Sample Question Paper - 19
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. What roles do enzymes play in detergents that we use for washing clothes? Are these enzymes produced from some unique microorganisms?

2. Why is secondary immune response more intense than the primary immune response in humans?

OR

What is colostrum? Why are breast-fed babies likely to be healthy?

3. How are recombinant vectors created? Why is only one type of restriction endonuclease required for creating one recombinant vector?

4. State the role of UV-light and ethidium bromide during gel electrophoresis of DNA fragments.

5. **(a)** How are mammals living in colder regions and seals living in polar regions able to reduce the loss of their body heat?

(b) If a population of 50 *Paramecium* in a pool increases to 150 after an hour, what would be the percent growth or birth rate per individual per hour for the same populations?

6. What are transgenic animals? How was the first transgenic cow found to be more useful than the normal cow for humans?

OR

Why is proinsulin so called? How is insulin different from it?

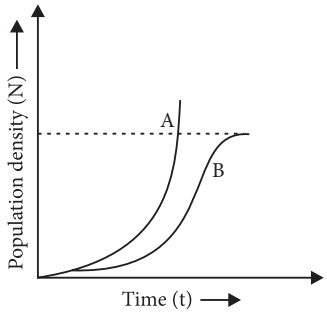
SECTION - B

7. **(a)** Write the importance of measuring the size of a population in a habitat or an ecosystem.

(b) Explain with the help of an example how the percentage cover is a more meaningful measure of population size than more numbers.

OR

Study the graph given below and answer the questions that follow.



(a) Write the status of food and space in the curves A and B.
(b) In the absence of predators, which one of the two curves would appropriately depict the prey population?
(c) Time has been shown on X-axis and there is a parallel dotted line above it. Give the significance of this dotted line.

8. **(a)** Name a drug used (i) as an effective sedative and pain killer (ii) for helping patients to cope with mental illnesses like depression, but often misused.
(b) How does the moderate and high dosage of cocaine affect the human body?

9. **(a)** Draw schematic diagrams of segments of a vector and a foreign DNA with the sequence of nucleotides recognised by *Eco*RI.
(b) Draw the vector DNA segment and foreign DNA segments after the action of *Eco*RI and label the sticky end produced.

10. How does the gene therapy help patients with ADA-deficiency?

11. Explain the importance of biodiversity hotspots and sacred groves.

12. Explain, giving one example, how co-extinction is one of the causes of loss of biodiversity. List the three other causes also (without description).

SECTION - C

13. **(a)** A heavily bleeding and bruised road accident victim was brought to a nursing home. The doctor immediately gave him an injection to protect him against a deadly disease.
(i) What did the doctor inject into the patient's body?
(ii) How do you think this injection would protect the patient against the disease?
(iii) Name the disease against which this injection was given and the kind of immunity it provides.
(b) For an organ transplant, it is an advantage to have an identical twin. Why?

OR

Your advice is sought to improve the nitrogen content of the soil to be used for cultivation of a non-leguminous terrestrial crop.
(a) Recommend two microbes that can enrich the soil with nitrogen.
(b) Why do leguminous crops not require such enrichment of the soil?
(c) Mention the role of cyanobacteria as a biofertiliser.

Solution

BIOLOGY - 044

Class 12 - Biology

1. Lipases are lipid dissolving enzymes that are added in detergents for removing oily stains from laundry. They are obtained from *Candida lipolytica* and *Geotrichum candidum*.

2. Secondary immune response is quicker and more intense than the primary immune response because the memory B cells are present to quickly deal with the invading microbes by forming antibodies. Body "remembers" that it previously encountered this type of infection.

OR

Colostrum (mother's first milk) is rich in IgA antibodies. It provides passive immunity to new born and protects it from various diseases and therefore, this milk is considered very essential for the new born infants.

3. Recombinant vectors are created by cutting the vector and source DNA using the same restriction enzyme. This results in production of complementary 'sticky ends'. DNA ligase help in linking alien DNA with the plasmid DNA.

Same restriction enzyme is used for creating one recombinant vector because it recognises and cuts the DNA at a particular sequence (recognition site) and create sticky ends.

4. DNA fragments can be seen only after staining. Ethidium bromide is used to stain DNA fragments followed by exposure to UV radiation. This gives bright orange colour to DNA fragments which helps to view separated DNA fragments.

5. **(a)** Animals inhabiting cold areas possess thick coat of hairs, feathers and subcutaneous fat to reduce loss of body heat.

(b) Initial number of *Paramecium* = 50

Number of *Paramecium* after 1 hour = 150

$$\text{Birth rate} = \frac{\text{Number of new } \textit{Paramecium}}{\text{Initial number of } \textit{Paramecium}} \times 100$$

$$= \frac{100}{50} \times 100 = 200\%$$

6. Transgenic animals are those animals which contain in their genome, a foreign gene introduced by recombinant DNA technology. Such gene is called transgene. Examples of transgenic animals are transgenic mice and transgenic rabbit, etc.

Rosie is the first transgenic cow which contains human gene coding for protein *alpha*-lactalbumin. The gene is expressed in mammary tissues and the protein is secreted in milk. This milk is nutritionally a more balanced product for human babies than natural cow milk.

OR

Proinsulin is the prohormone which needs to be processed before it becomes a fully mature and functional hormone. Proinsulin contains an extra stretch called the C peptide. This C peptide is not present in the mature insulin and is removed during maturation into insulin.

