

Inter (Part-I) 2021

Biology	Group-I	PAPER: I
Time: 2.40 Hours	(SUBJECTIVE TYPE)	Marks: 68

SECTION-I

2. Write short answers to any EIGHT (8) questions: (16)

(i) Write down the functions of proteins.

Ans Proteins perform many functions. They build many structures of the cell. All enzymes are proteins and, in this way, they control the whole metabolism of the cell. As hormones, proteins regulate metabolic processes. Some proteins (e.g., haemoglobin) work as carriers and transport specific substances such as oxygen, lipids, metal ions, etc. Some proteins called antibodies, defend the body against pathogens. Blood clotting proteins prevent the loss of blood from the body after an injury. Movement of organs and organisms, and movement of chromosomes during anaphase of cell division, are caused by proteins.

(ii) Define co-factor and activator.

Ans A non-protein part of enzymes is known as a **co-factor**, which is essential for the proper functioning of the enzymes.

Some enzymes use metal ions as co-factors like Mg^{2+} , Fe^{2+} , Cu^{2+} , Zn^{2+} , etc. The detachable co-factor is known as an **activator** if it is an inorganic ion.

(iii) What do you mean by lock and key method?

Ans Emil Fischer (1890) proposed a Lock and Key model to visualize substrate and enzyme interaction.

According to this model, as one specific key can open only a specific lock, in the same manner a specific enzyme can transform only one substrate into products(s).

Active site is a rigid structure and there is no modification or flexibility in the active site. This model does not support all reactions.

(iv) Differentiate between competitive and non-competitive inhibitors.

Ans Competitive inhibitors, because of structural similarity with the substrate, may be selected by binding sites. But they are not able to activate the catalytic sites. Thus products are not formed.

On the other hand, non-competitive inhibitors form enzyme inhibitor complex at a point other than the active site. They alter the structure of the enzyme in such a way that even if genuine substrate binds the active site, catalysis fails to take place.

(v) Differentiate between septate and non-septate hyphae.

Ans Septate hyphae are divided by cross-walls called septa into individual cells containing one or more nuclei.

Non-septate hyphae lack septa and are not divided into individual cells; instead these are in the form of an elongated multinucleated large cell.

(vi) How fungi is economically helpful in food industry?

Ans Certain fungi are used in food industry. Because of their fermenting ability, yeasts are used in production of bread and liquor. Penicillium species are used for giving flavour, aroma and characteristics colour to some cheese.

(vii) Differentiate between proterostomia and deuterostomia.

Ans

Proterostomia	Deuterostomia
1. Cleavage or division of the zygote is spiral and determinate.	1. Cleavage is radial and indeterminate.
2. During development process, the mouth in these animals arises from the blastopore or from its anterior margin.	2. During embryonic development, mouth is formed at some distance anterior to the blastopore and blastopore forms the anus.

(viii) How locomotion takes place in annelids?

Ans Phylum annelida comprises of three classes. In class polychaeta, the organs of locomotion are parapodia. In class oligochaeta, the organs of locomotion are setae. In class hirudinea, the organs of locomotion are absent. They move due to the contraction of their body and with the help of suckers.

(ix) Define metamorphosis.

Ans Life history of insects is characterized by metamorphosis. This is an abrupt change of form or structure during the life cycle. There are three morphologically distinct stages in the life cycle. The egg finally develops into larva, which is converted into motionless pupa that finally develops into an adult.

(x) How mammals have evolved from reptilian ancestors?

Ans The ancestors of mammals lived simultaneously along with reptiles during the Jurassic times and have been called mammal-like reptiles. Some were only the size of mice and lived on the trees. One of these early reptile was varanope. Probably at least five groups of such mammal-like reptiles developed mammalian characters and were 50% mammals.

(xi) What is Rubisco? Write down its functions.

Ans The Calvin cycle begins when a molecule of CO_2 reacts with a highly reactive phosphorylated five-carbon sugar named **ribulose biphosphate (RUBP)**. This reaction is catalyzed by the enzyme **ribulose biphosphate carboxylase**, also known as **Rubisco**.

(xii) Write down the molecular formulae for chlorophyll "a" and "b".

Ans The molecular formulae for chlorophyll a and b are as follows:

Chlorophyll a: $\text{C}_{55}\text{H}_{72}\text{O}_5\text{N}_4\text{Mg}$

Chlorophyll b: $\text{C}_{55}\text{H}_{70}\text{O}_6\text{N}_4\text{Mg}$

3. Write short answers to any EIGHT (8) questions: (16)

(i) Define biotechnology.

