

Sample Question Paper - 24
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

(2 Marks Each)

1. HIV (Human Immunodeficiency Virus) gains entry into the cells after infecting the human body. Name the cells into which HIV enters and explain the events that occur in these cells.
2. "Large scale cultivation of *Spirulina* is highly advantageous for human population." Give two reasons for the above statement.

OR

Not all microbes are pathogenic. Several microbes are useful to man in diverse ways. Name the microbes that help in the production of the following products commercially:

- | | |
|------------------|---------------|
| (a) Statin | $\frac{1}{2}$ |
| (b) Citric acid | $\frac{1}{2}$ |
| (c) Penicillin | $\frac{1}{2}$ |
| (d) Butyric acid | $\frac{1}{2}$ |
3. Name two drugs obtained from the latex of the plant given below. "These drugs are medically useful but are often abused". Taking the mentioned examples, justify your answer by giving reasons.

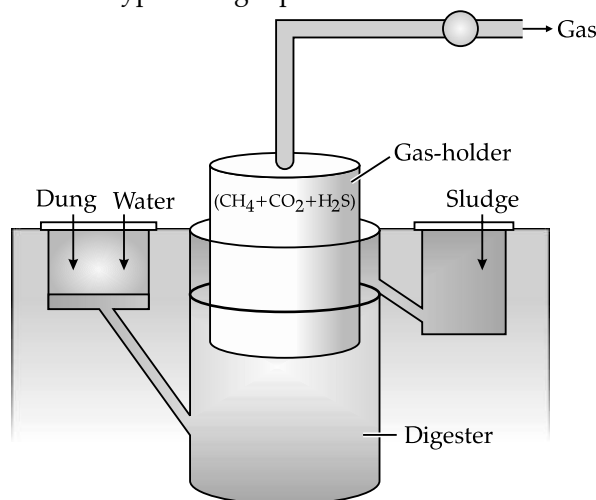


4. Given below is a table depicting population interactions between species A and species B.

Type of interaction	Species A	Species B
(a)	(-)	(+)
(b)	(+)	(-)

Name the types of interactions (a) and (b) in the above table.

5. The image shown below is of a typical biogas plant.



List the events that lead to biogas production from wastewater whose BOD has been reduced significantly. AI

6. Ronit has gone on a trek. After reaching high altitude, he started feeling sick. A doctor suggested that he is suffering from "Altitude sickness".

Why does Ronit suffers from altitude sickness after reaching the high-altitude regions? Give any two ways by which his body will acclimatize after a couple of days?

OR

In the absence of an external source of water, the kangaroo rat and desert plants in North American deserts are capable of meeting all their water requirements.

How do kangaroo rats and desert plants adapt themselves to survive in their extreme habitat?

Section -B

(3 Marks Each)

7. Two children, A and B of age 4 and 5 years respectively visited a hospital with a similar genetic disorder. The girl A was provided with enzyme replacement therapy and was advised to revisit periodically for further treatment. The girl B was however, given a therapy that did not require revisit for further treatment.

(a) Name the ailments the two girls were suffering from? 1

(b) Why did the treatment provided to girl A required repeated visits? AI 1

(c) How was the girl B cured permanently? 1

OR

A farmer while working on his farm was bitten by a poisonous snake. The workers in the farm immediately rushed him to the nearby health centre. The doctor right away gave him an injection to save his life. What did the doctor inject and why? Explain. 3

8. A group of youth were having a 'rave party' in an isolated area and was raided by police. Packets of 'smack' and syringes with needles were found littered around.

