Inter (Part-I) 2021

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

SECTION-I

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

(i) What is chemical definition of carbohydrates? Give its general formulae.

Ans Chemically carbohydrates are defined as polyhydroxy aldehydes or ketones or complex substances which on hydrolysis yield polyhydroxy aldehyde or ketone sub-units.

General formulae: $C_x(H_2O)_y$

(ii) Define reversible inhibitors. Name its two types.

Ans They form weak linkages with the enzyme. Their effect can be neutralized completely or partly by an increase in the concentration of the substrate.

(i) Competitive inhibitors

(ii) Non-competitive inhibitors

(iii) Write the induce-fit-model of enzyme action.

Ans Koshland proposed Induce Fit Model. He argues that when a substrate combines with an enzyme, it induces changes in the enzyme structure. The change in structure enables the enzyme to problem its catalytic activity more effectively.

(iv) Write the function of penicillin and lovastatin.

Ans Penicillin is an antibiotic which is used against bacterial diseases. Lovastatin is used for lowering blood cholesterol.

(v) Name the fruiting body of Fungi, Ascomycota and Basidiomycota.

Ans The fruiting blody of Ascomycota is called ascocarps. The fruiting body of basidiomycota is called mushrooms.

(vi) Describe co-factor and co-enzyme.

Ans Some enzymes have a non-protein part, which is called as a co-factor. It is essential for the proper functioning of the enzymes.

If the non-protein part of loosely attached to the protein part, it is known as co-enzyme. Co-enzyme can be used again and again.

(vii) Define term protandrous and gemmule.

Ans The asexual reproduction in sponges takes place by budding. The internal buds are called **gemmules**.

Some sponge species reproduce sexually. These are mostly hermaphrodite, mostly protandrous, *i.e.*, male sex cells develop first.

(viii) What is archaeopteryx? Give its two characters.

Ans **Archaeopteryx:**

Archaeopteryx is a genus of bird-like dinosaurs that is transitional between non-avian feathered dinosaurs and modern birds.

Two Characters:

1. Body is streamlined and spindle-shaped with four divisions, viz; head, neck, trunk and tail. These are warm-blooded (homeothermic).
2. Limbs are adapted for flying. The forelimbs are modified into wings and hind-limbs for perching and in some birds for running as in ostrich.

(ix) Name two super classes of vertebrates. Give example.

Ans Following are two super classes of vertebrates:

1. **Pisces (fishes).** It includes cyclostomata, chondrichthyes and osteichthyes.
2. **Tetrapoda (Four-footed)**

It includes amphibia, reptilia, aves and mammalia.

(x) Write any four characters of class osteichthyes (Bony fish).

Ans **Class Osteichthyes: (Bony Fishes)**

Following are the characteristics of bony fishes:

1. They have more or less bony skeleton which has replaced the cartilaginous skeleton.
2. Notochord may persist in parts.
3. The skin has embedded dermal scales which may be ganoid, cycloid or ctenoid scales. No placoid scales.
4. Fins both, median (single) or paired and have fin rays of cartilage or bone.

(xi) What is Cytochrome? Give its role.

Ans Cytochromes are electron transport intermediates containing haem of related prosthetic groups, that undergo valency changes of iron atom. Haem is the same iron containing group that is oxygen carrying pigment in haemoglobin.

(xii) Define chemiosmosis.

Ans Chemiosomosis is the process that uses membranes to couple redox reactions to ATP production. Electron transport chain pumps protons (H^+) across the membrane of thylakoids in case of photosynthesis into the thylakoids space. The energy used for this pumping comes from the electrons moving through the electron transport chain.

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

(i) What is inductive reasoning? Give one example.

Ans The other way of reasoning used in the formulation of hypothesis is **inductive reasoning** which is reasoning from the specific to the general. It begins with specific observations, and leads to the formation of general principle. For instance, if we know that sparrows have wings and are birds, and we know that eagle, parrot, hawk, crow are birds, then we induce (draw conclusion) that all birds have wings.

(ii) Write briefly about 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) Why the plasma membrane is a differentially permeable membrane?