Ans It deals with the use of living organisms, systems or processes in manufacturing and service industries.

(ii) Define hydroponic culture technique.

Ans **Hydroponic culture technique** is used to test whether a certain nutrient is essential for plant or not. In this technique the plants are grown in aerated water to which nutrient mineral salts have been added. Hydroponic farming, however, is yet not feasible. Astronauts may use it for growing vegetables.

(iii) What is cell fractionation technique?

Ans During cell fractionation, the tissues are homogenized or disrupted with special instruments and the various parts of the cells are separated by density-gradient centrifugation. The separation is achieved by spinning the homogenized or disrupted cells in a special medium in a centrifuge at medium speed.

(iv) Differentiate between microtubule and microfilament.

Ans **Microtubules** are long, unbranched, slender tubulin protein structures. One very important function of microtubules is their role in the assembly and disassembly of the spindle structure during mitosis.

Microfilaments are considerably more slender cylinders made up of contractile actin protein, linked to the inner face of the plasma membrane. They are involved in internal cell motion.

(v) What are amoebae? Give example.

Ans This group includes all free living freshwater, marine and soil amoebae as well as those that are parasites of animals. Amoebae lack flagella and move by forming specialized cytoplasmic projections called pseudopodia.

The intestinal parasite, *Entamoeba histolytica*, causes amoebic dysentery in humans.

(vi) What are kelps?

Ans The largest brown algae, called the kelps are tough and leathery in appearance. They possess leaf-like blades, stem-like stipes, and root-like anchoring holdfast.

(vii) Give characteristics of red algae.

Ans The multicellular body form of red algae is commonly composed of complex interwoven filaments that are delicate and feathery. A few red algae are flattened sheets of cells. Most multicellular red algae attach to rocks or other substances by a basal holdfast. Some red algae incorporate calcium carbonate in their cell walls from the ocean and take part in building coral reefs along with coral animals.

(viii) Define slime molds.

Ans **Slime Molds:**

The feeding stage of a slime mold is a plasmodium, a multinucleate mass of cytoplasm that can grow to 30 cm (1 ft) in diameter. The plasmodium, which is slimy in appearance, streams over damp, decaying logs and leaf litter. It often forms a network of channels that cover a large surface area. As it creeps along, it ingests bacteria, yeasts, spores and decaying organic matter.

(ix) Define bryophytes.

Ans The bryophytes are non-vascular flowerless plants. They show a regular alternation of generation. They have a dominant independent free living gametophyte. They are said to be the amphibians of the plant world.

(x) What is double fertilization?

Ans Double fertilization is a special process found in Angiosperms. In this, two male gametes fuse with two cells simultaneously. A male gamete (n) fuses with egg (n) to form a diploid zygote ($2n$), which develops later into an embryo, and second male gamete (n) fuses with another female cell called fusion nucleus ($2n$) resulting into a

triploid (3n) endosperm cell, which develops into food storing endosperm tissue. It is an important evolutionary advancement in which food storage in fertilized ovule is made only on fertilization i.e., formation of zygote. This actually helps the plant to economize its food resources.

(xi) Differentiate between granulocytes and agranulocytes.

Ans

Granulocytes	Agranulocytes
Granulocytes are the types of leucocytes. They are formed in red bone marrow. They include neutrophils, eosinophils, and basophils.	Agranulocytes are the types of leucocytes. They are formed in lymphoid tissue such as those of the lymph nodes, spleen, tonsils, adenoids and the thymus. They include monocytes and lymphocytes.

(xii) What are blue babies?

Ans Failure of inter-atrial foramen (an opening in the inter-atrial septum) to close or of ductus arteriosus to fully constrict results in cyanosis (blueness of skin) of new born. This is due to mixing of blood between two atria and the mixed blood is supplied to the body of newborn babies resulting in blueness of skin; thus the name blue babies.

4. Write short answers to any SIX (6) questions: 12

(i) Define binomial nomenclature. Give two examples.

Ans The assignments of names to organisms using two Latin words, the first denoting the genus and the second descriptive name, the two together constitute the name of species. For example, Human is called *Homo sapiens*. Potato is called *Solanum tuberosum*.

(ii) Write down about the structure of plasmid in bacteria.

