

**Sample Question Paper - 7**  
**Biology (044)**  
**Class- XII, Session: 2021-22**  
**TERM II**

*Time allowed : 2 hours*

*Maximum marks : 35*

**General Instructions :**

- (i) All questions are compulsory.
- (ii) The question paper has three sections and 13 questions. All questions are compulsory.
- (iii) Section–A has 6 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has a case-based question of 5 marks.
- (iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
- (v) Wherever necessary, neat and properly labeled diagrams should be drawn.

**SECTION - A**

1. Innate immunity provides the first line of defence against pathogen because it consists of different barriers to prevent the entry of foreign agents into our body. Explain the different barriers of innate immunity.
2. List the events that reduce the Biological Oxygen Demand (BOD) of a primary effluent during sewage treatment.

**OR**

- (a) “Bottled fruit juices are clearer as compared to those made at home”. Explain.
  - (b) Write the commercial use of product obtained from *Saccharomyces cerevisiae*.
3. State the functions of primary and secondary lymphoid organs in humans.
  4. Biofertilisers are the organisms that enrich the nutrient quality of the soil. Name two organisms belonging to two different kingdoms that are commonly used as biofertilisers and explain how?
  5. What is mutualism? Mention any two examples where the organisms involved are commercially exploited in agriculture.
  6. How do desert lizards cope with temperature variations in their environment? Explain.

**OR**

Tourists when visit Rohtang pass near Manali experience altitude sickness. List three symptoms of high altitude sickness and three adaptations to overcome it.

**SECTION - B**

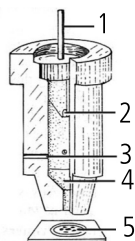
7. Name the causative organism, two symptoms and mode of transmission of ringworms.

**OR**

More and more children in metro cities of India suffer from allergies and asthma due to sensitivity to the changing environment. Name an allergen and write the response of the human body when exposed to it.

8. (a) What makes some viruses cause cancer in humans?  
(b) How do benign tumors turn malignant? How does the latter harm the human body?

9. Write any four ways used to introduce a desired DNA segment into a bacterial cell in recombinant technology experiments. Discuss any two methods.
10. (a) “India has greater ecosystem diversity than Norway”. Do you agree with the statement? Give reasons in support of your answer.  
(b) Write the difference between genetic biodiversity and species biodiversity that exists at all the levels of biological organisation.
11. Explain giving three reasons, why tropics show greatest levels of species diversity?
12. (a) Which instrument is shown in the given figure?



- (b) Identify the parts labelled 1, 2, 3, 4 and 5.
- (c) What is its use in gene transfer methods?

### SECTION - C

13. Unless the vector and source DNA are cut, fragments separated and joined, the desired recombinant vector molecule cannot be created.  
(a) How are the desirable DNA sequences cut?  
(b) Explain the technique used to separate the cut fragments.  
(c) How are the resultant fragments joined to the vector DNA molecule?

**OR**

Gene therapy is most recent and advanced therapeutic treatment of defective gene that has been diagnosed in a child/embryo. It involves insertion of normal healthy and functional gene into a person's cells and tissues to treat the disease and at the same time silencing the defective gene of individual. Correction of ADA deficiency is an example of gene therapy.

- (a) Expand the term ADA.
- (b) What is the role of this enzyme in the body? What is the cause of disorder?
- (c) Explain how gene therapy help patients with ADA deficiency.

## Solution

### BIOLOGY - 044

#### Class 12 - Biology

1. Innate immunity consist of four types of barriers. These are-

(i) Physical barriers: The skin on our body is the main barrier which prevents entry of the microorganisms. Mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tracts also help in trapping microbes entering our body.

(ii) Physiological barriers: The acid in the stomach, saliva in the mouth, tears from eyes - all prevent microbial growth.

(iii) Cellular barriers : Certain types of leukocytes of our body like polymorphonuclear leucocytes (PMNL-neutrophils), monocytes and natural killer cells (a type of lymphocytes) in the blood, as well as macrophages in tissues, can phagocytose and destroy microbes.