Ans Plasma membrane offers a barrier between the cell contents and their environment, allowing only selective

substances to pass through it. That is why, it is known as differentially permeable membrane.

(iv) Differentiate between microtubules and microfilaments.

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) Write two characters of Zooflagellates.

Ans Following are two characters of zooflagellates:

1. They are mostly unicellular organisms with spherical or elongated bodies with a single central nucleus.
2. They possess from one to many long, whip-like flagella that enable them to move.

(vi) Write the functions of micronucleus and macronucleus in ciliates.

Ans One or more small diploid micronuclei function in sexual process. A large polyploid macronucleus controls cell metabolism and growth.

(vii) Write two characters of euglenoids.

Ans Following are two characters of euglenoids:

1. They are closely related to zooflagellates.
2. They are plant-like in their pigments.

(viii) How does conjugation occur in ciliates?

Ans Most ciliates are capable of a sexual process called conjugation. During conjugation, two individual come together and exchange genetic material.

(ix) What is heterospory?

Ans In selaginella, the sporophyte have two kinds of sporangia *i.e.*, microsporangia and megasporangia. This condition is called heterospory.

(x) Define double fertilization. In which plants it occur?

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 evolutionany 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) What is apoplast pathway?

Ans **Apoplast pathway:**

It is the pathway involving system of adjacent cell walls, which is continuous throughout the plant roots. In the roots, apoplast pathway becomes discontinuous in the endodermis due to the presence of casparian strips.

(xii) Define imbibition in plants.

Ans Imbibition is the force in ascent of sap. Water molecules move along the cell walls of xylem vessels due to imbibition. The cell wall components, especially cellulose, pectin and lignin can take up water and increase in volume but the components do not dissolve in water, this is called imbibition.

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

(i) Define binomial system of nomenclature.

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.

(ii) What are microaerophilic bacteria? Give one example.

Ans Some bacteria require a low concentration of oxygen for growth and are known as microaerophilic bacteria.

Example: Campylobacter.

(iii) What are leguminous plants?

Ans **Leguminous plants** have nodules on their roots, which contain nitrogen fixing bacteria. The bacteria live on the plant material and fix nitrogen, converting it into nitrates, which the plant uses.

(iv) Differentiate between intracellular and extracellular digestion.

Ans **Intracellular digestion:**

They are involved in intracellular digestion since they have enzymes to digest the phagocytosed food particles.

Extracellular digestion:

They also help in extracellular digestion by releasing enzymes.

(v) What is antiperistalsis?

Ans **Antiperistalsis:**

Sometimes peristaltic movements are reversed and food may be passed from the intestine back into stomach and even into mouth. This movement is called antiperistalsis, leading to vomiting.

(vi) How aquatic plants obtain their oxygen?

Ans The aquatic plants obtain their oxygen by diffusion from dissolved oxygen in water.

(vii) What is a 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 larnyx.

(viii) What is diaphragm?

Ans The floor of the chest is called diaphragm. It is a sheet of skeletal muscles.

(ix) What is the main cause of lungs cancer?

Ans Smoking is the main cause of lungs cancer.

SECTION-II

NOTE: Attempt any Three (3) questions.

Q.5.(a) How biology has helped in increasing food production? (4)

Ans **Food Production:**

Food production has been tremendously increased in the following ways:

(i) **Plant breeding:** Plant breeders have developed through selective breeding new varieties of organisms that provide better sources of food than the original varieties. It has made hydroponics possible whereby plants can be cultivated in solution or moist material containing minerals, instead of growing in soil.

(ii) **Animal Breeding:** Animal breeders also have great success. The chicken, cow and sheep of today are much different animals from those available one hundred years ago.

(iii) **Poultry:** Poultry breeders have developed broilers for getting quick and cheap white meat.

(iv) **Food preservation:** Different techniques of food preservation have developed for protecting food from spoilage and for use and transport over long distances without damaging its quality. One of them is Pasteurization developed by Louis Pasteur. It is being widely used for preservation of milk and milk products.

