

Practice Questions 2021-22

Class XII

Term 2

Subject: Biology (044)

Time: 2 hours

Max. marks: 35

General instructions:

1. All questions are compulsory.
2. The question paper has three sections and 13 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

SECTION A

1. Malaria, caused by *Plasmodium* is often characterised by high fever recurring every three to four days. Explain why this happens.

[2 marks]

2. Rural energy shortage has been largely mitigated by biogas plants.

- (a) What is the primary flammable gas present in biogas?
- (b) Why is cattle dung used to produce biogas?

[2 marks]

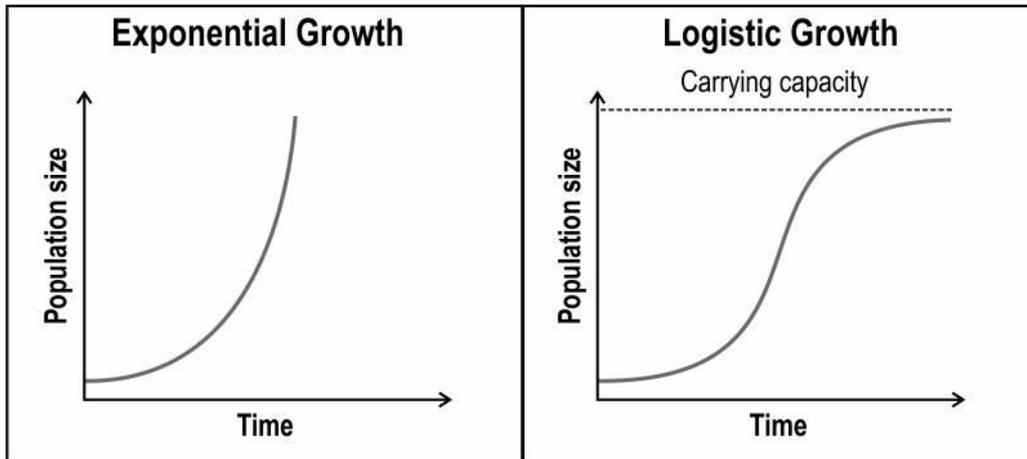
OR

Nicotine stimulates the adrenal gland and increases blood pressure and heart rate.

- (a) Despite higher heart rate leading to faster pumping of the blood, why would a smoker show oxygen deficiency in the body?
- (b) Why does a chronic smoker experience withdrawal symptoms if he abruptly discontinues smoking?

[2 marks]

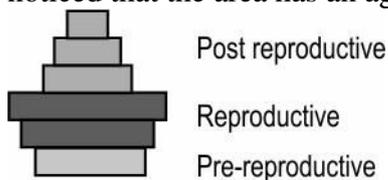
3. The population growth can be exponential (unimpeded) or logistic (competitive). These growth curves can be represented by the graphs as shown below:



- (a) Define carrying capacity.
 (b) What limits the growth of organisms as seen in the graphs above?

[2 marks]

4. While studying the human population data of a particular geographical area it was noticed that the area has an age pyramid as shown below.



- (a) What kind of natality and mortality rate of the pre-reproductive population contributes the kind of shorter base of the age pyramid as shown above?
 (b) Why do we usually have an age pyramid with a broader base?

[2 marks]

5. For an individual 'X' with a history of lung cancer in the parents, doctors advised certain genetic testing processes that help in detecting the inheritance of mutations.

(a) Malignant tumours spread rapidly and avoid detection. α -interferon is a biological response modifier and can target specific disease causing mechanisms.
 How does α -interferon help in the treatment of malignant tumours?

(b) For a cancer caused by inheritance of genetic mutations, how will the malignancy spread internally?

[2 marks]

6. *Eichhornia crassipes* (commonly known as water hyacinth) is an aquatic plant, native to the Amazon basin. It was introduced to the water bodies of India and other South-East Asian countries for industrial use of its fibres in making bags and footwear, as a substrate for biogas production and for its ability of uptake of heavy metals from the water bodies.
 However, *Eichhornia* has been named as the 'terror of bengal' due to its prolific,

invasive growth.

- (a) How does the growth of water hyacinth affect the growth of other native species?
- (b) There are a host of algae and fungi that form lichens in freshwater lakes. What would be the fate of freshwater snails that feed on such lichens if the algae and fungi are destroyed by growth of water hyacinth? Mention the scientific term used to denote such threats to biodiversity.

