Sample Question Paper - 8
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

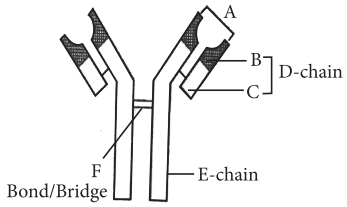
1. Name the type of immunity the mother provides the new born baby. How does it happen?

2. How do mycorrhizae act as biofertilisers? Explain. Name a genus of fungi that forms a mycorrhizal association with plants.

OR

What are methanogens? How do they help to generate biogas?

3. Identify A, D, E and F in the diagram of an antibody molecule given below:



4. Explain the different steps involved during primary treatment phase of sewage.

5. In certain seasons we sweat profusely while in some other season we shiver. Explain.

6. When you go for a trek/trip to any high altitude places, you are advised to take it easy and rest for the first two days. Comment, giving reasons.

OR

Explain brood parasitism with the help of an example.

SECTION - B

7. Why is a person with cuts and bruises following an accident administered tetanus antitoxin? Give reasons.

OR

Under polio prevention programme, infants in India were given polio vaccines on a large scale at regular intervals to eradicate polio from the country.

(a) What is a vaccine? How does it impart immunity to the child against the disease.

(b) With the help of an example each, differentiate between active and passive immunity.

8. Name the causative organism, two symptoms and mode of transmission in ascariasis.

9. In the experiment of cloning a gene, vector requires selectable marker.

(a) Give some examples of useful selectable markers for *E.coli.*

(b) What would be the effect of a plasmid without a selectable marker?

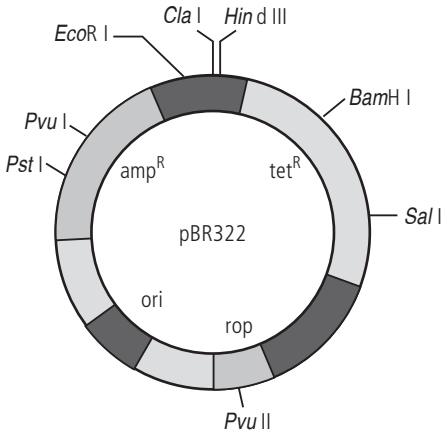
10. Write short note on broadly utilitarian approaches to conserve biodiversity, with the help of suitable examples.

11. Substantiate with the help of one example that in an ecosystem mutualists **(a)** tend to co-evolve and **(b)** are also one of the major causes of biodiversity loss.

12. To obtain a foreign-gene-product by recombinant DNA technology, what steps should be followed?

SECTION - C

13. Plasmids are vehicles of desired DNA fragments which can undergo independent replication to increase copies of desired genes. pBR322 has its own origin of replication, selectable marker and unique recognition site for cloning.



(a) What is the significance of ori?

(b) In pBR322, alien DNA is ligated in area of *Bam* H1 site. The recombinant plasmids are passed into bacteria during transformation. How recombinants could be selected from non-recombinants?

OR

Raghav, a student of agricultural science has read an article in a magazine about transgenic organism, which explain the advantages of transgenic organisms to human beings in the field of medicine, industry, etc., and various controversies related to transgenic organisms.

(a) What kind of ethical issues are connected to the production of transgenic animals?

(b) Explain the controversies related to transgenic organisms with example.

Solution

BIOLOGY - 044

Class 12 - Biology

1. 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.

2. Mycorrhiza is a mutually beneficial or symbiotic association of a fungus with the root of a higher plant. The most common fungal partners of mycorrhiza are *Glomus* species. Mycorrhizal roots show a sparse or dense wooly growth of fungal hyphae on their surface. They perform several functions for the plant – (i) Absorption of water, (ii) Solubilisation of organic matter of the soil humus, release of inorganic nutrients, absorption and their transfer to root. (iii) The fungus secretes anti-microbial substances which protect the young roots from attack of pathogens.

OR

Methanogens are a group of anaerobic bacteria which obtain their energy by reducing carbon dioxide and oxidising hydrogen with the production of methane. They are found in oxygen deficient environment such as marshes, swamps, sludge and digestive systems of ruminant animals like cow, buffalo, etc. These microorganims present in anaerobic sludge digester digest organic mass as well as aerobic microbes of the sludge to produce mixture of gases containing methane, H_2S and CO_2 called biogas.

3. A – Antigen binding site
B – Variable region
C – Constant region
D – Light chain
E – Constant region of heavy chain
F – Disulphide bond

4. Primary treatment phase of sewage treatment removes floating and suspended solids from sewage through two processes of filtration and sedimentation. First, floating matter is removed through sequential filtration. The filtrate is kept in large open settling tanks where grit settles down. Aluminium or iron sulphate is added in certain places to flocculation and settling down of solids. The sediment is called primary sludge while the supernatant is called effluent. The primary sludge traps a lot of microbes and debris. It is subjected to composting or land fill where anaerobic digestion removes the organic matter.

5. Human beings are able to maintain a constant body temperature at about ~37°C.
(i) During summers the external temperature may rise upto 45°C. Humans begin to sweat profusely when external temperature rises above 37°C. Cooling of the body occurs as sweat evaporates.
(ii) During winter, when external temperature is low, our body inadvertently starts shivering. It is an exercise that raises body temperature.