(v) **Biological control:** Much of the improvement in food production has resulted from the control of plants and animals that compete with or eat the organisms we use as food. The biological control is a very important type of control as it does not involve any toxicity problems for the human beings nor it make the insects resistant to the means of control. In biological control, the pests are controlled by letting them be eaten by their predatory species *e.g.*, an aphid that attacks walnut tree is being controlled biologically by a wasp that parasitizes this aphid. Even some bacteria are being used as bio-

pesticides. The use of insecticide, therefore, is discouraged these days and the biological control is being revived.

(vi) **Genetic engineering and tissue culture techniques:** Genes of disease resistance and other desirable characters are introduced into plants by using the techniques of genetic engineering. Such transgenic plants (plants having foreign DNA incorporated into their cells) can be propagated by cloning (production of genetically identical copies of organisms/cells by asexual reproduction) using special techniques such as tissue culture techniques, etc.

(vii) **Hydroponic culture techniques:** Hydroponic culture technique is used to test whether certain nutrients is essential for plants 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 because it is expensive compared with growing crops in soil. Astronauts may use it for growing vegetables.

(b) Explain various functions of blood in human. (4)

Ans For Answer see Paper 2017 (Group-II), Q.5,(a).

Q.6.(a) Write short note on lipids. (4)

Ans **Lipids:** The lipids are a heterogeneous group of compounds related to fatty acids. They are insoluble in water but soluble in organic solvents, such as: ether, alcohol, chloroform and benzene. Lipids include fats, oils, waxes, cholesterol, and related compounds.

Properties:

(i) **Part of membranes:** Lipids as hydrophobic compounds are components of cellular membranes.

(ii) **Source of energy:** Lipids are also used to store energy. Because of higher proportion of C-H bonds and very low proportion of oxygen, lipids store double the amount of energy as compared to the same amount of any carbohydrate.

(iii) **Protection of organisms:** Some lipids provide insulation against atmospheric heat and cold and also act as waterproof material. Waxes, in the exoskeleton of insects, and cutin, an additional protective layer on the cuticle of epidermis of some plant organs *e.g.*, leaves, fruits, seeds, etc., are some of the main examples.

(b) Give detail of taxonomic status of fungi. (4)

Ans **Taxonomic Status of Fungi**

Taxonomic status of fungi has changed from that of a group of Plant Kingdom. Now they are placed in a separate kingdom "Fungi".

Plant-like characters: They resemble plants in some respects:

(i) They have cell wall.
(ii) They lack centrioles.
(iii) They are non-motile.

Animal-like characters: Fungi resemble, more animals than plants. They show following animal-like characters:

(i) Fungi are heterotrophs.
(ii) They lack cellulose in their cell wall and contain **chitin** – a nitrogen-containing polysaccharide also found in exoskeleton of arthropods. For this reason, some mycologists (scientists who study fungi) think that fungi and animals probably arose from a common ancestor.

Differences between Fungi and Animals:

Fungi are different from animals in following ways:

(i) Fungi have cell wall.
(ii) They are absorptive heterotrophs.
(iii) They are non-motile.

So fungi are neither plants nor animals.

Fungi -- different from all organisms

(i) **DNA studies:** Their DNA studies also confirms that they are different from all other organisms.
(ii) **Nuclear mitosis:** They show a characteristic type of mitosis, called **'nuclear mitosis'**. During nuclear

mitosis, nuclear envelope does not break; instead the mitotic spindle forms within the nucleus and the nuclear membrane constricts between the two clusters of daughter chromosomes. (In some fungi nuclear envelop dismantles late).

Conclusion:

As fungi are distinct from plants, animals and protists in many ways, they are assigned to a separate kingdom 'Fungi'.

Q.7.(a) Describe characteristics of cyanobacteria. (4)

Ans For Answer see Paper 2019 (Group-II), Q.7.(a).

(b) Elaborate evolution of seed habit in plants. (4)

Ans **Evolution of Seed Habit**

A review of the kingdom Plantae indicates that the seed-plants (spermatophytes) predominate over non-seed vascular plants.

