

**Sample Question Paper - 3**  
**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**

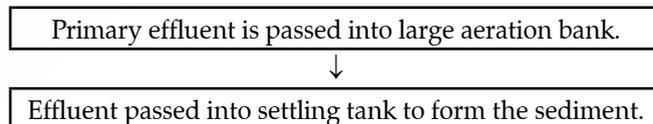
(2 Marks Each)

1. Mention a product of human welfare obtained with the help of each one of the following microbes :

- |  |                |
|--|----------------|
| (a) LAB                                | <b>AI</b><br>½ |
| (b) <i>Saccharomyces cerevisiae</i>    | ½              |
| (c) <i>Propionibacterium shermanii</i> | ½              |
| (d) <i>Aspergillus niger</i>           | ½              |

2. Large quantities of sewage is generated everyday in cities and towns, which is treated in sewage treatment plants (STPs) to make it less polluted. Given below is the flow diagram of one of the stages of STP.

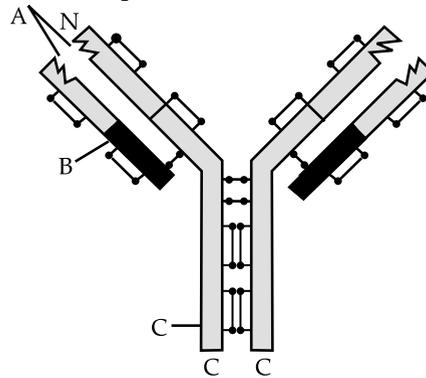
Observe the given flow diagram and answer the questions accordingly.



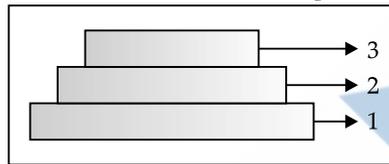
OR

- (a) Why primary effluent is passed into large aeration tanks? 1
  - (b) Write the technical term used for the sediment formed? Mention its significance. 1
3. Which term is used to refer the state experienced by addicts when their regular dose of alcohol/drug is abruptly discontinued. List any two symptoms, it is characterized by.

4. Identify the given structure. Name the parts A, B and C shown in the diagram.



5. Define the term age pyramid. Label the three tiers 1, 2, 3 given in the below age pyramid.



6. Predators play an important role in the food chain. They also maintain the level of diversity in communities. What other roles you observe in nature that they can play.

OR

A population has more young individuals compared to the older individuals. What would be the status of the population after some years?

### Section - B

(3 Marks Each)

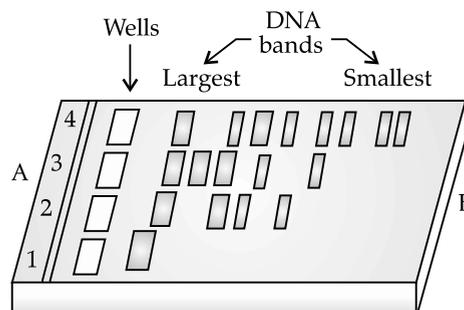
7. (a) Which organ of the human body is initially affected when bitten by an infected female *Anopheles*?  
Name the stage of the parasite that infects this organ. 1  
(b) Explain the events that are responsible for chill and high fever in the patient. 1

OR

Define vector. Name two diseases whose spread can be controlled by the eradication of *Aedes* mosquitoes.

8. Prior to a sports events, blood and urine samples of sportspersons are collected for drug tests.  
(a) Why is there a need to conduct such tests? 1  
(b) Name the drugs the authorities usually look for. 1  
(c) Write the generic names of two plants from which these drugs are obtained. 1

9. Given below is the diagram representing the observations made for separating DNA fragments by Gel electrophoresis technique. Observe the illustration and answer the questions that follow.