6. 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 palpitation (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

Brood parasitism in birds is a fascinating example of parasitism in which the parasitic bird lays its eggs in the nest of its host and lets the host incubate them. During the course of evolution, the eggs of the parasitic bird have evolved to resemble the host's eggs in size and colour to reduce the chances of the host bird detecting the foreign eggs and ejecting them from the nest. Laying eggs by koel in crow's nest is an example of brood parasitism.

7. A person with cuts and bruises following an accident has chances of getting infected from tetanus. So, in this case quick immune response is required which is provided by giving the patient tetanus antitoxin which is a preparation containing preformed antibodies to the toxin.

OR

(a) Vaccine is suspension or extract of weakened (attenuated/ dead) pathogens of disease which when

injected into healthy person provides it active acquired immunity to the disease.
Vaccination stimulates the antibody production and formation of memory cells without causing the disease. This protects the child by neutralising the pathogenic agents during infection.
(b) The given table shows differences between active and passive immunity:

	Active immunity	Passive immunity
(i)	It is developed when the person's own cells produce antibodies in response to infection or vaccine. *E.g.*, MMR vaccine.	It is developed when antibodies produced in other organisms are injected into a person to counter act antigen such as snake venom.
(ii)	It provides relief only after long period.	It provides immediate relief.

8. Ascariasis is caused by the common round worm *Ascaris lumbricoides*, a giant intestinal worm. Symptoms of this disease include internal bleeding, muscular pain, fever, anaemia and blockage of the intestinal passage. A healthy person acquires infection through contaminated water, vegetables, fruits, etc.

9. (a) The genes encoding resistance to antibiotics such as ampicillin, chloramphenicol, tetracycline or kanamycin, etc. are considered as useful selectable markers for *E.coli*.
(b) If a cloning vector does not have a selectable marker, then it would not be possible to distinguish between transformants (host bacterium having rDNA) and non-transformants. Therefore, an ideal cloning vector should have selectable markers for the selection of transformants.

10. Broadly Utilitarian approaches to conserve biodiversity are as follows:
(i) Oxygen : Through their photosynthetic activity plants are replenishing oxygen of the atmosphere. Amazon rainforest is estimated to contribute 20% of it.
(ii) Pollination: Bees, bumble- bees, butterflies, moths, beetles, birds and bats are engaged in pollination of plants which is essential for formation of fruits and seeds.
(iii) Climate regulation: Forest and oceanic systems regulate global climate.
(iv) Aquifers: Plant cover is essential for retention of rain water, its percolation and storage in aquifers and reservoirs.
(v) Flood and erosion control: Plant cover protects the soil from wind and water erosion. Run off of rain water is reduced so that flood water is rarely formed.
(vi) Nutrient cycling : It is essential for continued availability of nutrients to plants without which there would be no photosynthetic activity.

11. (a) An ecosystem mutualists often involve co-evolution, *i.e.*, the evolution of the flower and its pollinator species are tightly linked with one another. For example, fig species can be pollinated only by its partner wasp species and no other species.
(b) Elimination of one invariably leads to the extinction of the other. If one of the mutant organism such as either fig or wasps member goes down drastically then others population will also be drastically affected. This is one of the major cause of biodiversity loss.

12. Recombinant DNA technology can be used to obtain foreign-gene-products. It involves following steps :
(i) Isolation of genetic material (DNA) using enzymes.
(ii) Identification and cutting of DNA from specific location using restriction enzymes and separating the fragments of DNA using gel electrophoresis to obtain gene of interest.
(iii) Amplification of gene of interest using PCR.
(iv) Adding or ligation of gene of interest into suitable vector using ligase enzymes. This produces a recombinant DNA molecule.
(v) Insertion of recombinant DNA into the host cell or organism.
(vi) Selection of recombinants from non-recombinant cells.
(vii) Culturing recombinant cell under suitable conditions and obtaining the desired foreign-gene-product.

13. (a) Ori (Origin of replication) is DNA sequence which is specialised to initiate replication. It also determine the number of copies it would form.
(b) In pBR322, if alien DNA is ligated in the area of *Bam* H1, site of tetracycline resistance gene, then recombinant plasmid would not possess tetracycline resistance but continues to have ampicillin resistance.

Recombinants will grow only in ampicillin containing medium but will die out in tetracycline containing medium. But, non recombinants will grow on the medium containing both the antibiotics. So, in the given case one antibiotic resistance gene helps in selecting transformants, whereas the other antibiotic resistance gene gets inactivated due to insertion of alien DNA, and helps in selection of recombinants.

OR

(a) The ethical issues connected to the production of transgenic animals include:

- Introduction of a transgene from one species into another species violates the 'integrity of species'.
- Transfer of human genes into animals (and vice-versa) dilutes the concept of 'humanness'.
- When animals are used for production of pharmaceutical proteins, they are virtually reduced to the status of a 'factory'.
- Use of animals in biotechnology causes great suffering to them.
- It is disrespectful to living beings and only exploits them for the benefit of human beings.

(b) Introduction of transgenic organisms has also created certain controversies. Transgenes in commercial crops can endanger native species. For example, the gene for Bt toxin expressed in pollen might endanger pollinators like honeybees. These crops cause problems in human health by supplying allergens and transfer of antibiotic resistance markers. They also cause damage to the natural environment. Transgenic crops are always costly so that they are adverse to the interest of the farmers.