One of the most significant events in the history of land plants was the development of seed habit. It was an important change in the reproductive system of the vascular plants which occurred approximately 390 million years ago. First complete seeds appeared approximately 365 million years ago during **late Devonian** times. Technically, a seed may be defined as a fertilized ovule. An **ovule** is an integumented indehiscent megasporangium. **Integuments** are specialized protective coverings around megasporangium which vary in number. All seed producing plants are called **spermatophytes**. Various steps involved in the evolution of seed habit are as follows.

1. Evolution of heterospory.
2. Retention and germination of megaspore within the megasporangium.
3. Development of protective layers around megasporangium.

4. Reduction to a single functional megaspore per sporangium.
5. Development of an embryo sac within the sporangium.
6. Modification of distal end of megasporangium for pollen capture.

1. Evolution of Heterospory:

Primitive vascular land plants produced one kind of spores, a condition called **homospory**. All groups of land plants up to **pteridophytes** are **homosporous**. During the early phase of evolution, some plant groups started producing two different types of spores, the smaller ones called **microspores** and the larger ones known as **megaspores**.

2. Retention and germination of megaspore within the megasporangium:

During the usual reproductive cycle in the heterosporous vascular land plants, the megaspores are used to be shed and dispersed soon after their formation in order to germinate into female gametophyte. However, in some plants (*e.g.*, Selaginella) the megaspore is not allowed to escape from megasporangium immediately after its formation. In others, the megaspore is permanently retained within the megasporangium. Here, within the confines of the megasporangium wall, the megaspore germinates to form egg containing female gametophyte.

3. Development of protective layers around megasporangium:

Some branch-like structures of sporophyte surrounding the megasporangium fused around the megasporangium to form protective envelop or **integument**. The megasporangium tightly locked by integuments becomes totally indehiscent. This important change led to the evolution and formation of the ovule, which is nothing but an integumented indehiscent

megasporangium. In this way, more protection is accorded to the egg-containing apparatus in terrestrial environment.

4. **Reduction to a single functional megaspore per sporangium:**

Each megaspore mother cell within a megasporangium used to produce four gametophytes. There was a competition for space and food among the four gametophytes. Soon the early vascular plants adopted a new strategy *i.e.,* only one megaspore is selected for further development into a healthy female gametophyte while the remaining three are aborted.

5. **Development of an embryo sac within the sporangium:**

The single healthy megaspore retained within the megasporangium germinates to form an egg containing female gametophyte called an **embryo sac**.

6. **Modification of distal end of megasporangium for pollen capture:**

When most of the structural and functional changes leading to the development of seed habit were completed, another important modification took place in the megasporangium, which was now integumented, indehiscent and permanently attached to the sporophyte. The distal end of the megasporangium became modified for capturing pollen (microspore containing male gametophyte).

Pollen after being trapped in the distal cavity of the megasporangium produces pollen tube which carry male gametes deep into the embryo sac to fertilize the egg, forming a zygote, that forms an embryo. The megasporangium (ovule) after fertilization is transformed into a seed, the integuments becoming the seed coats. The seed offers maximum degree of protection to a developing embryo under the unfavorable terrestrial environment. The development and evolution of seed

habit was a great success and a giant leap which ultimately enabled plants to colonize land permanently.

Q.8.(a) Describe infection cycle of HIV. (4)