(i) Why is taking 'smack' considered an abuse? 1

(ii) Write the chemical name of 'smack' and the name of its source plant. 1

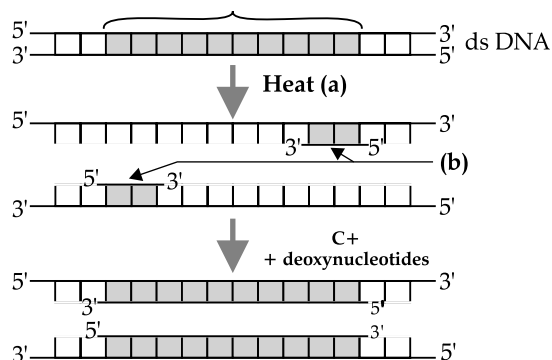
(iii) Syringes and needles used by the youth for taking the drug could prove to be very fatal. Why? 1

9. Explain the roles of the following in Biotechnology:
- Restriction endonuclease 1
 - Gel-Electrophoresis 1
 - Selectable markers in pBR322. 1
10. (a) India has greater ecosystem diversity than Norway." Do you agree with the statement ? Give reasons in support of your answer. 1
- (b) Write the difference between genetic biodiversity and species biodiversity that exists at all levels of biological organization. 2
11. Faced with the conflict between development and conservation, many nations find it unrealistic and economically not feasible to conserve all their biological wealth. On a global basis, this problem has been addressed by renowned conservationists. They identified for maximum protection for certain 'biodiversity hotspot' regions. According to Conservation International at present, there are 36 biodiversity rich areas in the world that have been qualified as hotspots.
- (a) State any two criteria for determining biodiversity hotspots. 2
- (b) Name any two hotspots designated in India. 1
12. When the gene product is required in large amounts, the transformed bacteria with the plasmid inside the bacteria are cultured on a large scale in an industrial fermenter which then synthesizes the desired protein. This product is extracted from the fermenter for commercial use.
- (a) Why is the used medium drained out from one side while fresh medium is added from the other? Explain. 1
- (b) List any four optimum conditions for achieving the desired product in a bioreactor. 2

Section - C

(5 Marks)

13. A schematic representation of Polymerase Chain Reaction (PCR) up to the extension stage is given below.



- (a) (i) Name and explain the process 'a'. 2
- (ii) Identify 'b'. 1
- (b) Mention the applications of PCR in the field of 2
- Biotechnology
 - Diagnostics

OR

A large number of transgenic animals have been produced for scientific purposes. They are created deliberately inserting a gene into the genome of an animal. The first transgenic sheep developed was Tracy. It's genome was changed and it carried genes from other species. The reason behind producing the transgenic animals was for specific economic trait.

- (a) What are transgenic animals? How they are helpful to humans? 1
- (b) Name the transgenic animal having the largest number amongst all the existing transgenic animals. 1
- (c) Name the first transgenic cow developed and state the improvement in the quality of the product produced by it. 1
- (d) Mention any two purposes for which these animals are produced. 2

Solution

BIOLOGY - 044

Class 12 - Biology

Section - A

(2 Marks Each)

1. HIV (Human immuno deficiency virus) The HIV gains entry into the macrophages and the helper T-cells after infecting the human body.

Events that occur in the human host after the entry of HIV :

- (i) After entering the human body, the HIV virus attacks and enters the macrophages.
- (ii) Inside the macrophages, the RNA of the virus replicates with the help of enzyme reverse transcriptase and give rise to viral DNA.
- (iii) Then, this viral DNA incorporates into the host cell DNA, uses raw materials and infected cell machinery and directs the synthesis of virus particles.
- (iv) At the same time, HIV enters the helper T-lymphocytes, replicates and produces progenies.
- (v) As a result, T-lymphocytes start decreasing in number and immune response of the person becomes weak.

$\frac{1}{2} + 1\frac{1}{2}$

[CBSE Marking Scheme, 2016]

2. Source of good protein, fats, carbohydrates, minerals and vitamins for undernourished humans and animal population, its cultivation reduce environmental pollution / can be grown in wastewater / molasses / straw / animal manure, easy to cultivate.