Ans Many bacteria contain plasmids in addition to chromosomes. These are the circular, double stranded DNA molecules. They are self-replicating and are not essential for bacterial growth and metabolism. They often

contain drug resistant, heavy metals, disease and insect resistant genes on them.

(iii) **Write about three important ingredients of saliva.**

Ans Saliva is secreted by three pairs of salivary glands namely sublingual glands situated below the tongue; submaxillary glands behind the jaws and parotid glands in front of the ears. Saliva produced by these glands contains three important ingredients:

- (i) Water and mucous.
- (ii) Sodium bicarbonate and some other salts.
- (iii) Carbohydrate digesting enzyme, Amylase or ptyalin.

(iv) **Define symbiotic nutrition.**

Ans **Symbiotic Nutrition:** It is a mutual nutrition between organisms living in association with one another. These organisms belong to two different species. Some important examples are lichens, mycorrhiza and root nodules with nitrogen fixing bacteria.

(v) **How trapping and decomposition of insects occur in pitcher plant?**

Ans **Pitcher Plant** has leaves modified into a sac or a pitcher, partly filled with water. The end of the leaf is modified to form a hood, which partly covers the open mouth of the pitcher. Small insects that fall into the pitcher are prevented from climbing out by numerous stiff hairs. The proteins of trapped insects are decomposed by bacteria or enzymes and the products of this decay are absorbed by the inner surface of the pitcher leaf.

(vi) **Write two properties of respiratory surfaces in animals.**

Ans The respiratory surfaces in most animals exhibit the following features:

1. Large surface and moisture:

The surface area should be extremely large and kept moist as it is seen in the lungs in the land vertebrates and in the gills in the case of fishes.

2. Thin epithelium:

The distance across which diffusion has to take place should be little. In most animals, the epithelium which separates air and blood is only two cell thick. As a result, the distance for diffusion is very short.

(vii) Define larynx.

Ans The larynx or voice box is a complex cartilaginous structure surrounding the upper end of the trachea. One of the cartilages, the epiglottis has a muscularly controlled, hinge-like action and serves as a lid which automatically covers the opening of the larynx during the act of swallowing, so as to prevent the entry of food or liquid into the larynx.

(viii) Differentiate between diaphragm and pleura.

Ans

Diaphragm	Pleura
The floor of chest is called diaphragm. It is a sheet of skeletal muscles.	Lungs are covered with double layered thin membranous sacs called pleura.

(ix) What is asthma?

Ans Asthma is a serious respiratory disease associated with severe paroxysm of difficult breathing, usually followed by a period of complete relief, with recurrence of attack at more or less frequent intervals.

SECTION-II

NOTE: Attempt any Three (3) questions.

Q.5.(a) What is biological method? Discuss it under following headings: (4)

(i) Theory (ii) Law

Ans **Biological Method:**

Science is an arranged and organized knowledge. Like other sciences, biological sciences also have a set methodology. It is based on experimental inquiry.

Theory:

A theory is made from a hypothesis which has been tested by many experiments. A good theory is predictive and has explanatory power. One of the most important features of a good theory is that it may suggest new and different hypothesis. A theory of this kind is called productive. If a theory is not productive or if even one of its hypothesis is falsified it can lead to rejection of the theory. However, even in the case of productive theory, the testing goes on.

Scientific Law:

In fact, many scientists take it as a challenge and exert even greater efforts to disprove the theory. If a theory survives this sceptical (disbelieving) approach and continues to be supported by experimental evidences, it becomes a scientific law. A scientific law is a uniform or constant fact of nature. It is virtually irrefutable (indisputable or certain) theory.

Examples of biological laws are Hardy-Weinberg laws and Mendel's law of inheritance. Laws are even more general than theories and afford answers to even more complex questions. Therefore, there are relatively few scientific laws in biology.

(b) Write a note on types of immunity.

(4)

Ans Types of Immunity

1. Active Immunity:

The use of vaccines, which stimulate the production of antibodies in the body, and making a person **immune** against the disease or infection, is called **active immunity**. But this active immunity has been achieved by artificially introducing, antigens in the body, so it is called **artificially induced active immunity**.

But, when a person is exposed to an infection (antigen) -- becomes ill, and in most cases survives, then this immunity, developed against that disease is called **naturally induced immunity or auto immune response**.