- (a) Why are the DNA fragments seen to be moving in the direction A → B? 1  
(b) Write the medium used on which DNA fragments separate. 1  
(c) Mention how the separated DNA fragments can be visualised for further technical use. 1

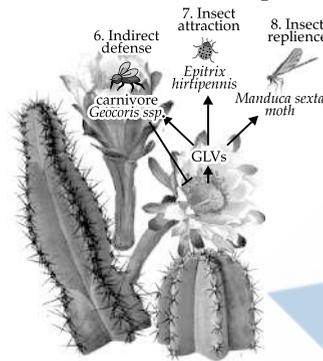
10. "The population of a metro city experiences fluctuations in its population density over a period of time."

(a) When does the population in a metro city tend to increase? 1

(b) When does the population in metro city tend to decline? 1

(c) If 'N' is the population density at the time 't', write the population density at the time 't + 1'. 1

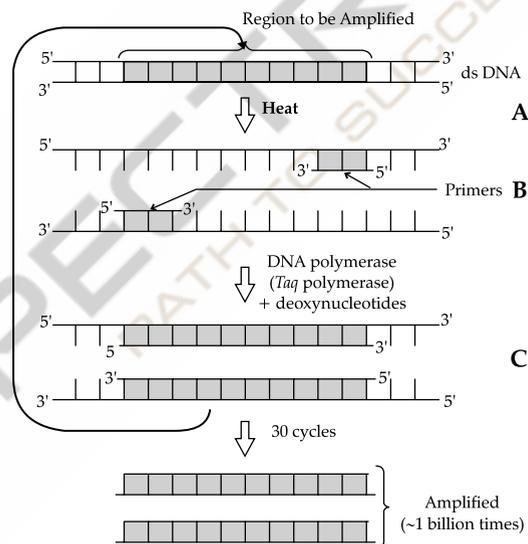
11. The picture shown below shows defence mechanisms in a plant.



(a) Explain any two defence mechanisms plants have evolved against their predators. 2

(b) How does predation differ from parasitism? 1

12. Identify and explain the steps 'A', 'B' and 'C' in the given diagram representing the Polymerase Chain Reaction (PCR).



### Section - C

(5 Marks)

13. Crown gall is a neoplastic disease of most dicotyledonous plants and is caused by the soil bacterium *Agrobacterium tumefaciens*. A large chromosomal plasmid in these bacteria was found to be responsible for this disease. The plasmid is known as Ti plasmid. Bacteria free crown gall cells can be cultured in the absence of phytohormones. Ti plasmid is widely used in genetic engineering to deliver the desirable genes. The part of Ti plasmid transferred into plant cell DNA is called T-DNA. T-DNA with desired DNA segment is inserted into the chromosome of the host plant where it produces copies of itself.

(a) What is the full form of T-DNA? 1

(b) Ti plasmid cannot infect and develop crown gall disease in which living organisms? 1

(c) What happens when T-DNA is inserted into the host cell, while making transgenic plant. 1

(d) What are the advantages of *Agrobacterium* mediated gene transfer in plants?

2

OR

Plants having foreign genes in their genome inserted through genetic engineering are called transgenic plants. Genes can be incorporated either through a vector or through direct introduction of DNA. Bt cotton is a genetically modified organism which is pest resistant. It contains gene cry I Ac and cry II Ab of *Bacillus thuringiensis*. It is used to control lepidopterans, coleopterans and dipterans. Bt cotton can resist cotton bollworm and produce higher yields. Cry gene produces cry protein or Bt toxin. It is an endotoxin which remains as protoxin in plants and gets converted to active toxin after getting ingested by the insects. Alkaline pH of the insect gut solubilizes the protein crystals. The activated toxin creates pores in the midgut of the insects which in turn leads to their death.

(a) Why does the toxin produced by *B. Thuringiensis* not kill the Bacillus?

2

(b) How man has exploited Bt toxin genes for his benefit? What type of changes occur in the gut of insects on consuming this protein?