(Any two) 1×2

[CBSE Marking Scheme, 2016]

OR

- (i) *Monascus purpureus*
- (ii) *Aspergillus niger*
- (iii) *Penicillium notatum*
- (iv) *Clostridium butylicum*

$\frac{1}{2} \times 4$

[CBSE Marking Scheme, 2017]

3. Morphine and heroin are the drugs that are extracted from the latex of unripe capsules of poppy plant (*Papaver somniferum*). Morphine acts as an effective pain killer and sedative. Heroin (a derivative of morphine) is used as depressant. If these drugs are used in excess, then it may impair the physical and mental state of a person and is said to be abused. 2

4. (a) Amensalism 1
(b) Predation 1

5. Events that lead to biogas production from waste water with reduced BOD are :

- (i) Once the BOD of wastewater is significantly reduced, the effluent is passed into a settling tank for sedimentation.
- (ii) From the settling tank, the major part of sedimented material called activated sludge (bacterial flocs) is pumped into large tanks called anaerobic sludge digester and a small part is pumped back into the aeration tank to serve as inoculum.
- (iii) In these tanks, the sludge is anaerobically digested by bacteria and fungi and the biogas is produced which is a mixture of methane, hydrogen sulphide and CO_2 . The biogas can be used as a source of energy as it is inflammable. 2

6. "Altitude sickness" is because of low atmospheric pressure at high altitude and as a result, the body does not get sufficient oxygen. $\frac{1}{2} + \frac{1}{2}$

The body compensates low oxygen availability by increasing RBCs production, decreasing the binding capacity of haemoglobin, and by increasing the breathing rate.

$\frac{1}{2} + \frac{1}{2}$ (Any two)

OR

Kangaroo rats fulfil the water requirement by internal oxidation of fat in the absence of water. It also has the ability to concentrate its urine, so that minimal volume of water is used to remove excretory products. 1

Desert plants have thick cuticle to prevent loss of water. CAM plants open their stomata during the night time to reduce the loss of water during photosynthesis. 1

Section - B

(3 Marks Each)

7. (a) Adenosine deaminase (ADA) deficiency. 1

(b) (In Enzyme Replacement Therapy) functional ADA is introduced to the patient (by injection), this therapy is not completely curative / enzyme can act only for a limited time period. 1

(c) As there is no permanent cure at the age of five, the gene isolated from bone marrow cells producing ADA is introduced into the cells of girl-B at early embryonic stages which acted as a permanent cure. 1

[CBSE Marking Scheme, 2019]

Detailed Answer :

- (a) They were suffering from adenosine deaminase (ADA) deficiency.
- (b) Girl A was given enzyme replacement therapy, in which lymphocytes isolated from patient's blood are cultured *in-vitro*. A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are subsequently returned to the patient. However, as these cells are not immortal, the patient requires a periodic infusion of such genetically engineered lymphocytes.
- (c) Girl B was treated with gene therapy, in which the gene isolated from bone marrow cells producing ADA is introduced into cells at early embryonic stages, which is a permanent cure. 3

Commonly Made Error

- Many students missed writing the answers of all the parts of the question asked.

Answering Tip

- Make sure you read the question properly and avoid being in a hurry to conclude the answer.

OR

(i) Antitoxin / Antivenoms / Preformed antibodies. 1

(ii) Whenever quick immune response is required, we need to directly inject preformed antibodies / Antitoxins. $\frac{1}{2} + \frac{1}{2}$

(iii) To neutralize the effect of snake venom quickly, passive immunity is provided. $\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2017]

8. (i) Because an addictive substance causes drug dependence and affects nervous system / used in amounts or frequencies that impairs one's physical and physiological or psychological functions. 1

(ii) Diacetyl-morphine $\frac{1}{2}$
Papaver somniferum / poppy plant / opium poppy. $\frac{1}{2}$

(iii) They can transmit serious infections *i.e.*, transmission of HIV infections or AIDS or Hepatitis. 1

[CBSE Marking Scheme, 2017]

9. (i) Cuts at specific position within the DNA / cuts DNA at specific nucleotide / cuts at palindromic nucleotide sequence. 1

(ii) Method of separation of DNA fragments (under the influence of electric field). 1

(iii) Helps in identifying and eliminating non-transformants from transformants / selection of transformants. 1

[CBSE Marking Scheme, 2017]

Detailed Answer :

- (i) The enzyme restriction endonuclease recognises the base sequence at palindrome sites in DNA and cut its strand.
- (ii) Gel electrophoresis is a technique of separation of charged molecules under the influence of an electric field. With the help of the gel electrophoresis technique, DNA fragments get separated according to their size through the pores of agarose gel.
- (iii) Selectable marker (marker gene) helps to select the transformants and eliminate the non-transformants.
E.g., antibiotic resistance genes.

