Sample Question Paper - 12
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. To which category of cells do B-cells and T-cells belong? How do they differ from each other with reference to their formation and response to antigens?

2. Given below is a list of four microorganisms. State their usefulness to humans.

(a) *Nucleopolyhedrovirus*

(b) *Saccharomyces cerevisiae*

(c) *Monascus purpureus*

(d) *Trichoderma polysporum*

OR

Explain process of production of activated sludge during sewage treatment.

3. Explain any three methods to force 'alien' or recombinant DNA into host cells.

4. Name the source and the types of *cry* genes isolated from it for incorporation into crops by biotechnologists. Explain how have these genes brought beneficial changes in the genetically modified crops.

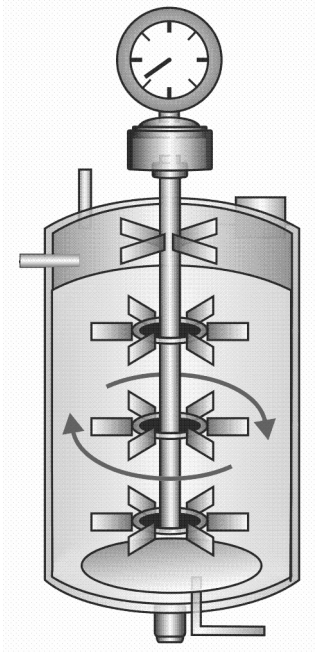
5. **(a)** When and why do some animals like frogs hibernate?

(b) When and why do some animals like snails go into aestivation?

6. A recombinant DNA is formed when sticky ends of vector DNA and foreign DNA join. Explain how the sticky ends are formed and get joined.

OR

Name the type of bioreactor shown. Write the purpose for which it is used.



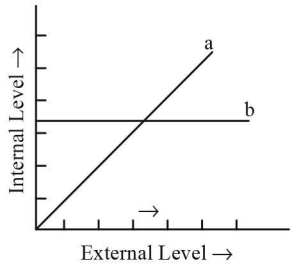
SECTION - B

7. **(a)** List any two situations when a medical doctor could recommend injection of preformed antibodies into the body of a patient. Name this kind of immunization and mention its advantages.

(b) Name the kind of immunity attained when instead of antibodies weakened antigens are introduced into the body.

8. Giving two reasons explain why there is more species biodiversity in tropical latitudes than in temperate ones.

9. The following graph represents the organismic response to certain environmental condition (*e.g.*, temperature) :



(a) Which one of these, 'a' or 'b', depicts conformers?

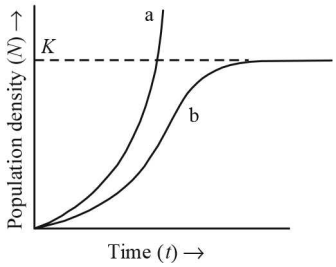
(b) What does the other line graph depict?

(c) How do these organisms differ from each other with reference to homeostasis?

(d) Mention the category to which humans belong.

OR

Study the population growth curves in the graph given below and answer the questions which follow:



(a) Identify the growth curves 'a' and 'b'.

(b) Which one of them is considered a more realistic one and why?

(c) If $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$ is the equation of the logistic growth curve, what does *K* stand for?

(d) What is symbolised by *N*?

10. **(a)** Why are transgenic animals so called?

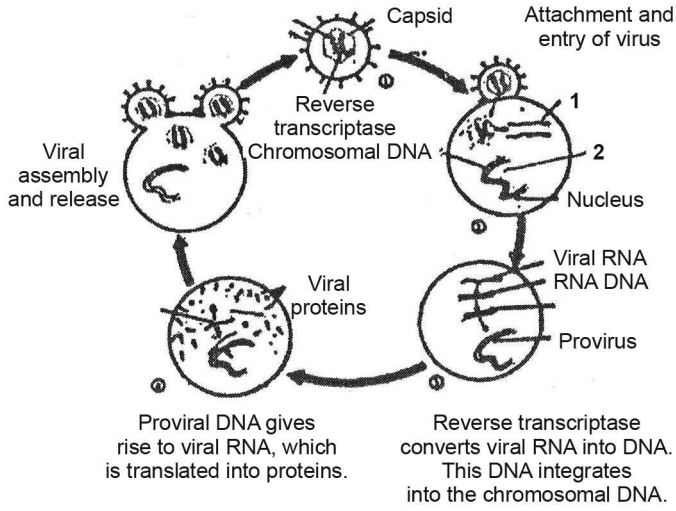
(b) Explain the role of transgenic animals in (i) vaccine safety and (ii) biological products with the help of an example each.

