

Sample Question Paper - 6
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. A team of students is preparing to participate in the interschool sports meet. During a practice session you find some vials with labels of certain cannabinoids.
 - (a) Will you report to the authorities? Why?
 - (b) Name a plant from which such chemicals are obtained.
 - (c) Write the effect of these chemicals on human body.
2. Various bioactive molecules have been produced through microbial action. Given table shows different organic acids and enzymes produced commercially for industrial and medical use and identify labels P–S.

	Bioactive molecule	Microbe	Function
1.	Citric acid	P	Added to jams, jellies and soft drinks as preservative.
2.	Q	<i>Clostridium butyricum</i>	Rancidity of butter.
3.	Proteases	<i>Bacillus subtilis</i>	R
4.	Tissue Plasminogen Activator	<i>Streptococcus</i>	S

OR

Bioinsecticides are living organisms or their products which are able to kill or repel specific insects.

- (a) Name any two predators which can control scale insects or aphids pests of vegetables.
 - (b) Name commercial bioinsecticide obtained from *Bacillus thuringiensis*.
 - (c) Name any two natural insecticides.
3. State the role of thymus as a lymphoid organ. Name the cells that are released from it and mention their function.
 4. How do methanogens help in producing biogas?
 5. Interspecific interaction arise from the interaction of populations of two different species. Name and explain the type of interaction that exists in mycorrhizae and between cattle egret and cattle.
 6. Why do we experience shivering during winters when the temperature is very low?



OR

Mention how have plants developed mechanical and chemical defence against herbivores to protect themselves with the help of one example of each.

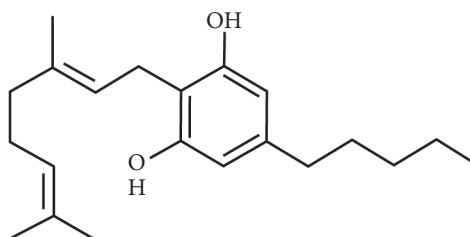
SECTION - B

7. "Malaria is caused by a tiny protozoan *Plasmodium*."

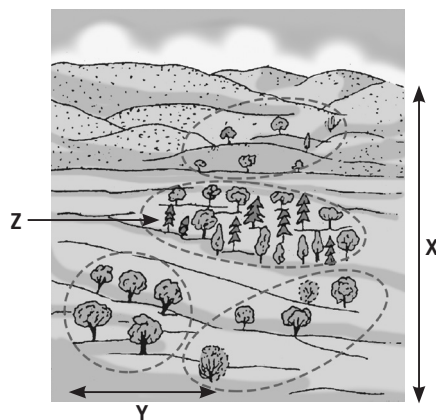
- (a) State what happens in the human body when malarial parasites infected RBCs burst to release the parasites in the blood.
- (b) Mention the specific sites in the host body where production of
 - (i) sporozoites and
 - (ii) gametocytes takes place in the life cycle of the malarial parasites.

OR

- (a) It is generally observed that the children who had suffered from chicken-pox in their childhood may not contract the same disease in their adulthood. Explain giving reasons the basis of such an immunity in an individual. Name this kind of immunity.
 - (b) What are interferons? Mention their role.
8. Given below shows a chemical structure of a molecule which are naturally obtained from the inflorescence of a plant.



- (a) Name the plant from which such chemicals are obtained.
 - (b) Write the effect of these chemicals on human body.
9. Why has a bacterium to first become 'competent' to be able to take up DNA? Explain how it become 'competent' and takes in the recombinant DNA.
10. Ecological diversity is the diversity at community and ecosystem levels. They represent the local, unique habitat and regional components of species diversity.

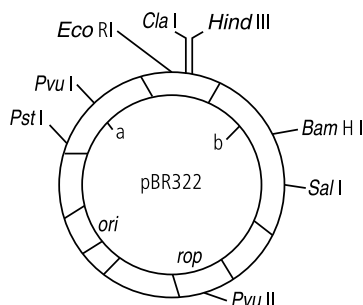


- (a) Define ecosystem diversity.
- (b) Identify X, Y and Z perspectives of diversity.

11. "Alien species are highly invasive and are a threat to indigenous species". Substantiate this statement with any three examples.
12. Prepare a flow chart in formation of recombinant DNA by the action of restriction endonuclease enzyme *EcoRI*.