[2 marks]

OR

Conservation of biodiversity is vital to maintain the balance in ecosystem.

- (a) Mention ONE condition when ex-situ conservation is a more viable process to conserve a species.
- (b) What are the TWO most important parameters that help in naming an area as a biodiversity hotspot?

[2 marks]

SECTION B

7. A pest control program needed to be developed for the Sunderbans mangrove ecosystem and biocontrol methods were being explored.

- (a) Why would biocontrol methods be the best method for a pest control program in a biome like Sunderbans?
- (b) What is the difference in the action of a biocontrol agents as against the action of chemical pesticides?
- (c) Mention any two points of vital information about the pests that the designers of the pest control program need to be aware of?

[3 marks]

OR

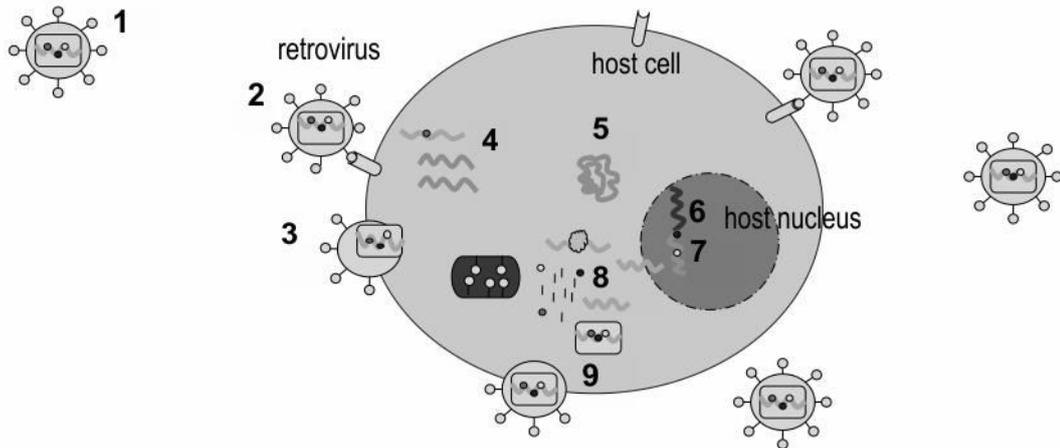
Lymphocytes are an integral part of our immune system and help in the humoral and cell-mediated immune response process.

- (a) Specify the type of lymphocytes that mediate humoral immune response and the ones that mediate cell-mediated immunity.
- (b) What is the chemical nature of antibodies?
- (c) How is an organ rejected by the body due to 'unmatched' transplant?

[3 marks]

8. The image below represents the replication of a retrovirus.

In the image, steps 1- 5 depict different stages in the invasion of the retrovirus into the host cell and steps 6 - 9 show the invasion of the host DNA and the processes resulting out of it.



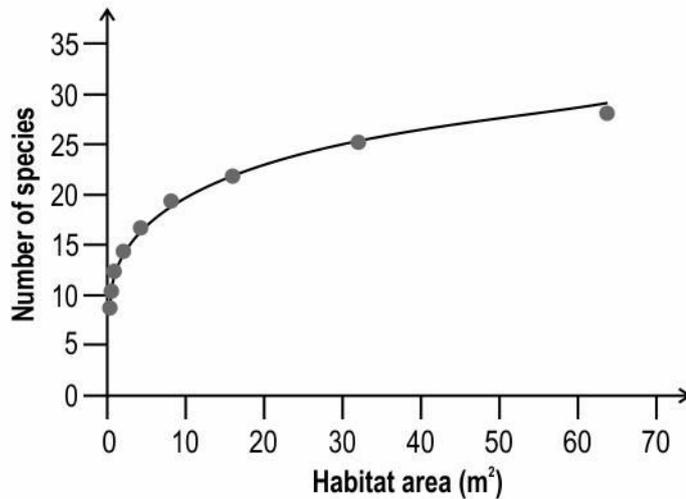
- (a) Why does the retrovirus need to use reverse transcriptase to infect the host genome?
- (b) What is the significance of step 7 and 8 (after the viral genome enters the host nucleus) as shown in the diagram?