11. Name the technique to obtain multiple copies, of a DNA segment of interest, synthesised *in vitro*. Mention three diagnostic applications of this technique.

12. What is meant by the term 'hotspot' in biodiversity? List two criteria used for determining a hotspot. Name two hotspots of India.

SECTION - C

13. **(a)** The diagram below illustrates the attack of a virus on a host cell.



(i) Name the parts numbered 1 and 2.

(ii) Describe the functions performed by the part labelled number 1 on its entry into host cell.

(iii) What are such viruses called?

(iv) Name any two human diseases caused by such viruses.

(b) Write the full name of human disease in which the body loses its general immunity towards infections. How is the disease transmitted? Give any two methods.

OR

(a) What happens to a normal cell in a body when oncogenes get activated under certain conditions?

(b) Which techniques are useful to detect cancer of internal organs?

(c) Why are cancer patients often given α-interferon during their treatment?

Solution

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Class 12 - Biology

1. B-cells and T-cells belong to the category of lymphocytes. B-cells and T-cells are formed in the bone marrow but B-cells are differentiated in bone marrow while T-cells are differentiated in thymus. B-cells produce antibodies to kill the antigens while T-cells produce killer T-cells, helper T-cells and suppressor T-cells to fight with antigens.

2. **(a)** *Nucleopolyhedrovirus* : It is a baculovirus which is an effective biocontrol agent as it is useful in controlling many insects and other arthropods. It serves as species specific narrow spectrum bioinsecticide.

(b) *Saccharomyces cerevisiae* : It is used to ferment dough, in order to make bread. It is also used for the preparation of ethanol.

(c) *Monascus purpureus* : Its fermentation activity produces statins which inhibit cholesterol synthesis and is therefore used in lowering blood cholesterol.

(d) *Trichoderma polysporum* : It is a fungus that produces cyclosporin A, which is used as immunosuppressive agent in organ transplantation.

OR

The aerobic microbes consists of micro algae (*Chlorella pyrenoidosa*), micro-fungi, bacteria and protozoa. These aerobes grow in "flocs" and consume a major part of organic matter so that the BOD of sewage is reduced. Now the effluent is passed through a sedimentation tank where microbial flocs are allowed to settle down. The settled material is called 'activated sludge'.

3. The three methods which force 'alien' or recombinant DNA into host cells are: electroporation, $CaCl_2$ treatment and microinjection.

Electroporation : In this method, electrical impulses induce transient pores in the plant cell membrane through which the DNA molecules are incorporated into the plant cells.

$CaCl_2$ treatment: Treating cells with a specific concentration of a divalent cations, such as calcium cell increases the efficiency with which DNA enters the cell through pores in its cell wall. Recombinant DNA (rDNA) can then be forced into such cells by incubating the cells with recombinant DNA on ice, followed by placing them briefly at 42°C (heat shock), and then putting them back on ice. This enables the cells to take up the recombinant DNA.

Microinjection : It is the introduction of foreign gene into plant cell or animal cell by using microneedles or micropipettes.

4. Source of *cry* gene is *Bacillus thuringiensis*. *cryIAc*, *cryIIAb*, *cryIAb*, are types of *cry* genes isolated from it. The introduction of *cry* gene acts as biopesticide. The *cry* gene produces crystals of toxic insecticidal protein. The activated toxin causes death of the insect. In this way, *cry* genes make the crop plant insect-pest resistant.

5. **(a)** When animals are exposed to low temperatures, hibernation is necessary for cold-blooded animals like frogs to prevent their metabolic rate getting slow down.

(b) When animals like snails are exposed to lethal high temperatures, they go into aestivation to avoid the heat of summer.

6. Restriction enzymes cut the strand of DNA a little away from the centre of the palindrome sites, but between the same two bases on the opposite strands. This leaves single stranded portions at the ends producing over-hanging stretches called sticky ends on each strand. These are named so because they form hydrogen bonds with their complementary cut counterparts. This stickiness of the ends facilitates the action of the enzyme DNA ligase.

