

Sample Question Paper - 10
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. How does haemozoin affect the human body when released in blood during malarial infection?
2. Mention the importance of lactic acid bacteria to humans other than setting milk into curd.
3. Name bioactive molecules from fungus and yeast respectively. Write one medical use of each one of these.
4. (a) Name the types of acquired immune responses and the special types of lymphocytes involved in providing them.
(b) Name the most abundant class of immunoglobulins (Igs) in the body.

OR

A boy of ten years had chicken-pox. He is not expected to have the same disease for the rest of his life. Mention how it is possible.

5. Many species share a habitat and the interactions between them play a major role in regulating population growth and abundance. Name and explain the interaction, that is seen between clownfish and sea anemones.
6. Pollinating species of wasps show mutualism with specific fig plants. Mention the benefits the female wasps derive from the fig trees from such an interaction.

OR

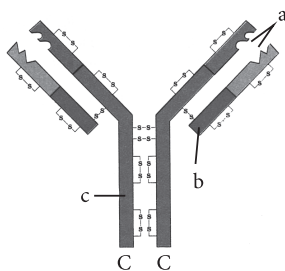
Amoeba cannot survive in marine environment. Explain.

SECTION - B

7. Write the events that take place when a vaccine for any disease is introduced into the human body.



OR



Identify a, b and c in the schematic diagram of an antibody given above and answer the questions.

- (a) Write the chemical nature of an antibody.
 - (b) Name the cells that produce antibodies in humans.
 - (c) Mention the type of immune response provided by an antibody.
8. Name one air borne and a water borne disease in humans. List one specific symptom of each one of them.
9. Describe the roles of (a) high temperature, (b) primers in carrying the process of polymerase chain reaction.
10. Why are sacred groves highly protected?
11. Explain, taking one example, the effect of co-extinction on biodiversity.
12. Name the organism from where the thermostable DNA polymerase is isolated. State its role in genetic engineering.

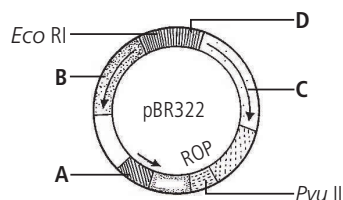
SECTION - C

13. If a desired gene is identified in an organism for some experiments, explain the process of the following :

- (a) Cutting of desired gene at specific locations.
- (b) Synthesis of multiple copies of the desired gene.

OR

Refer to the given figure and answer the following questions.



- (a) What are the characteristics of given vector?
- (b) Identify the labelled part A and give its significance.
- (c) What does B, C and D represent?
- (d) Name the unique recognition sites present in B and C.



Solution

BIOLOGY - 044

Class 12 - Biology

1. Haemozoin is a toxic substance released by rupturing of RBCs into blood during malarial infection. It causes chill and high fever recurring every 3-4 days.

2. Lactic acid bacteria is beneficial to us in the following ways other than helping in curdling of milk:

(i) Increases nutritional quality of curd by increasing vitamin B₁₂ content.

(ii) Checks the growth of disease-causing microbes in the gut.

3. Cyclosporin A is obtained from fungus *Trichoderma polysporum* whereas statin is obtained from yeast *Monascus purpureus*.

Cyclosporin A has immunosuppressive properties. It inhibits activation of T cells and therefore prevents rejection of transplants.

Statin inhibits cholesterol synthesis and is therefore used in lowering blood cholesterol.

4. (a) Immune responses are of two types - primary and secondary. T-lymphocytes are involved in immune responses.

(b) IgG

OR

A body when encounters a pathogen (in this case chicken pox) for first time produces antibodies, that results in memory of the first encounter to protect the body in future from the same disease.

5. Commensalism is the interaction between clownfish and sea anemone. The clownfish lives among the stinging tentacles of sea anemone and gets protection from its predators which stay away from the stinging tentacles. The sea anemone does not appear to derive any benefit by hosting the clownfish.

6. Many species of fig trees have mutual relationship with the pollinator species of wasp. A fig species can be pollinated only by its partner wasp species and not by other species. The female wasp uses the fruit not only as an oviposition (egg laying) site but also uses the developing seeds within the fruit for nourishing its larvae. The wasp pollinates the fig inflorescence while

searching for suitable egg-laying sites. In return the fig offers the wasp some of its developing seeds as food for the developing wasp larvae.

OR

Amoeba is a freshwater animal. If it is placed in marine environment, then it will not be able to survive because of osmoregulation problem. The freshwater animal is adapted to live in fresh environment, so, if it is kept in saline water, it will not be able to cope with outside hypertonic environment and it would face death.