2. Passive Immunity:

It contrast to active immunity, in which case antigens are introduced to stimulate the production of antibodies, by artificial or natural method; antibodies are injected in the form of antisera, to make a person immune against a disease, this is called **passive immunity**.

In body, antigen-antibody complexes are formed, which are taken up by phagocytes and destroyed. The patient is spared the complications (or possibly death) caused by the infection or venom.

Passive immunity response is immediate, but not long-lasting. Because no time is taken for the production of sufficient level of antibodies, (as antibodies are being injected) and after the level of antibodies is reduced or they are used up -- No more antibodies production is there.

The method of passive immunization is used to combat active infections of: tetanus, infectious hepatitis, rabies, snake bite venom, etc. In the case of snake bite venom, passive immunity is produced by the anti-toxins, so the serum is called antivenom serum.

Q.6.(a) Describe secondary and tertiary structure of protein. (4)

Ans **Secondary Structure:**

The polypeptide chains in a protein molecule usually do not lie flat. They usually coil into a helix, or into some other regular configuration. One of the common secondary structures is the α -helix. It involves a spiral formation of the basic polypeptide chain. The α -helix is a very uniform geometric structure with 3.6 amino acids in each turn of the helix. The helical structure is kept by the formation of hydrogen bonds among amino acid molecules in successive turns of the spiral. β -pleated sheet is formed by folding back of the polypeptide.

Tertiary Structure:

Usually, a polypeptide chain bends and folds upon itself forming a globular shape. This is the proteins' tertiary

conformation. It is maintained by three types of bonds, namely: ionic, hydrogen and disulfide ($-S-S-$). For example, in aqueous environment, the most stable tertiary conformation is that in which hydrophobic amino acids are buried inside while the hydrophilic amino acids are on the surface of the molecule.

(b) Write a note on ascomycetes. Also give importance of yeast. (4)

Ans Ascomycota (Ascomycetes or Sac -- Fungi)

It is the largest group of fungi, including over 60,000 species, 50% or so occurring in lichens and some, such as morels, are mycorrhizal. Most are terrestrial, though some are marine or freshwater. The group shows diversity from unicellular yeasts to large cup fungi and morels. They produce haploid sexual spores called **ascospores** by meiosis inside their characteristic sac-like structures called **asci** (sing. ascus). Meiosis follows nuclear fusion inside the ascus, commonly 8 ascospores are produced inside each ascus. Most sac -- fungi have asci inside macroscopic fruiting bodies called **ascocarps** --the visible morels, etc. Their hyphae are septate. They have lengthy dikaryotic phase that forms **ascocarps**. They reproduce asexually by conidia that are often dispersed by wind.

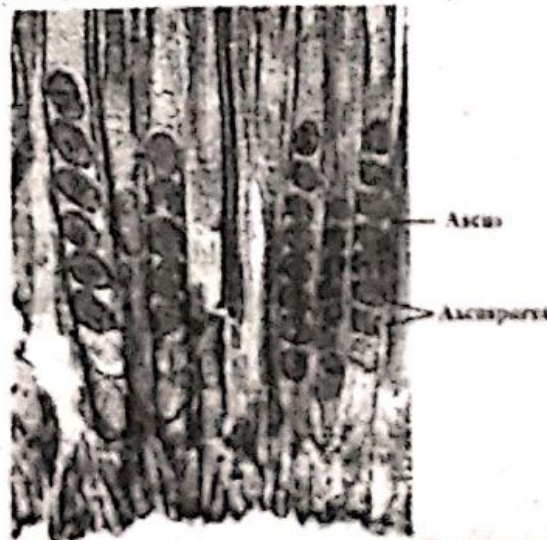


Fig. Asci and Ascospores. Each ascus contains eight haploid ascospores.

Yeasts are unicellular microscopic fungi, derived from all the three different groups of fungi but mostly Ascomycetes, and reproducing mostly asexually by budding. However, yeasts reproduce sexually by forming asci / ascospores or basidia / basidiospores. They ferment carbohydrate (glucose) to ethanol and carbon dioxide. Because of this feature and many other reasons, these are of greater economic importance (see economic importance of fungi). *Saccharomyces cerevisiae* is the most commonly exploited yeast.

Q.7.(a) Describe physical and chemical methods to control bacteria. (4)

Ans Following are the methods to control bacteria:

Physical Methods:

In this, steam, dry heat, gas, filtration and radiation are used to control bacteria. The process in which we use physical agents to control bacteria / microorganisms is known as **sterilization process**. Sterilization is destruction of all life forms.