Ans

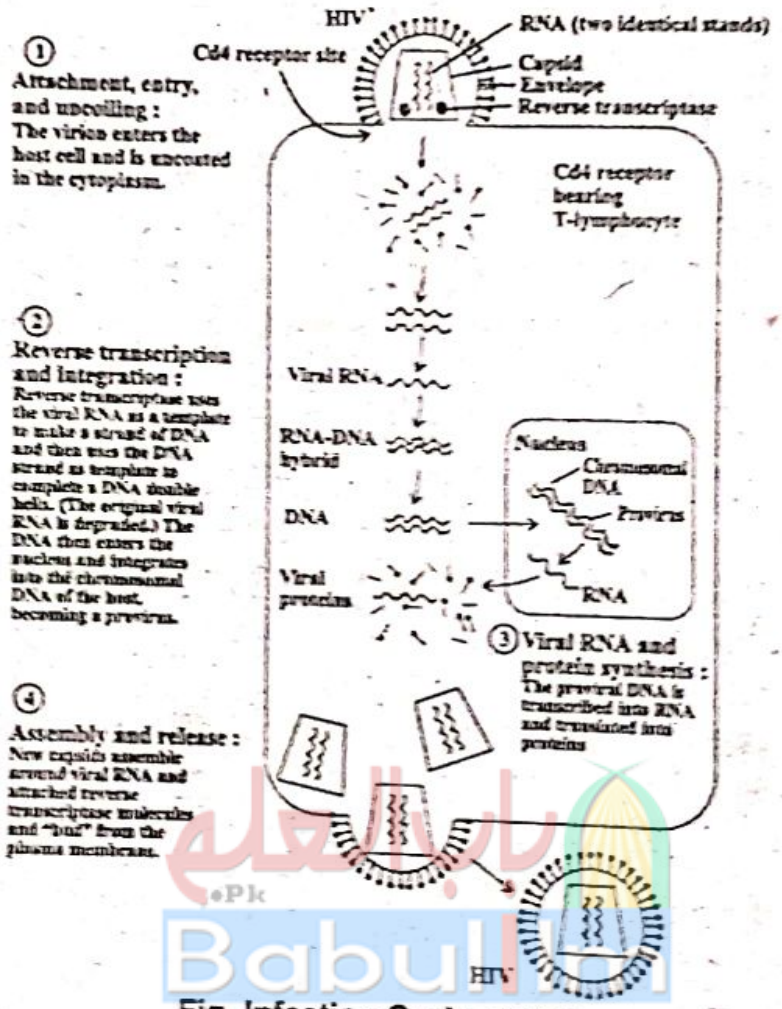

Fig. Infection Cycle of HIV.

(b) Draw and explain glycolysis in detail. (4)

Ans For Answer see Paper 2019 (Group-I), Q.8.(b).

Q.9.(a) Write a note on structure and function of plastids. (4)

Ans For Answer see Paper 2019 (Group-II), Q.9.(a).

(b) Write about food poisoning and obesity. (4)

Ans **Food Poisoning:**

This term indicates an illness from indigestion of food containing toxic substances. One of the commonest causes of food poisoning are the toxins produced by bacteria, Salmonella and Campylobacter. These bacteria live in the intestines of cattle, chicken and duck without causing disease symptoms. Humans, however, may develop food poisoning if they drink milk, eat meat or eggs, which are contaminated with these bacteria. The symptoms of food poisoning are diarrhoea, vomiting and abdominal pain. They occur from 12-24 hours after eating contaminated food. Infection is most likely, if unpasteurized milk is drunk or if meat is not properly cooked.

The liquid that escapes during defrosting frozen meat contains Salmonella bacteria. The dishes and utensils while the meat is defrosting must not be allowed to come in contact with any other food.

A severe form of food poisoning is **botulism**. This is caused by toxin produced by bacteria known as Clostridium botulinum. Botulism develops by the use of improperly canned or otherwise preserved foods, especially meat. The toxin produced by these bacteria is very powerful and has selective action on central nervous system, causing cardiac and respiratory paralysis. The early symptoms of this diseases are fatigue, dizziness, double vision, headache, nausea, vomiting, diarrhoea and abdominal pain.

Obesity:

It is the term employed when a person has abnormal amount of fat on the body. If one eats too much food than body requirement, the surplus is stored as fat so becomes overweight or **obese**. There is fat stored in adipose tissue in the abdomen, around the kidneys and under the skin. Certain cells accumulate drops of fat in their cytoplasm. As these drops increase in size and number, they join

together to form one large globule of fat in the middle of the cell, pushing the cytoplasm into thin layer and the nucleus to one side. Groups of fat cells form adipose tissue. Some people never seem to get fat no matter how much they eat, while others lay down fat when their intake only just exceeds their need. The explanation probably lies in the balance of hormones which, to some extent, is determined by heredity. An obese person is much more likely to suffer from high blood pressure, heart disease, diabetes mellitus, stomach disorder than a person who has normal body weight.