[3 marks]

9. Diversity is seen in the living world at various levels. The distribution of biodiversity shows specific patterns that account for the species richness or paucity across the globe.

- (a) Explain, with reasons, how species diversity changes with changing latitudes.
- (b) The graph below represents species-area relationship. What does such a graph signify?

Species-area Relationship



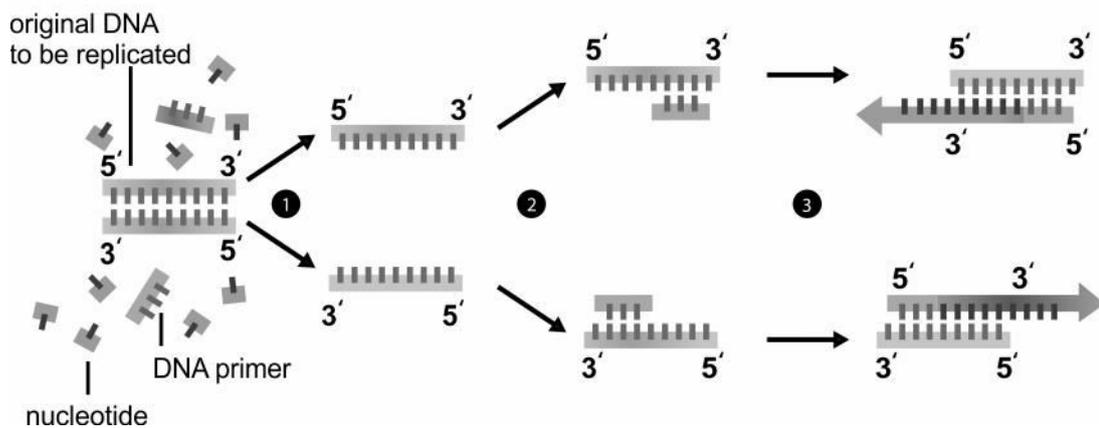
[3 marks]

10. In recombinant DNA technology, the endonuclease cuts the DNA into fragments.
- Where does a restriction endonuclease cut the DNA strand?
 - How is the restriction endonuclease able to cut the DNA strand as mentioned in (a)?
 - DNA fragments formed by the action of endonuclease can be separated by gel electrophoresis. What is the principle on which gel electrophoresis works?

[3 marks]

11. Polymerase Chain Reaction (PCR) is often used to detect the presence of pathogens like bacteria and viruses, even though they may be in low concentration.
- What is the technique that allows PCR to detect low concentrations of pathogens?
 - The image below shows steps involved in a PCR. Step 1 is denaturation, step 2 annealing and step 3 extension. During a PCR, if step 2 is bypassed, what would be the implication on the process?

Polymerase chain reaction - PCR



[3 marks]

12. Populations of organisms respond differently to the abiotic factors of the environment. Organisms that are able to maintain physiological homeostasis ensuring constant body temperature are called regulators while others that cannot, are termed as conformers.

Crocodiles are often seen basking in the sun more during certain periods of the year.



- Identify, with a reason, if the species described above is an environmental conformer or regulator.
- Crocodiles are usually sluggish and show minimum movement. How does such behaviour aid in conservation of body heat in a crocodile?
- If the geographical location of a population of crocodiles was to receive harsh winter conditions, what could be TWO most viable survival methods for the animals?

[3 marks]

SECTION C

Consider the information given below to answer the questions that follow:

When scientists look at improving food production and crop value, they have looked at the possibility of using arid conditions for increasing available farmlands.

Plants growing in low water content areas can have three modes of adaptation:

- drought escape: where the plants complete the life cycle before the dry season comes in
- drought avoidance: where the plants naturally have adaptations like reduced leaves, lower stomatal presence to reduce water loss
- drought tolerance: where the plants inherently have low water requirement and can grow in dry conditions

When any of these is genetically incorporated in a plant that otherwise grows in moderate water availability, it may impact physiological processes like mobilisation and storage of minerals, maturation of flowers and fruits etc.

The National Academies Press published a report titled *Transgenic Plants and World Agriculture (2000)*. In the chapter named *Examples of GM crops that can benefit World Agriculture*, the report speaks about techniques for developing pest resistance in GM crops and its advantages.

