

Sample Question Paper - 20
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. The barriers which prevent the entry of the foreign agents in the innate immunity are given in the following table. Identify a, b, c, and d.

Type of barrier		Barrier
(i)	Physical	Skin, <i>a</i>
(ii)	Physiological	<i>b</i> , in the eye
(iii)	<i>c</i>	Interferon
(iv)	Cellular	WBC, <i>d</i>

OR

The principle of immunisation is based on the property of 'memory' of the immune system. Name and explain the type of immunity that is provided by injecting microbes deliberately during immunisation into the human body.

- 2. (a) How is activated sludge formed during sewage treatment?
(b) This sludge can be used as an inoculum or as a source of biogas. Explain.
- 3. A and B are the two different cloning vectors in two different bacterial colonies cultured in chromogenic substrate. Bacterial colonies with cloning vector A were colourless whereas those with B were blue coloured. Explain giving reasons the cause of the difference in colour that appeared.
- 4. Ti plasmid isolated from a soil bacterium is called natural genetic engineer because genes carried by its plasmid produce effect in several parts of the plant. Name the source organism from which Ti plasmid is isolated. Explain the use of this plasmid in biotechnology.

OR

Write the functions of

- (a) *cryI*Ac gene
- (b) RNA interference (RNAi).

5. Name and describe the technique that helps in separating the DNA fragments formed by the use of restriction endonuclease.
6. Write the differences between genetic biodiversity and species biodiversity that exists at all the levels of biological organisation.

SECTION - B

7. (a) Name and explain giving reasons, the type of immunity provided to the newborn by the colostrum and vaccinations.
(b) Name the type of antibody
 - (i) present in colostrum
 - (ii) produced in response to allergens in human body.

OR

- (a) Name the lymphoid organ in humans where all the blood cells are produced.
 - (b) Where do the lymphocytes produced by the lymphoid organ mentioned above migrate and how do they affect immunity?
8. Why are genes encoding resistance to antibiotics considered useful selectable markers for *E. coli* cloning vector? Explain with the help of one example.
 9. Eli Lilly, an American company prepared two DNA sequences corresponding to A and B chains of human insulin and intro. Describe the various stages involved in gene transfer for the commercial production of human insulin by Eli Lilly.
 10. Predation is an interaction between members of two species in which one species capture, kill and eat up members of other species. Why is predation required in a community of different organisms?
 11. The accelerated rates of species extinctions that the world is facing now are largely due to human activities.
 - (a) Explain co-extinction as a cause of biodiversity loss with an example.
 - (b) What are the other major causes for biodiversity loss?
 12. White Bengal tigers are protected in special settings in zoological parks. Tiger reserves are maintained in Western Ghats.
 - (a) How do these two approaches differ from each other? Mention the advantages of each one.
 - (b) What is the significance of cryopreservation technique?

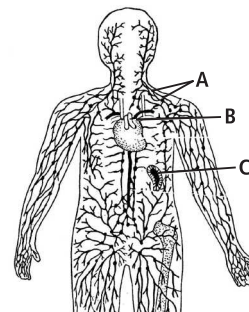
SECTION - C

13. Cancer is one of the most dreaded disease and can be treated successfully only if detected at an early age.
 - (a) Why do normal cells not show cancerous growth?
 - (b) Cancer can be treated successfully only if detected at an early stage.
How do the following help in detecting cancer?
 - (i) Biopsy, (ii) Histopathology, (iii) MRI

OR

Refer to the given figure and answer the following questions.

- (a) Name the parts labelled A, B and C.
- (b) What is the function of part labelled C?
- (c) What is the function of B?



Solution

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1. a – Mucous membrane
b – Lysozyme
c – Cytokine
d – Natural killer cells

OR

Artificial active immunity is the type of immunity that is provided by injecting microbes deliberately during immunisation into the human body. The microbes are injected through vaccines. Vaccine is a suspension of dead/weakened microbes of disease which when injected into healthy person provides artificial active immunity e.g., live BCG vaccine for tuberculosis, MMR vaccine for measles, mumps and rubella.

2. (a) Once the BOD of the waste matter is reduced to 10-15% of raw sewage, it is passed into settling tank where the bacterial flocs are allowed to undergo sedimentation. This sediment called activated sludge. (b) During the digestion of activated sludge through anaerobic sludge digesters, bacteria produce a mixture of gases such as methane, hydrogen sulphide and carbon dioxide which form biogas and can be used as a source of energy as it is inflammable.

3. Presence of the insert within a gene results in insertional inactivation of the enzyme β -galactosidase, hence bacterial colonies do not produce any colour. Therefore, bacterial colonies with cloning vector A are colourless as they are recombinants with the insert and bacterial colonies with cloning vector B are blue coloured as they are non-recombinants.

4. *Agrobacterium tumefaciens* is a soil-inhabiting bacterium that may invade growing plants at the junction of root and stem, where it can cause a cancerous growth known as a crown gall. *A. tumefaciens* contains Ti plasmid which carries gene for tumour formation. For using *Agrobacterium tumefaciens* as a cloning vector researchers deleted the genes which governs auxin and cytokinin production (the oncogene) from T-DNA of Ti plasmid. It is known as disarming. After disarming, this T-DNA is inserted into chromosomes of the host plant where it produces copies of itself.

OR

(a) *cryIAC* gene controls cotton bollworms in Bt cotton.