7. In vaccination, a preparation of antigenic proteins of pathogens or weakened pathogen is introduced into the body. These antigens generate the primary immune response and the memory B and T cells. When the vaccinated person is attacked by the same pathogen again, the existing memory T or B cells recognise the antigen quickly and attack the invaders with massive production of lymphocytes and antibodies.

OR

In the given structure of an antibody molecule, 'a' is the antigen binding site, 'b' is constant region of light chain and 'c' is constant region of heavy chain.

(a) Antibodies are protein in nature.

(b) B-cells produce antibodies.

(c) Humoral immune response is an antibody mediated immune response.

8. Influenza caused by *Orthomyxovirus* is an air borne disease. It is caused by droplet infection. Person suffering from influenza experiences headache and fever.

Typhoid caused by bacterium *Salmonella typhi* is a water borne disease. It is transmitted through faecal oral route. Patient suffering from typhoid has high fever and feels abdominal pain.

9. In the process of PCR (polymerase chain reaction), the role of high temperature and primer is as follows:

(a) High temperature : During high temperature denaturation step takes place. In this step, the target DNA is heated to a high temperature (94° to 96°C) resulting in the separation of two strands.



(b) Primers : During annealing, the two oligonucleotide primers anneal to each of the ssDNA template since the sequence of the primers is complementary to the 3' ends of the template DNA. Presence of primer is important for polymerisation to take place. Temperature (40°C – 60°C) is kept low depending on the length and sequence of primers.

10. Sacred groves are forest patches around places of worship, held in high esteem by tribal communities. They are most undisturbed forest patches which are often surrounded by highly degraded landscapes. Not a single branch is allowed to be cut from these forests and as a result, many endemic species which are rare or have become extinct elsewhere can be seen to flourish here. *E.g.*, Jaintia and Khasi hills in Meghalaya.

11. 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 co-evolved plant-pollinator mutualism like in *Pronuba yuccaselles* and *Yucca* where extinction of one invariably leads to the extinction of the other.

12. *Taq* DNA polymerase isolated from thermophilic bacterium *Thermus aquaticus* synthesises the DNA region from gene of interest between the primers, using dNTPs (deoxynucleotide triphosphates) and Mg^{2+} . The primers are extended towards each other so that the DNA segment lying between the two primers is copied. It is stable even at high temperatures.

13. (a) Restriction endonuclease such as *EcoRI*, *HindIII*, *BamHI* acts as molecular scissors or chemical scalpels. They serve as the tools for cutting DNA molecules at specific palindromic sites, which is the basic requirement for gene cloning or recombinant DNA technology.

(b) Polymerase chain reaction (PCR) is a technique of synthesising multiple copies of the desired gene (DNA segment) in vitro. The basic requirements of PCR are

DNA template, two oligonucleotide primers usually 20 nucleotides long, dNTPs and DNA polymerase which is stable at high temperature (usually *Taq* polymerase). Working mechanism of PCR is as follows :

(i) **Denaturation** : the target DNA (DNA segment to be amplified) is heated to high temperature (94°C). Heating results in the separation of two strands of DNA. Each of the two strands of the target DNA now act as template for synthesis of new DNA strand.

(ii) **Annealing** : During this step, two oligonucleotide primers hybridise to each of single stranded template DNA in presence of excess of synthetic oligonucleotides.

(iii) **Extension** : During this step, the enzyme DNA polymerase synthesises the DNA segment between the primers. *Taq* DNA polymerase, isolated from a thermophilic bacterium *Thermus aquaticus*, is used in most of the cases. This step requires presence of deoxynucleotide triphosphates (dNTPs) and Mg^{2+} and occurs at 72°C.

OR

(a) The given figure is of plasmid vector pBR322. It is an extra-chromosomal, self-replicating, usually circular, double stranded DNA molecules found naturally in many bacteria and some yeast.

(b) Labelled part A represents origin of replication (*ori*). It is a specific sequence of DNA bases which is responsible for initiating replication.

(c) B - Ampicillin resistance gene, C-Tetracycline resistance gene, D - Cleavage site. B and C are antibiotic resistance genes which are useful as selectable markers. These help in selecting transformants (host cells containing vectors) from non - transformants. D is the recognition site for restriction enzyme.

(d) The recognition sites for enzymes *Pst* I and *Pvu* I are present in the ampicillin resistant gene (B) and recognition sites for enzymes *Bam* HI and *Sal* I are present within tetracycline resistant gene (C).