10. (a) Yes

India / tropical region :

- (i) are less seasonal / more constant / more predictable.
- (ii) promote niche specialisation leading to greater biodiversity.
- (iii) Species diversity increases as we move towards equator.
- (iv) More number of species exist.

Norway / temperate region :

- (i) more seasonal / less constant / less predictable.
- (ii) do not promote niche specialisation leading to low bio-diversity.
- (iii) Species diversity decreases as we move away from the equator.
- (iv) Less number of species exist.

(Any one)

- (b) (i) **Genetic diversity :** Diversity / variation within a species over its distributional range/ (same explanation with the help of a correct examples)
- (ii) **Species diversity :** Diversity / variation at a species level (same explained with the help of a correct example). **1 + 2**

[CBSE Marking Scheme, 2018]

Detailed Answer :

- (a) Yes, India has greater ecosystem diversity than Norway. It is because India lies primarily in the tropical and sub-tropical

zone while Norway lies near the Arctic region. This exposes the India to greater amount of sunlight and thus a greater level of ecosystem diversity.

(b) Difference between genetic diversity and species diversity :

Genetic diversity	Species diversity
It refers to the number of genes and their alleles found in organisms.	It refers to the numbers of species per unit area.
It increases as we move up the biological organization.	It may or may not increase to a greater extent as we move up the biological organization.

11. (a) Criteria for determining biodiversity hot spots are :

- High levels of species richness. **1**
- High degree of endemism. **1**

(b) Hotspots in India - Western Ghats, Himalaya (Indo-Burma/Sunderland to be accepted) **(Any two) 1**

12. (a) This is to maintain the cells in the medium in their log/exponential phase. This is physiologically the most active phase. **1**

(b) Temperature, pH, substrate and oxygen are the four optimum conditions required for achieving the desired product in a bioreactor. **(Any four) $\frac{1}{2} \times 4 = 2$**

[CBSE Marking Scheme, 2020]

Section - C

(5 Marks)

13. (a) (i) "a" represents denaturation process. During the process, the double-stranded DNA molecules are heated to a high temperature (94°C – 98°C), so that the two strands separate into a single-stranded DNA molecule. Each strand acts as a template for DNA synthesis. **2**

(ii) "b" represents the primer annealing. **1**

(b) Applications of PCR in the field of:

(i) Biotechnology : It is used to amplify a single or a few copies of a piece of DNA. The amplified fragment can be used to ligate with a vector for further cloning. This results in recombinant DNA (rDNA). **1**

(ii) Diagnostics : PCR is used to detect HIV in suspected AIDS patients. It is also used to detect mutations in genes in suspected cancer patients. It is a powerful technique to identify many other genetic disorders. **1**

Commonly Made Error

- While explaining denaturation, very few candidates mentioned the exact temperatures at which denaturation occurs.

Answering Tip

- Students should understand the significance of temperature at denaturation step of PCR technique.

OR

- (a) Transgenic animals are those animals whose genome has been altered by the introduction of an extra gene through manipulation, *e.g.*, transgenic rats, rabbits, sheep, etc. **1**

They are helpful to humans in many ways:

- (i) Transgenic animals are produced to study how genes are regulated and how they effect the normal functions and development of the animal body.
- (ii) Medicines are produced from transgenic animals, *e.g.*, alpha-1-antitrypsin.
- (iii) Transgenic animals are used to test vaccine safely before using them on humans.
- (iv) They are designed to increase our understanding of how genes contribute to the development of diseases.

- (b) Mice **1**

- (c) Rosie, it produced human protein-enriched milk (2.4 grams per litre). **1**

- (d) Transgenic animals are produced to:

- (i) Study the disease in animals.
- (ii) Ensure vaccine safety and chemical safety testing. **1+1**

Commonly Made Error

- Students usually get confused between transgenic animals and other animals. It seems they are unaware of the concept of transgenic animals.

Answering Tips

- Understand definitions, importance, significance and applications of transgenic animals in detail.

