

Sample Question Paper - 14
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. Give the scientific name of the microbes from which cyclosporin A and statin are obtained. Write one medical use of each one of these drugs.
2. How are malignant tumors different from benign tumors? Why are some patients treated with α interferons?

OR

Name the plant source of the drug popularly called 'smack'. How does it affect the body of the abuser?

3. List any two key tools used in recombinant DNA technology.
4. Explain the role of Ti plasmids in biotechnology.
5. What is the advantage the eurythermal has and what is the constraint the stenothermal has?
6. Name the soil bacterium that produces a protein/chemical that is toxic to insect pests. Show with an example that these are encoded by different forms of the genes.

OR

Genetic modification has been used to create tailor-made plants to supply alternative resources to industries, in the form of starches, fuels and pharmaceuticals.

List any four advantages of genetically modified plants.

SECTION - B

7. Why do tribes who live in high altitude of Himalayas experience discomfort in respiration? How do they get adapted to survive in such a situation?

OR

Mention the special adaptations evolved in parasites and why?

8. (a) Name the causative organisms for the following diseases:

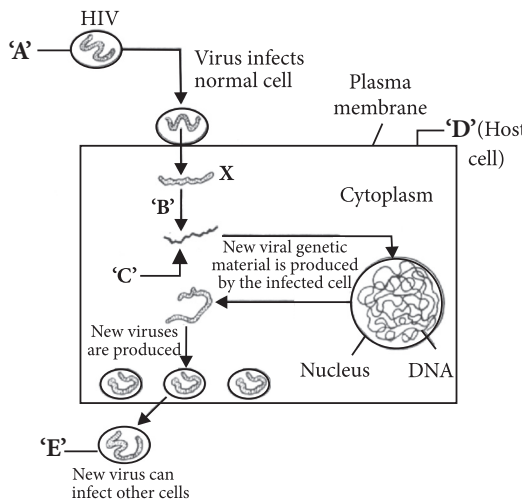
- (i) Elephantiasis,
- (ii) Ringworm,
- (iii) Amoebiasis

(b) How can public hygiene help control such diseases?

9. Describe the process of amplification of “gene of interest” using PCR technique.
10. Recombinant DNA-technology is of great importance in the field of medicine. With the help of a flow chart, show how this technology has been used in preparing genetically engineered human insulin.
11. Taking one example each of habitat loss and fragmentation, explain how are the two responsible for biodiversity loss.
12. The sacred groves of Aravalli Hills and Ooty botanical garden both aim at biodiversity conservation. How do they differ in their approaches? Explain.

SECTION - C

13. (a) Study the diagram showing replication of HIV in humans and answer the following questions accordingly.



- (i) Write the chemical nature of the coat 'A'.
- (ii) Name the enzyme 'B' acting on 'X' to produce molecule 'C'. Name 'C'.
- (iii) Mention the name of the host cell 'D' the HIV attacks first when it enters into the human body.
- (iv) Name the two different cells the new viruses 'E' subsequently attack.

(b) What is metastasis? Why is it fatal?

OR

- (a) Currently in our country a number of biofertilisers are available commercially in the market. There is a need to push for use of biofertilisers in place of chemical fertiliser. Why do farmers prefer biofertilisers to chemical fertilisers these days? Explain.
- (b) How do *Anabaena* and mycorrhiza act as biofertilisers?

Solution

BIOLOGY - 044

Class 12 - Biology

1. 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.

2. Comparison between benign tumor and malignant tumor are as follows :

Benign tumor		Malignant tumor
(i)	It remains confined to the affected organ.	It spreads to other organs of the body.
(ii)	Rate of growth is usually slow.	Rate of growth is usually rapid.
(iii)	It causes limited damage to the body.	The cancer cells migrate to other sites of the body and start a new tumor there. This property is called metastasis.
(iv)	It is non-cancerous.	It is cancerous.

Some patients are treated with α -interferon as these are biological response modifiers which activate their immune system and help in destroying the tumor.

OR

Smack is an opioid narcotic, obtained from poppy plant, *Papaver somniferum*. It is a powerful analgesic and relieves the pain by acting on central nervous system.

3. Biological or key tools used in recombinant DNA technology are :

(i) Enzymes : Different kinds of specific enzymes used in recombinant DNA technology are lysing enzymes which includes lysozyme, cellulase and chitinase and cleaving enzymes (enzymes used to break DNA molecules) including exonuclease, endonuclease and restriction endonuclease.

(ii) Cloning vectors : These are DNA molecules that can carry foreign DNA segment and replicate inside a host cell. It may be plasmids, a bacteriophage, cosmids, yeast artificial chromosomes (YACs), Bacterial artificial chromosomes (BACs) and viruses.

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.

5. Eurythermal can tolerate wide range of temperature variations and thus have wider distribution on earth, on the other hand, stenothermal can tolerate only narrow range of temperature and is restricted to specific regions only.

6. Soil bacterium *Bacillus thuringiensis* produces proteins that kill certain insects like lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes), etc. *cry* genes code for certain crystal (cry) proteins that are toxic to insect larvae. The genes *cryIAC* and *cryIIAb* control cotton bollworm and *cryIAB* controls corn borer.

OR

Applications of genetically modified plants are as follows:

(i) Genetically modified plants are resistant to (a) diseases resulting from viral, bacterial and fungal infections (b) pests, such as nematodes and insects and (c) pesticides.

(ii) GM plants can tolerate adverse abiotic stresses such as cold, drought, salt, heat.

(iii) GM plants show increased efficiency of mineral usage (this prevents early exhaustion of fertility of soil).