7. **(a)** It is important to measure population size of habitat because it indicates that whether population is flourishing or declining.

(b) The percentage cover or biomass is a more meaningful measure of the population size in a forest area, where only a single huge banyan tree is accompanied by large number of *Parthenium* plants.

OR

(a) There is ample food and space for the population depicted by the curve A. When the resources are unlimited, the curve is exponential. There is limited food and space for the population depicted by the curve B. When the resources are limiting, the curve becomes sigmoid.

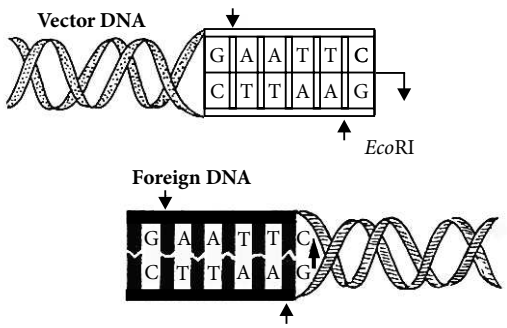
(b) In the absence of predators, curve B would appropriately depict the prey population.

(c) The dotted line represents the carrying capacity of the environment. The carrying capacity represents the size of population that the environment can hold by providing necessary resources. When a population reaches this line its population size is stabilised by various environmental factors.

8. **(a)** (i) Morphine (ii) Barbiturates

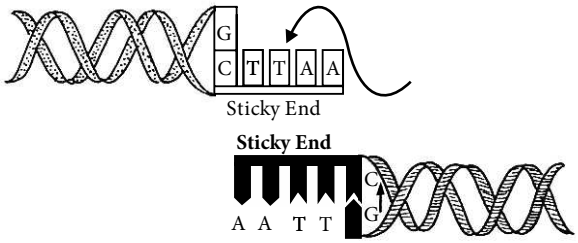
(b) Cocaine taken in low dose induces sense of well being and pleasure and delays fatigue, but in high dosage, it causes hallucinations.

9. **(a)**



Segments of a vector and a foreign DNA with the sequence of nucleotide recognised by *Eco*RI.

(b)



Vector DNA segment and foreign DNA segment after the action of *Eco*RI.

10. The first step towards gene therapy for an ADA deficient patient is extraction of lymphocytes. Lymphocytes, a kind of white blood cells, are extracted from the bone marrow of the patient and are grown in a culture outside the body. A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are reinjected to the patient's bone marrow.

11. (i) Hotspots : 'Biodiversity hotspots' are the regions which are characterised by very high levels of species richness and high degree of endemism. India has three hotspots – Indo-Burma (North-East India), Himalayas, and Western Ghats. Importance of hotspots are as follows:

– Maintaining genetic diversity of all present species and varieties.

– Maintaining viable populations of native species, subspecies and varieties.

– Maintaining resilience in species/habitats/ ecosystems to adapt to environmental changes.

– Maintaining the various types of communities/ ecosystems/habitats both in number and distribution.

– Checking human aided introduction of alien/ exotic species.

(ii) Sacred forests or sacred groves are forest patches around places of worship which are held in high esteem by tribal communities. They are the most undisturbed forest patches (island of pristine forests) which are often surrounded by highly degraded landscapes. They are found in several parts of India, *e.g.*, Karnataka, Maharashtra, Rajasthan (Aravalli), Madhya Pradesh (Sarguja, Chanada and Bastar), Kerala, Meghalaya. Temples built by tribals are found surrounded by deodar forests in Kumaon region, Jaintia and Khasi hills in Meghalaya. Not a single branch is allowed to be cut from these forests. As a result, many endemic species which are rare or have become extinct elsewhere can be seen to flourish here. Bishnois of Rajasthan protect *Prosopis cineraria* and Black Buck religiously. Some water bodies are also held sacred in certain places. *e.g.*, Khecheopalri in Sikkim. Their aquatic flora and fauna are naturally preserved.

12. 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.

The other three causes of biodiversity loss are –

(i) Habitat loss and fragmentation

(ii) Over-exploitation

(iii) Alien species invasions

13. (a) (i) Doctor injected anti-tetanus toxin into patient's body.

(ii) Injection containing preformed antibodies or antitoxin (preparation containing antibodies to toxin) would neutralise the pathogenic agents and would give quick relief.

(iii) Injection was given against tetanus and it provides artificial passive immunity.

(b) For an organ transplantation, tissue matching (histocompatibility) and blood group compatibility of donor and recipient are very important. If they do not match, organ may be rejected. This is because, immune system recognises the protein in the transplanted tissue or organ as foreign and initiates cellular immunity. Chances of matching of tissue as well as blood group are very high if donor and recipient are identical twins, because of genetic similarity. Transplantation between identical twins is known as isograft.

OR

(a) *Azotobacter* and *Azospirillum*

(b) Leguminous crops have symbiotic nitrogen fixing bacteria such as *Rhizobium* that live in the root nodules of these plants. These bacteria obtain food and shelter from the plant and in return they trap nitrogen directly from the atmosphere which they provide to the plant.

(c) A number of free living and symbiotic blue green algae or cyanobacteria have the property of nitrogen fixation and are photosynthetic. Therefore, they add organic matter as well as extra nitrogen to the soil. Hence, blue green algae serve as biofertilisers and are added to agricultural fields such as cotton, maize, jowar, rice, etc.