(iv) Cytokine barriers : Virus-infected cells secrete proteins called interferons which protect non-infected cells from further viral infection.

2. Secondary treatment or biological treatment of sewage considerably reduces the biological oxygen demand (BOD) of primary effluent during sewage treatment. The organic matter present in the effluent is decomposed with the help of microbial flora called as sewage fungus. The effluent is constantly agitated or aerated. This causes the growth of various aerobic microorganisms and sewage fungi. These microbes digest the organic matter thereby reducing the BOD of original sewage by 10-15%.

OR

(a) The fruit juices sold in market or bottled juices are treated with pectinases and proteases which makes them clearer than those made at home.

(b) Yeast (*Saccharomyces cerevisiae*) is used for commercial production of ethanol.

3. There are two types of lymphoid organs : primary lymphoid organs and secondary lymphoid organs. The primary lymphoid organs e.g., bone marrow and thymus where T lymphocytes and B lymphocytes, mature and acquire their antigen-specific receptors. After maturation, the lymphocytes migrate to secondary lymphoid organs, e.g., spleen and lymph nodes where they undergo proliferation and differentiation. The acquired immune response to antigens usually develops in these organs and become effector cells.

4. *Rhizobium* (Kingdom Monera) and *Glomus* (Kingdom Fungi) are commonly used as biofertilisers. *Rhizobium* forms symbiotic association with root nodules of leguminous plants. They fix nitrogen in the nodule which becomes available to the plant and to the soil.

*Glomus* forms mycorrhizal association with roots of higher plants which is mutually beneficial to both the partners. The fungus performs functions like:

(i) absorption of water

(ii) solubilisation of organic matter of soil humus

(iii) direct absorption of minerals from the soil

(iv) secretion of anti-microbial substances that protect the plant root from pathogenic attack.

In return it gets sugar and other food ingredients from the plant.

5. Mutualism is an interaction between two organisms of different species where both the partners are benefitted and the association is obligatory. E.g., : nitrogen fixation in root nodule of legume by *Rhizobium* bacteria and pollination of orchid flower *Ophrys* by bee.

6. Desert lizards lack the physiological ability that mammals have to deal with the high temperature. They keep their body temperature fairly constant by behavioural means. They enjoy in the sun and absorb heat when their body temperature drops below the comfort zone, but move into shade when the surrounding temperature starts increasing. Some species are capable of burrowing into the soil to hide and escape from too much heat.

OR

Atmospheric pressure is low at higher altitudes as compared to plains. When we go for a trek/trip on high altitude, then due to low atmospheric pressure our body does not get enough oxygen, as a result of which we experience nausea, fatigue and heart palpitation (altitude sickness). But by taking rest for first two days, body gets acclimatised to high altitude conditions. The body compensates low oxygen availability by increasing red blood cell production, thereby, decreasing binding capacity of haemoglobin and increasing breathing rate. Hence, we will automatically stop experiencing altitude sickness.

7. Ringworm is a fungal disease caused by dermatophytes, which include *Trichophyton*, *Microsporum* and *Epidermophyton*. Symptoms of ringworm are appearance of dry, scaly lesions on skin, nails, scalp. Ringworm infection is acquired by sharing towels or clothes or comb with infected person.

OR

Pollen grain is an allergen. Exposure to pollen causes hay fever. It is the form of allergy due to pollen of grasses, trees and other plants. It is characterised by inflammation of the membrane lining the nose and sometimes of the conjunctiva. The symptoms are sneezing, running nose and watering eyes due to histamine release.

8. (a) Cancer causing viruses are called oncogenic viruses. The genes of oncogenic viruses are known as viral oncogenes which could lead to oncogenic transformation of cells, causing cancer.

(b) Abnormal increase in number of cells in a tissue or organ forms a clone of proliferative cells. This excessive proliferation gives rise to a mass of cells which is initially known as benign tumor. The benign tumor cells sometimes enter into the blood vessels and migrate to other sites in the body where these cells continue to divide and start a new tumor there, such tumor cells are known as malignant cells and tumors are called malignant tumors. The malignant tumors are designated as cancer. The malignant tumors damage normal cells and compete with them for vital nutrients and disrupt the normal metabolism.