High temperature is usually used in microbiological labs for control of microbes. Both dry heat and moist heat are effective. Moist heat causes coagulation of proteins and kills the microbes. Dry heat causes oxidation of chemical constituents of microbes and kills them.

Certain electromagnetic radiations below 300 nm are effective in killing of bacteria. Gamma rays are in general used for sterilization process.

Heat sensitive compounds like antibiotics, seras, hormones, etc. can be sterilized by means of membrane filters.

Chemical Methods:

One can use antiseptics, disinfectants and chemotherapeutic agents for microbial control. Chemical substances used on living tissues that inhibit the growth of bacteria are called **antiseptics**.

The important chemical agents used for **disinfection** are oxidising and reducing agents. For example, halogens and phenols, hydrogen peroxide, Potassium permanganate, alcohol and formaldehyde, etc. inhibit the growth of vegetative cells and are used on non-living materials.

Chemotherapeutic agents and **antibiotics** work with natural defense and stop the growth of bacteria and other microbes. These are sulfonamides, tetracycline, penicillin, etc. They destroy or inhibit the growth of bacteria in living tissues.

(b) Describe land adaptations in bryophytes. (4)

Ans In general, bryophytes developed the following adaptive characters for terrestrial environment:

- (i) Formation of a compact multicellular plant body which helped in the conservation of water by reducing cell surface area exposed to dry land conditions. Presence of cuticle further reduces loss of water by evaporation.
- (ii) Development of photosynthetic tissues into special chambers for the absorption of carbon dioxide without losing much water and exposure to light.
- (iii) Formation of special structures like rhizoids for absorption of water and anchorage.
- (iv) Heterogamy (production of two types of gametes) is evolved, forming non-motile egg containing stored food and motile sperms.
- (v) Gametes are produced and protected by the special multicellular organs (antheridia and archegonia).
- (vi) Multicellular embryo is formed which is retained and protected inside the female reproductive body during its development.
- (vii) Alternation of spore-producing generation (sporophyte) with gamete producing generation (gametophyte) enabled the plant to produce and test

the best genetic combinations for adapting to the versatile terrestrial conditions.

Q.8.(a) Write notes on smallpox and polio. (4)

Ans For Answer see Paper 2018 (Group-I), Q.8.(a).

(b) Draw and describe the Calvin Cycle. (4)

Ans For Answer see Paper 2017 (Group-I), Q.7.(b).

Q.9.(a) What are plastids? Give their three types and explain only chloroplast in detail. (4)

Ans **Plastids:**

Membrane-bound, mostly pigment containing bodies present in the plant cells are called plastids. They are green in colour. They are present in green leaves, fruits and in sepals.

Plastids are present only in plant cells.

There are three main types of plastids:

1. Chloroplasts
2. Chromoplasts
3. Leucoplasts

1. Chloroplasts:

There are membrane-bound structures containing a green pigment (chlorophyll).

Size:

Chloroplasts vary in their shape and size with a diameter of about 4-6 μm .

Structure:

Under light microscope, they appear to be heterogeneous structures with small granules known as grana embedded in the matrix.

Under electron microscope, a chloroplast shows three main components:

- (a) Envelope (b) Stroma (c) Thylakoid

Envelope:

It is formed by a double membrane.

Stroma:

It covers most of the volume of the chloroplast.

Stroma is a fluid which surrounds the thylakoids. It contains proteins, ribosomes and a small circular DNA. In this part, CO_2 is fixed to sugars. Dark reactions of photosynthesis and some proteins are also synthesized here.

Thylakoids:

Thylakoids are the flattened vesicles which arrange themselves to form grana and intergrana. About 50 or more thylakoids piled to form one granum. Chlorophyll molecules are arranged on thylakoids membrane. Each granum is connected with others by non-green part called intergranum.

Membranes of the grana are the sites where light energy is trapped to form ATP.

Chlorophyll:

Green pigment in chloroplast is chlorophyll. Chlorophyll molecule resembles haem group of haemoglobin. The main difference between these, two molecules is that chlorophyll has Mg^{+2} while haem has Fe^{+2} as central atom.

(b) Discuss nutrition in insectivorous plants. (Any two) (4)

Ans For Answer see Paper.2017 (Group-II), Q.6.(b).