3

□□□



## Solution

**BIOLOGY - 044**

**Class 12 - Biology**

### Section - A

(2 Marks Each)

- 1.** (a) Milk to curd 1/2  
 (b) Bread / ethanol / alcoholic drinks / whisky  
 / brandy / beer/ rum 1/2  
 (c) Swiss cheese 1/2  
 (d) Citric acid 1/2

[CBSE Marking Scheme, 2015]

- 2.** (a) Vigorous growth of useful aerobic microbes into flocs. 1  
 (b) Activated sludge - Some of it is pumped back into the aeration tank to serve as the inoculum. 1/2+1/2

**OR**

Differences between opioids and cannabinoids are:

	Opioids	Cannabinoids
<b>Specific receptor site in human body</b>	Receptors of opioids are located in the GI tract and central nervous system.	Receptors are located in the brain only.
<b>Mode of action in human body.</b>	Act as depressant and slows down the body functions.	Affects the cardiovascular system of the body.

1+1

- 3.** Withdrawal syndrome. 1  
 Anxiety, shakiness, nausea and sweating.  
 (Any two) 1/2+1/2  
 [CBSE Marking Scheme, 2016]

- 4.** The given figure represents the structure of an antibody molecule. 1/2

- A- Antigen binding site 1/2  
 B- Light chain 1/2  
 C- Heavy chain 1/2

- 5.** Age pyramid is defined as a graphical illustration that shows the distribution of various age groups in a population forming the shape of a pyramid when the population is growing. The three tiers labelled in the diagram are :

1. Pre-reproductive phase
2. Reproductive phase
3. Post-reproductive phase 1/2 × 4

- 6.** (i) Predators act as conduits (channels) for energy transfer across trophic levels.  
 (ii) They keep prey population under control. An efficient predator may cause extinction of prey species. 2

#### Commonly Made Error

- Majority of the students are unclear about the role of predators. Most of them write that the predators disturb the ecosystem.

#### Answering Tip

- Make sure, you learn the role of predators thoroughly.

**OR**

Variations in number of individuals in a population can be expressed as population density and population size. A population of younger individual than older individuals will show positive growth in future (after some years), that is, it will increase after some time.

2

## Section - B

(3 Marks Each)

7. (a) Liver cells, sporozoites. 1  
(b) Parasites reproduce asexually in RBC / multiply, Rupture of RBCs is associated with release of toxic substance called as hemozoin. 2  
[CBSE Marking Scheme, 2016]

### Detailed Answer :

The infected female *Anopheles* is the carrier of malarial parasite called *Plasmodium*. When bitten by this carrier, the liver is initially affected. The infective stage of *Plasmodium* is sporozoite which is injected into the blood by female anopheles. From blood, the sporozoites reach the liver cells where they multiply in liver cells. The liver cells rupture and liberate the parasite in blood where they attack RBCs, multiply and cause their rupture. Rupture of RBCs is associated with the release of a toxin called as hemozoin, which causes chill and high fever recurring every 3-4 days. 3

OR

Vector is an organism, typically a biting insect or tick, that transmits a disease or parasite from one animal to another. 1

Dengue, Chikungunya/Yellow Fever / Eastern Equine Encephalitis / West Nile Fever / Zika / Zika Viral Disease. (Any two) 2  
[CBSE Marking Scheme, 2018]

### Commonly Made Error

- Students often write incorrect names of the diseases caused by *Aedes* mosquito. Many of them write Malaria, which is incorrect as it is caused by female *Anopheles* mosquito. Spelling error while writing the names of the disease is commonly seen.

### Answering Tip

- Learn the name of diseases and write biological names with correct spellings according to the rules of binomial nomenclature.