SECTION - C

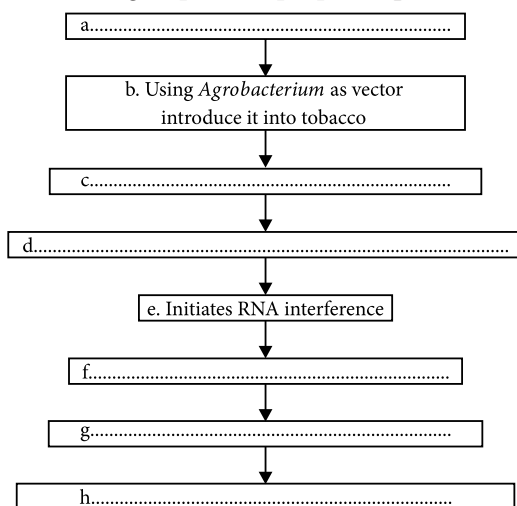
13. (a) Selectable markers help in identifying and eliminating non-transformants and selectively permitting the growth of the transformants. Identify the selectable markers (a, b) in the diagram of *E. coli* vector shown below.



- (b) How is the coding sequence of β -galactosidase considered a better marker than the ones identified by you in the diagram? Explain.
- (c) *EcoRI* is a restriction endonuclease. How is it named so? Explain.

OR

Two of the steps involved in producing nematode resistance tobacco plants based on the process of RNAi are mentioned below. Write the missing steps in its proper sequence.



Solution

BIOLOGY - 044

Class 12 - Biology

1. (a) Yes, I will report to authorities because cannabinoids are drugs and drug abuse is an illegal practice.

(b) *Cannabis sativa*

(c) Cannabinoids alter thoughts, feelings and perceptions. These drugs cause illusions.

2. P - *Aspergillus niger*

Q - Butyric acid

R - Chill proofing of alcoholic drinks

S - Clot buster

OR

(a) Lady bug and Praying mantis

(b) Thuricide

(c) Azadirachtin and Pyrethrin

3. Thymus is a primary lymphoid organ where the maturation of T-lymphocytes takes place. Thymus is quite large in size at the time of birth but it atrophies with age.

T-lymphocytes are released from thymus. These cells provide cell-mediated immunity and defend against pathogens including protists and fungi that enter the cells.

4. Methanogenic bacteria or methanogens are the group of anaerobic microbes which digest organic mass as well as aerobic microbes of the sludge to produce a mixture of gases containing methane, H_2S and CO_2 called biogas.

5. Mycorrhiza is a mutualistic interaction between fungus and roots of higher plants. The root provides food and shelter to the fungus. The fungus helps the plant in solubilisation and absorption of minerals, water uptake and protection against pathogenic fungi. The egret and grazing cattle in close association is an example of commensalism. The egrets always forage close to where the cattle are grazing because the cattle, as they move, stir up and flush out insects from the vegetation that otherwise might be difficult for the egrets to find and catch.

6. When the ambient temperature is very low, our body starts shivering. It is an exercise that raises body temperature and helps to maintain constant internal body temperature at about $37^\circ C$, by mechanism of homeostasis.

OR

Plants cannot run away from their predators or herbivores. They therefore have evolved an astonishing

variety of morphological (mechanical) and chemical defences against herbivores. Thorns and spines (*Acacia*, Cactus) are the most common morphological means of defence. Many plants produce and store chemicals that make the herbivores sick when eaten, inhibit feeding or digestion, disrupt its reproduction or even kill it. E.g. *Calotropis* produces highly poisonous cardiac glycosides to prevent herbivory.

7. (a) When RBCs infected with malarial parasites burst, they release toxin called haemozoin which causes chill and high fever recurring every three or four days.

(b) (i) Production of sporozoites occurs in female *Anopheles* mosquito, inside oocyst on the surface of stomach.

(ii) Gametocytes formation takes place in human host inside RBCs.

OR

(a) Children who had suffered from chicken-pox may not contract the same disease in their adulthood because of development of memory cells. These type of cells develop during first encounter with the pathogen. Memory cells are highly specific and may remain in body for decades. Subsequent encounter with the same pathogen elicits a highly intensified secondary or anamnestic response. This type of immunity is known as acquired natural active immunity.