OR

The figure of simple stirred tank bioreactor is shown. It is a type of culturing method which produces a larger biomass to get higher yields of desired protein. It provides the optimal conditions for achieving the desired product by providing optimal growth

conditions (temperature, pH, substrate cells, oxygen). Stirred tank bioreactor is cylindrical with curved base to facilitate the mixing of reactor contents.

7. **(a)** If a person is infected with some deadly microbes to which quick immune response is required as in tetanus, we need to directly inject the preformed antibodies or antitoxin. Even in the cases of snakes bites the injection which is given to the patients, contain preformed antibodies against the snake venom. This type of immunisation is called passive immunisation. It provides immediate relief but may cause some problems.

(b) In vaccination, a preparation of antigenic proteins of pathogens or inactivated weakened pathogens are introduced into the body. This produces immune response and the type of immunity is called passive immunity.

8. There is more species biodiversity in tropical latitudes than in temperate one because :

(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.

9. **(a)** Line 'a' depicts conformers.

(b) The line graph 'b' depicts regulators.

(c) Regulators are able to maintain homeostasis by physiological means which ensures constant body temperatures. On the contrary, conformers do not have the ability to maintain homeostasis, instead their body temperature changes with ambient temperature.

(d) Humans belong to the category of regulators.

OR

(a) Growth curve 'a' represents the J-shaped or exponential growth; 'b' represents S-shaped or logistic growth.

(b) The logistic growth is more realistic since resources for growth for most animal populations become limiting sooner or later.

(c) *K* denotes the carrying capacity.

(d) *N* is the population density at a time t.

10. **(a)** The animals that contain gene or genes usually from an unrelated organism incorporated into them through genetic engineering are called transgenic animals. The incorporated foreign genes are called transgenes (to denote transferred genes) and hence the animals having them are called transgenic animals.

(b) **(i)** Transgenic animals in vaccine safety : Vaccines can be tested for their safe use on transgenic animals prior to their release and selling for human use *e.g.,* transgenic mice are used to test the safely of polio vaccine.

(ii) Transgenic animals in obtaining biological product: Medicines required to treat certain human diseases may contain biological products that are often expensive to make. Our body may need external supply of certain biological products for better growth. Transgenic animals can be made to produce such products. *E.g.* First transgenic cow Rosie produced human alpha lactalbumin rich milk which is a more balanced product for human babies than natural cow milk.

11. Polymerase chain reaction (PCR) is a technique of synthesizing multiple copies of the desired gene (DNA) *in vitro*. This technique was developed by Kary Mullis in 1985.

Applications of PCR :

(i) Diagnosis of pathogens

(ii) Diagnosis of specific mutations

(iii) DNA fingerprinting

(iv) In prenatal diagnosis

(v) In gene therapy.

12. Hotspots are those regions of rich biodiversity which have been declared sensitive due to direct or indirect interference of human activities. The two main criteria for determining a hotspot are:

(i) Number of endemic species

(ii) Degree of threat in terms of habitat loss.

The two hotspots of India are Eastern Himalayas and Western Ghats.

13. (a) (i) 1 is viral RNA and 2 is provirus.

(ii) Viral RNA initiates the formation of viral DNA in the host.

(iii) Retroviruses

(iv) Cancer, AIDS

(b) In AIDS or acquired immuno deficiency syndrome the body loses its general immunity towards infections. It is transmitted by : (i) blood transfusion of AIDS patient, (ii) sexual contact with AIDS patient.

OR

(a) When cellular oncogenes or proto-oncogenes are activated under certain conditions in normal cells in a body, they could lead to oncogenic transformation of the cells. Transformation of normal cells into cancerous neoplastic cells may be induced by physical, chemical or biological agents also.

(b) Techniques like radiography (use of X-rays), CT (computed tomography) and MRI (magnetic resonance imaging) are very useful to detect cancers of the internal organs. Computed tomography uses X-rays to generate a three-dimensional image of the internals of an object. MRI uses strong magnetic fields and non-ionising radiations to accurately detect pathological and physiological changes in the living tissue.

(c) Cancer patients are often given α-interferon during their treatment, because these biological response modifiers activate the immune system, and help in destroying the tumour.