8. (a) To detect drug abuse / use of banned drugs / use of cannabinoids / anabolic steroids / narcotic analgesics/ diuretics / hormones / drugs used to accelerate performance / increase muscle strength / bulk / promote aggressiveness / to ensure fair game. 1

(b) Cannabinoids / cocaine / coca alkaloid / coke / crack / hashish / charas / ganja / hemp plant extract. 1

(c) *Cannabis* / *Atropa* / *Erythroxylum* / *Datura*. (Any two) 1

[CBSE Marking Scheme, 2016]

### Detailed Answer :

- (a) The blood test is conducted to check the level of certain drugs in the blood which are banned by sports authorities.
- (b) Authorities look for certain drugs like narcotic analgesics, anabolic steroids, diuretics and certain hormones.
- (c) The generic name of the plants from which drugs are obtained are *Cannabis sativa* and *Papaver somniferum*. 1+1+1
9. (a) B is the anode end. DNA fragments are negatively charged thereby moving towards anode which is a positive rod, through sieving effect provided by agarose under the influence of an electric field during gel electrophoresis.
- (b) Most commonly used matrix is agarose. Agarose is a natural polymer extracted from seaweeds.
- (c) Ethidium bromide is used as a stain for DNA, which on exposure to UV-light appears as orange coloured bands. 1+1+1
10. (a) Population in a metro city will tend to increase when natality and immigration will be higher.
- (b) Population in metro city will tend to decline when mortality and emigration will be higher.
- (c) The equation  $N_{t+1} = N_t + [(B + I) - (D + E)]$  represents the population density at time  $t + 1$ .  
Here,  
 $N_{t+1}$  = Population density at time  $t+1$ .  
 $N_t$  = Population density at time  $t$ .  
B = Natality  
I = Immigration  
D = Mortality  
E = Emigration 1+1+1
11. Plants have developed following defence mechanisms :
- (a) (i) Thorns are (morphological) means of defence. 1  
(ii) Plants may produce / store chemicals such as nicotine, strychnine etc, for defence which inhibit digestion / disrupts reproduction / kill the predator / *Calotropis* produces highly poisonous cardiac glycosides / plants may produce chemicals such as nicotine/caffeine/quinine/strychnine/opium are produced as defence. 1

(b)	S. No.	Parasitism	Predation
	(a)	Lives and feed on the host.	Only feeds on prey.
	(b)	Host specific.	Prudent / not prey specific.
	(c)	Co-evolve with the host.	Control / check prey population.

(Any one difference) 1  
[CBSE Marking Scheme, 2016]

12. Polymerase chain reaction is a technique that is used to reproduce (amplify) selected sections of DNA or RNA for analysis. 1

In PCR, each cycle has three steps:

- (a) The step 'A' in the given diagram is **Denaturation of DNA** : This step involves unwinding of two strands of DNA by heating the sample at 94°C–98°C. 1
- (b) The step 'B' is **Primer annealing** : In this, primer gets positioned on the exposed nucleotides, according to the base-pairing rules. 1
- (c) The step 'C' is **Extension of primers** : DNA polymerase recognises primers as 'start' tags and begins to extend the primers using the free nucleotides provided in the reaction and the genomic DNA as template. The DNA doubles with each round of reactions. 1

### Section - C

(5 Marks)

13. (a) T-DNA stands for transfer DNA. 1
- (b) Ti plasmid cannot infect and develop crown gall disease in humans. 1
- (c) While making transgenic plant, T-DNA is inserted into the host cell, and is then integrated into the target host genome. 1
- (d) **Advantages of *Agrobacterium* mediated gene transfer in plants are:**
- (i) It allows transfer of relatively large segment of DNA. 1
- (ii) It transfers DNA with defined ends and minimal rearrangement. 1+1

OR

- (a) The toxin produced is in inactive form as protoxin. It does not kill the bacteria and attacks only its target pest because protoxin is activated in the optimum pH medium of the gut of insect pest. 2
- (b) Specific Bt toxin genes are isolated from *Bacillus thuringiensis* and is incorporated into several crop plants such as cotton and corn, which become pest resistant against certain insects. Protoxin becomes active toxin in alkaline pH of gut of insects. Toxins bind to surface of midgut and cause perforation, swelling, lysis of cells ultimately leading to death. 3

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