(b) Interferons are the proteins produced by virus infected cells. They protect non-infected cells from further viral infection.

8. (a) Natural cannabinoids are obtained from the inflorescences of the plant *Cannabis sativa*

(b) Cannabinoids alter thoughts, feelings and perceptions. These drugs cause illusions and may affect our cardiovascular system if inhaled or taken orally.

9. Competent host is essential for biotechnology experiment. Since DNA is a hydrophilic molecule, it cannot pass through membranes, so the bacterial cells must be made capable to take up the DNA i.e., made competent.

This can be achieved by :

(i) Treatment of DNA with divalent cation of $CaCl_2$ or rubidium chloride : Treating them with a specific concentration of a divalent cation, increases the efficiency with which DNA enters the bacterium through pores in its cell wall.



(ii) Heat shock treatment of DNA : 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 bacteria to take up the recombinant DNA.

10. (a) Ecosystem diversity is the variety of ecosystems which indicate diversity in the number of niches, trophic levels, food webs, nutrient cycles.

(b) X - Gamma diversity

Y - Beta diversity

Z - Alpha diversity

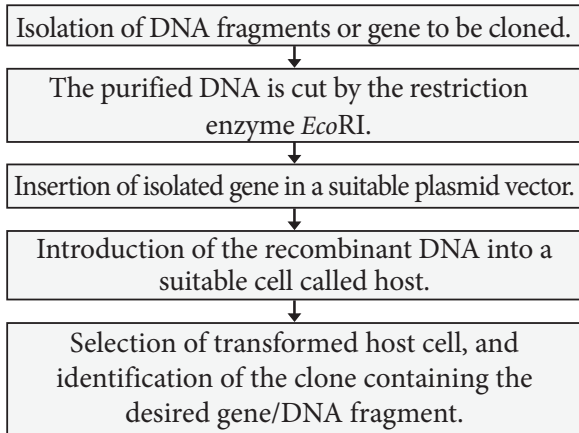
11. Non-native or alien species are often introduced inadvertently by man for their economic and other uses. They often become invasive and drive away the local species. For example:

(i) Water hyacinth (*Eichhornia crassipes*) was introduced in Indian waters to reduce pollution but it turned out to be a problematic species. It has clogged water bodies including wetlands at many places resulting in death of several aquatic plants and animals.

(ii) Nile Perch (a predator fish) was introduced in Lake Victoria of East Africa. It killed and eliminated ecologically unique assemblage of over 200 native species of small cichlid fish.

(iii) African catfish *Clarias gariepinus* introduced for aquaculture in India poses threat to indigenous catfishes.

12.



↓
Multiplication / expression of the introduced gene in the host.

13. (a) Selectable marker in given cloning vector pBR322 are ampicillin resistance gene(a), and tetracycline resistance gene(b). They help in selecting transformant from non-transformant ones.

(b) Selection of recombinants due to inactivation of antibiotics is a cumbersome procedure because it requires simultaneous plating on two plates having different antibiotics. Therefore, alternative selectable markers have been developed which differentiate recombinants from non-recombinants on the basis of their ability to produce colour in the presence of a chromogenic substrate. In this, a recombinant DNA is inserted within the coding sequence of an enzyme, β -galactosidase. This results into inactivation of the enzyme, which is referred to as insertional inactivation. The presence of a chromogenic substrate gives blue coloured colonies if the plasmid in the bacteria does not have an insert. Presence of insert results into insertional inactivation of the β -galactosidase and the colonies do not produce any colour, these are identified as recombinant colonies.

(c) Enzyme *EcoRI* is named as follows : The capital letter *E* comes from the genus *Escherichia* : The letters *co* are derived from the species name *coli*. The letter *R* is from RY13 (strain). The Roman number *I* indicates that it was the first enzyme isolated from the bacterium *E. coli* RY13.

OR

Missing steps in the sequence of producing nematode resistant tobacco plant are :

(a) Isolation of nematode (*Meloidogyne incognita*) specific gene

(c) Production of sense and anti-sense RNA in the host cells.

(d) Two RNA's being complementary to each other form a double stranded (dsRNA).

(f) Silences the specific *mRNA* of nematode.

(g) The parasite could not survive in a transgenic host.

(h) Transgenic plant gets protected from the parasite.