and animal breeding – conventional and non conventional methods; sustainable agriculture: integrated nutrient management, integrated pest management; organic farming, soil conservation, irrigation and rain water management.

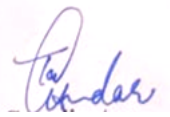
- Agronomy – definition, history, crop rotation, multiple cropping, relay cropping, multi-storeyed cropping, inter – cropping; soil fertility and soil productivity, green manuring; organic manures and their role in soil fertility; characteristics and uses of nitrogenous, phosphatic and potassic fertilizers; vermiculture, composting, herbicide and biopesticide production.

Pharmacology

- Distribution and botanical features of important drugs and aromatic plants of J&K(*Artemisia, Atropa*, *Crocus*, *Podophyllum, Aconitum, Picrorhiza, Arnebia, Ferula*).
- Phytochemistry in pharmacology; isolation and characterization of activepharmacological principles: their sources and chemistry, standardisation of drugs.

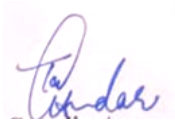
Foresty

- Silviculture: concepts and practices of silviculture techniques with special reference to nursery and tree planting; forest types of India; National Forest Policy; afforestation, reforestation; ecological impact of deforestation on resource availability; definition and scope of agroforestry; farm forestry and social forestry; agroforestry systems classification; criteria of an agroforestry tree.
- Wastelands – types and their management through different agroforestry practices; diagnosis – designing for implementation of agroforestry programmes in mountainous regions; important fodders, fuels and fruit trees of India.



Instructions for Entrance Test in M. Sc. Biotechnology, 2021

1. Total number of questions will be 50.
2. Each question will carry 1 mark and the maximum marks will be 50.
3. Time duration of the Test will be 60 minutes.
4. All questions will be of objective type.
5. Each question will have four choices; student will be required to choose the correctone among them.
6. There will be no negative marking.
7. Blue or black point pen alone will be permitted.
8. Calculators and other such electronic devices will not be permitted.
9. The questions will be attempted on a Response Sheet to be provided at the time of Test.
10. Students will be required to bring their admit cards with them, without which theywill not be allowed to appear in the Test.
11. The merit list shall be based on 70% weightage on entrance test and 30% weightage for academic marks in qualifying exam.



Model Question Paper for Entrance Test in M. Sc. Biotechnology, 2021

1. Which of the following enzymes is responsible for relaxing the supercoiled DNA?

   a. DNA gyrase
   b. Topiosomerase I
   c. DNA polymerase III
   d. Primase

2. Sorbitol – mannitol are used in the initial stages of protoplast culture as:

   a. Additional source of carbon
   b. Additional source of energy
   c. To keep cell alive after removal of cell wall
   d. To act as osmotic stabilizer

3. To which of the following types do the enzymes EcoR1 and Hind III belong?

   a. I
   b. II
   c. III
   d. IV

4. Which of the following sequences is most likely to be a restriction enzyme recognitionsite?

   a. C G G C T T
   b. C G C C G C
   c. C T A A T G
   d. G T C G A C

5. Plasmids of the same compatibility group:

   a. Insert at different sites in the host chromosome to maintain their copy number per cell
   b. Form large sized co – integrates
   c. Can be maintained in the same host cell as independent plasmids
   d. Cannot be maintained together in the same host cell as independent plasmids

6. Mutation in a codon UCG may convert C into A. This will cause:

   a. Termination of translation
   b. Enhancement of translation
   c. Formation of different polypeptide
   d. No effect on translation

7. A cross between a black and a white guinea pig resulted into a progeny of six black andfive white guinea pigs. This suggests the following genotypes for the parents:

    a. BB, bb
    b. Bb, Bb
    c. Bb, bb
    d. BB, Bb

8. P^{BR} 327 is a:

    a. pUC vector
    b. Yeast plasmid vector
    c. *E. coli* plasmid vector
    d. Phagemid

9. Helical structure of DNA is determined by

    a. Electron diffraction measurements
    b. Neutron diffraction measurements
    c. X-ray diffraction measurements
    d. Diffraction of visible light

10. The end product of purine catabolism in normal humans is

    a. Urea
    b. Uric acid
    c. Creatinine
    d. Xanthine

11. Most abundant protein in the human body is

    a. Haemoglobin
    b. Keratin
    c. Collagen
    d. Immunoglobulin