(iv) GM plants have high nutritional value, e.g., vitamin A enriched rice.

7. 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

palpitations (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, decreasing binding capacity of haemoglobin and increasing breathing rate. Hence, we will automatically stop experiencing altitude sickness.

OR

Parasitism is a negative interaction wherein parasite depends on its host organism partially or completely for survival and perpetuation. Accordingly, parasites are classified as partial or hemiparasites and complete or holoparasites. Also they could be ectoparasites (on host's body) or endoparasites (inside host's body). Parasites are adapted vividly on the basis of their dependability on host.

In accordance with their lifestyles, parasites evolved special adaptations such as:

- (i) anaerobic respiration in internal parasites
- (ii) loss of unnecessary sense organs
- (iii) presence of adhesive organs (e.g., suckers in tapeworm) to cling on to the host
- (iv) loss of certain organs (e.g., bedbugs lack wings, *Taenia* loses digestive system)
- (v) excessive multiplication
- (vi) resistant cysts and eggs for safe transfer of their progeny to new hosts
- (vii) high reproductive capacity.

8. (a) (i) Elephantiasis – *Wuchereria bancrofti*

(ii) Ringworm – *Microsporum*

(iii) Amoebiasis– *Entamoeba histolytica*

(b) Maintenance of public hygiene is very important for prevention and control of many infectious diseases. Public hygiene includes proper disposal of waste and excreta, periodic cleaning and disinfection of water reservoirs, pools and tanks and observing standard practices of hygiene in public catering. These measures are particularly essential where the infectious agents are transmitted through food and water such as typhoid, amoebiasis and ascariasis.

9. 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 :

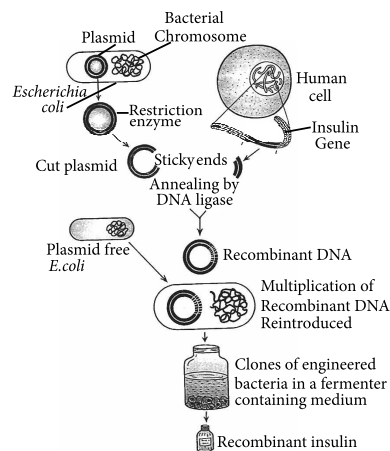
(i) **Denaturation** : the target DNA (DNA segment to be amplified) is heated to high temperature (94°C). Heating results in the separation of two strands of DNA. Each of the two strands of the target DNA now act as template for synthesis of new DNA strand.

(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.

10. The recombinant DNA technology process has made great impact in the area of health care by mass production of safe and more effective therapeutic drugs. Further, the recombinant therapeutics do not induce unwanted immunological responses.

Flow chart showing preparation of genetically engineered human insulin is as follows:



11. Loss of habitat through filling wet lands, ploughing grasslands, cutting down trees, burning a forest and clearing some area of vegetation results in annihilation of plants, microorganisms and forcing out of animals which in alien land die out after sometime. Habitat loss deprives plants and animals of their homes and they get killed.

Fragmentation of habitat, e.g., forest land surrounded by crop lands, orchards, urban areas, etc. disrupts complex interaction amongst species, destruction of species in cleared regions, annihilation of species

restricted to deeper undisturbed parts of forest and decreased biodiversity in the habitat fragments.

12. Sacred groves are undisturbed forest patches, surrounded by highly degraded landscapes where not even a single branch of tree is allowed to be cut. As a result, many endemic species which are rare or have become extinct, seen to flourish here. While botanical gardens are areas where many species of plants, are conserved outside their natural habitats. They help to restore endangered species, whose chances of survival are very small. Thus, sacred groves of Aravalli Hills are sites of *in-situ* conservation, where endangered species are protected in their natural habitat whereas Ooty Botanical gardens are sites of *ex-situ* conservation, where the endangered species are protected outside their natural habitats.

13. (a) (i) A - Protein

(ii) B - Reverse transcriptase

C - Viral DNA

(iii) D - Macrophage

(iv) E - Macrophages and T-lymphocytes

(b) Metastasis is a property shown by cancerous cells in which these cells detach from the tumours and move to distant sites through body fluids and develop secondary tumours. Metastasis is fatal because the cancerous cells spread to other parts of body, damage other normal cells, compete with them for vital nutrients and disrupt the normal metabolism.

OR

(a) Chemical fertilisers cause pollution of water bodies as well as groundwater, besides getting stored in crop plants. Therefore, farmers are pressing for switch over to organic farming which includes the use of manures biofertilisers, biopesticides. Biofertilisers are microorganisms which bring about nutrient enrichment of soil by enhancing the availability of nutrients to crops. The microorganisms which act as biofertilisers are bacteria, cyanobacteria (blue green algae) and mycorrhizal fungi. Bacteria and cyanobacteria have the property of nitrogen fixation while mycorrhizal fungi preferentially withdraw minerals from organic matter for the plant with which they are associated. Phosphate is also solubilised by some bacteria and by some fungi that form association with plant roots.

(b) *Anabaena* is free living and symbiotic nitrogen fixing cyanobacteria. Cyanobacteria are photosynthetic and have the property of nitrogen fixation. They add organic matter as well as extra nitrogen to the soil. Cyanobacteria are an extremely low cost biofertilisers. Mycorrhiza is a mutually beneficial or symbiotic association of a fungus with the roots of a higher plant. Mycorrhizal roots show a sparse or dense wooly growth of fungal hyphae on their surface. Plants having mycorrhizal associations show resistance to root-borne pathogens.