"There is clearly a benefit to farmers if transgenic plants are developed that are resistant to a specific pest. For example, papaya-ringspot-virus-resistant papaya has been commercialised and grown in Hawaii since 1996. (Gonsalves 1998).

Developments resulting in commercially produced varieties in countries such as the United States and Canada have centered on increasing shelf life of fruits and vegetables, conferring resistance to insect pests or viruses, and producing tolerance to specific herbicides. While these traits have had benefits for farmers, it has been difficult for the consumers to see any benefit other than, in limited cases, a decreased price owing to reduced cost and increased ease of production (Nelson et al. 1999; Falck-Zepeda et al. 1999).

A possible exception is the development of GM technology that delays ripening of fruit and vegetables, thus allowing an increased length of storage."

Ref: <https://www.nap.edu/read/9889/chapter/5>

13. Bt cotton is known to be a pest resistant GM crop. How does Bt cotton get its insect resistance?

[2 marks]

14. One advantage of incorporating pest resistance in GM crops is, obviously, that it helps in pest control. Traditionally, chemical pesticides have been used as pest control methods in agricultural farmlands.

(a) What is the environmental advantage of developing GM crops with pest

resistance?

(b) Name and explain the cellular defense mechanism that has been used to develop such pest resistance against specific nematodes.

[2 marks]

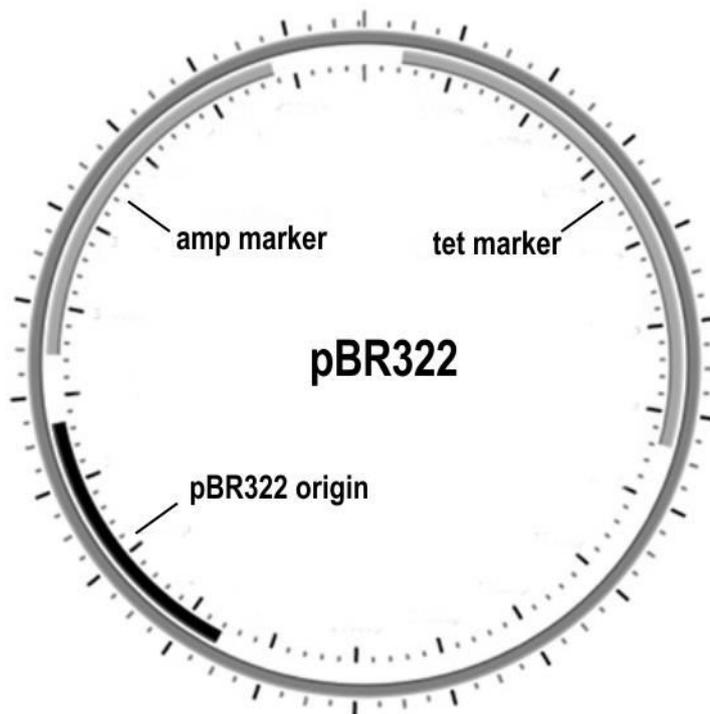
15. For a fruit plant naturally growing in moderate water availability, GM techniques can help in incorporating drought escape characteristics. This will reduce their life cycle duration and can have adverse impacts. State ONE such possible impact on the commercial value of the fruit.

[1 marks]

Answer the following questions in relation to the diagram and information on the pBR322 plasmid:

The ability of plasmids and bacteriophages to replicate inside a bacterial cell, independent of the chromosomal DNA control is used in the technique of cloning vectors.

E.coli cloning vector pBR322 has restriction sites, site of origin and antibiotic resistant genes that make it perfect as a cloning vehicle.



OR

pBR322 and normal *E. coli* genes were incorporated in the DNA of two test plant specimen A and B respectively.

Later, antibiotic ampicillin was administered to the two plant specimen to combat bacterial infections.

What would MOST LIKELY be the fate of each of the two test specimen and why?

[2 marks]

16. The sequences amp marker and tet marker are the selectable markers in the plasmid and help in transformation and can help in differentiating the non-recombinants from the transformants. This is done using 'chromogenic substrates'.

- (a) What is the chemical basis on which the chromogenic substance act?
- (b) Explain how the substrates help in the differentiation process.
- (c) Why are such chromogenic substrates advantageous in the separation of non-recombinants and transformants?

[2 marks]

17. Mention any TWO characteristics that are important for a cloning vector.

[1 marks]

*****End of Paper*****