(b) RNA interference (RNAi) takes place in all eukaryotic organisms as a method of cellular defense. This method involves silencing of a specific mRNA.

5. 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

under the influence of an electrical field by a technique called agarose gel electrophoresis.

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 which are visible as bright orange coloured bands.

6. 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.

7. (a) Colostrum (mother's first milk) rich in IgA antibodies provides natural passive immunity to new born. In passive immunity, ready-made antibodies are directly injected into a person to protect the body against foreign agents.

Through vaccination, artificial active immunity will be provided to the newborn in which his own cells will produce antibodies in response to vaccine. E.g., BCG vaccine for tuberculosis.

(b) (i) IgA (ii) IgE

OR

(a) Bone marrow

(b) The lymphocytes produced migrate to secondary lymphoid organs like spleen, lymph nodes, tonsils, Peyer's patches of small intestine and appendix. The secondary lymphoid organs provide the sites for interaction of lymphocytes with the antigen, which then proliferate to become effector cells which then affect immunity.

8. Genes encoding resistance to antibiotics are considered useful selectable markers for *E. coli* cloning vector because they help in selecting transformant cell from non-transformant ones.

The genes encoding resistance to antibiotics such as tetracycline, ampicillin, kanamycin or chloramphenicol etc. are useful selectable markers for *E. coli*. The common *E. coli* cells are not resistant to any of these antibiotics. Plasmid pBR322 has two antibiotic resistance genes – ampicillin resistance (*amp^r*) and tetracycline resistance (*tet^r*) which are considered useful for selectable markers.

The presence of restriction sites within the markers *tet^r* and *amp^r* permits an easy selection for cells transformed with the recombinant pBR322. For example, insertion of the DNA fragment into the plasmid using enzyme PstI or PvuI places the DNA insert within the gene *amp^r*. this makes *amp^r* nonfunctional. Bacterial cells containing such a recombinant pBR322 will be unable to grow in the presence of ampicillin, but will grow on tetracycline.

9. The steps involved in the production of artificial insulin or humulin are as follows:

- (i) Isolation of donor or DNA segment – A useful DNA segment is isolated from the donor organism.
- (ii) Formation of recombinant DNA (rDNA) – Both the vector and donor DNA segments are cut in the presence of restriction endonuclease. In the presence of ligase DNA segments of both are joined to form rDNA.
- (iii) Production of multiple copies of rDNA – In this process multiple copies of this recombinant DNA are produced.
- (iv) Introduction of rDNA in the recipient organism – The rDNA is inserted into a recipient organism.
- (v) Screening of the transformed cells – The recipient (host) cells are screened in the presence of rDNA and the product of donor gene. The transformed cells are separated and multiplied.

10. Predators plays an important role in a community :

- (i) They act as conduits for energy transfer across trophic levels.
- (ii) Predators keep prey population under control. They are used for biological control of weeds and pests.
- (iii) Predators help in maintaining species diversity.
- (iv) They help in growth of vegetation by controlling population of herbivores.

11. (a) Co-extinction means that when a species become extinct, the plant and animal species associated with it in an obligatory relation also become extinct. For example the case of a coevolved plant-pollinator mutualism like in *Pronuba yuccaselles* and *Yucca* where extinction of one invariably leads to the extinction of the other.

(b) The four causes of biodiversity loss are –

- (i) Habitat loss and fragmentation

(ii) Over-exploitation

(iii) Alien species invasions

(iv) Co-extinctions.

12. (a) In zoological parks, White Bengal tigers are protected outside their natural habitats. It is the mode of *ex situ* conservation. Animals are kept under human supervision and are protected against all adverse factors. Western ghats are hot-spots, *i.e.*, areas of high endemism and high level of species richness. It is a mode of *in-situ* conservation. Endangered species in Tiger reserves are conserved in their natural habitat. These are protected from predators.

(b) Cryopreservation is *ex-situ* conservation technique in which tissues, organs, embryos, seeds etc. are stored at very low temperature of –196°C. At this temperature the living material can be stored indefinitely in compact, low maintenance refrigeration units. It can be revived as and when required. In order to prevent extinction, endangered organisms are being cryopreserved so that they can be revived to help in conservation.

13. (a) Normal cells have a limited life span. Their production is regulated in such a manner that number of given cell type remains nearly constant. These cells also show property of contact inhibition, which inhibit their uncontrolled growth.

(b) (i) Biopsy is a procedure wherein a sample of tissue is taken from the body in order to examine it more closely in a laboratory for presence of any malignancy.

(ii) Histopathology is the diagnosis and study of diseases of the tissues and involves examining of the tissues and/or cells under a microscope.

It helps in diagnosis of abnormal growth in cells of a tissue.

(iii) MRI or magnetic resonance imaging is very helpful to detect cancer of the internal organs. It is a medical imaging technique used in radiology to form pictures of anatomy and the physiological processes of the body. MRI scanners use strong magnetic fields and radio waves to generate images of the organs of the body.

OR

(a) A - Lymph nodes

B - Thymus

C - Spleen

(b) 'C' refers to spleen. Spleen is a bean shaped organ which is the largest single mass of lymphoid tissue in the body. In foetus, it produces all types of blood cells but in adult, it only produces lymphocytes. Macrophages of spleen are phagocytic.

(c) B refers to thymus. Thymus is the site of T-lymphocyte maturation. Therefore, thymus helps in cellular immune response. It is situated near the heart and is quite large in size at the time of birth but keeps reducing with age.