9. Four ways to form a desired DNA segment into a host cell are (i) Electroporation, (ii) Chemical mediated gene transfer (iii) Microinjection and (iv) biolistic gun.

(i) Electroporation : It is the formation of temporary pores in the plasma membrane of host cells by using lysozyme or calcium chloride. These pores are used for introduction of foreign DNA.

(ii) Microinjection : In this method, foreign DNA is directly injected into the nucleus of animal or plant cell by using microneedles or micropipettes.

10. (a) Yes, India has greater ecosystem diversity than Norway as India comes under the tropical region whereas, Norway lies in temperate region. Tropical regions account for greater biological diversity as they have deserts, rainforests, mangroves, coral reefs, wetlands, estuaries and alpine meadows than temperate

regions. In tropical region, more solar energy is available that also promotes higher productivity and increased biological diversity.

(b) Differences between genetic and species biodiversity are as follows :

	Genetic biodiversity	Species biodiversity
(i)	It is related to the number of genes and their alleles found in organisms.	It is related to number and distribution of species found in an area.
(ii)	It is trait of the species.	It is trait of a community.
(iii)	It influences the adaptability and distribution of a species in diverse habitats.	It influences biotic interactions and stability of the community.
(iv)	Example : India has more than 50,000 genetically different strains of rice and 1,000 varieties of mango.	Example : Western ghats have greater amphibian species diversity as compared to Eastern ghats.

11. The reasons for more species biodiversity in tropical latitudes are:

(i) Temperate region was subjected to frequent glaciations in the past, while tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification.

(ii) Tropical environments, unlike temperate ones, are less seasonal, relatively more constant and predictable. Such constant environments promote niche specialisation and lead to a greater species diversity.

(iii) There is more solar energy available in the tropics, which contributes to higher productivity; this in turn might contribute indirectly to greater diversity.

12. (a) The instrument shown is gene gun.

(b) (1) Firing pin, (2) DNA coated pellets (Microprojectiles) (3) Vent, (4) Stopping plate and (5) Target cells.

(c) Gene gun (or biolistic) method is a vectorless method of gene transfer in which tungsten or gold particles, coated with foreign DNA are bombarded into target cells at a very high velocity.

**13. (a)** Desirable DNA sequences are cut by the use of enzyme restriction endonuclease. When restriction enzymes cut the strand of DNA a little away from the centre of the palindromic sites, between the same two bases on the opposite strands, it leaves single stranded portions at the ends. This forms overhanging stretches called sticky ends on each strand. They are called sticky as they form hydrogen bonds with their complementary cut counterparts. The stickiness of the ends facilitates the action of the enzyme DNA ligase.

**(b)** After the cutting of DNA by restriction enzyme, fragments of DNA are formed. Separation of DNA fragments according to their size or length is done by a technique called agarose gel electrophoresis.

Since, DNA fragments are negatively charged molecules they can be separated by forcing them to move towards the anode under an electric field through a medium/matrix. Most commonly used matrix is agarose.

DNA fragments separate according to size through the pores of agarose gel. Hence the smaller, the fragment size, the farther it moves.

The separated DNA fragments can be seen only after staining the DNA with a compound known as ethidium bromide (EtBr) followed by exposure to UV radiation. The fragments are visible as bright orange coloured bands.

**(c)** DNA ligase help to join resultant fragments to the vector DNA molecule. DNA ligases join two individual fragments of double stranded DNA by the formation of phosphodiester bond between them.

**OR**

**(a)** ADA → Adenosine Deaminase Deficiency

**(b)** Adenosine deaminase enzyme is crucial for the immune system to function. This disorder is caused due to the deletion of the gene for adenosine deaminase.

**(c)** The first step towards gene therapy for an ADA deficient patient is extraction of lymphocytes. Lymphocytes, a kind of white blood cells, are extracted from the bone marrow of the patient and are grown in a culture outside the body. A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are reinjected to the patient's bone marrow.