

St. Paul's School
Class XII – Pre-board (2023-24)
Biology (044)

Time: 3 hrs

Max. Marks: 70

General instructions:

- (i) All questions are compulsory.
- (ii) The question paper has five sections and 33 questions.
- (iii) Section – A has 16 questions of 1 mark each; Section – B has 5 questions of 2 marks each; Section – C has 7 questions of 3 marks each; Section – D has 2 case-based/passage-based questions of 4 marks each; and Section – E has 3 questions of 5 marks each.
- (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. In human females, meiosis-II is not completed until 1
- (a) Puberty
 - (b) Fertilisation
 - (c) Uterine implantation
 - (d) Birth

2. Given below are the four enzymes and their activities. 1

Enzymes	Activity
A. <i>Taq</i> DNA polymerase	1. Stable above 86°C
B. Exonuclease	2. Cleaves the ends of linear DNA
C. Protease	3. Degeneration of proteins
D. Chitinase	4. Breakdown of fungal cell wall

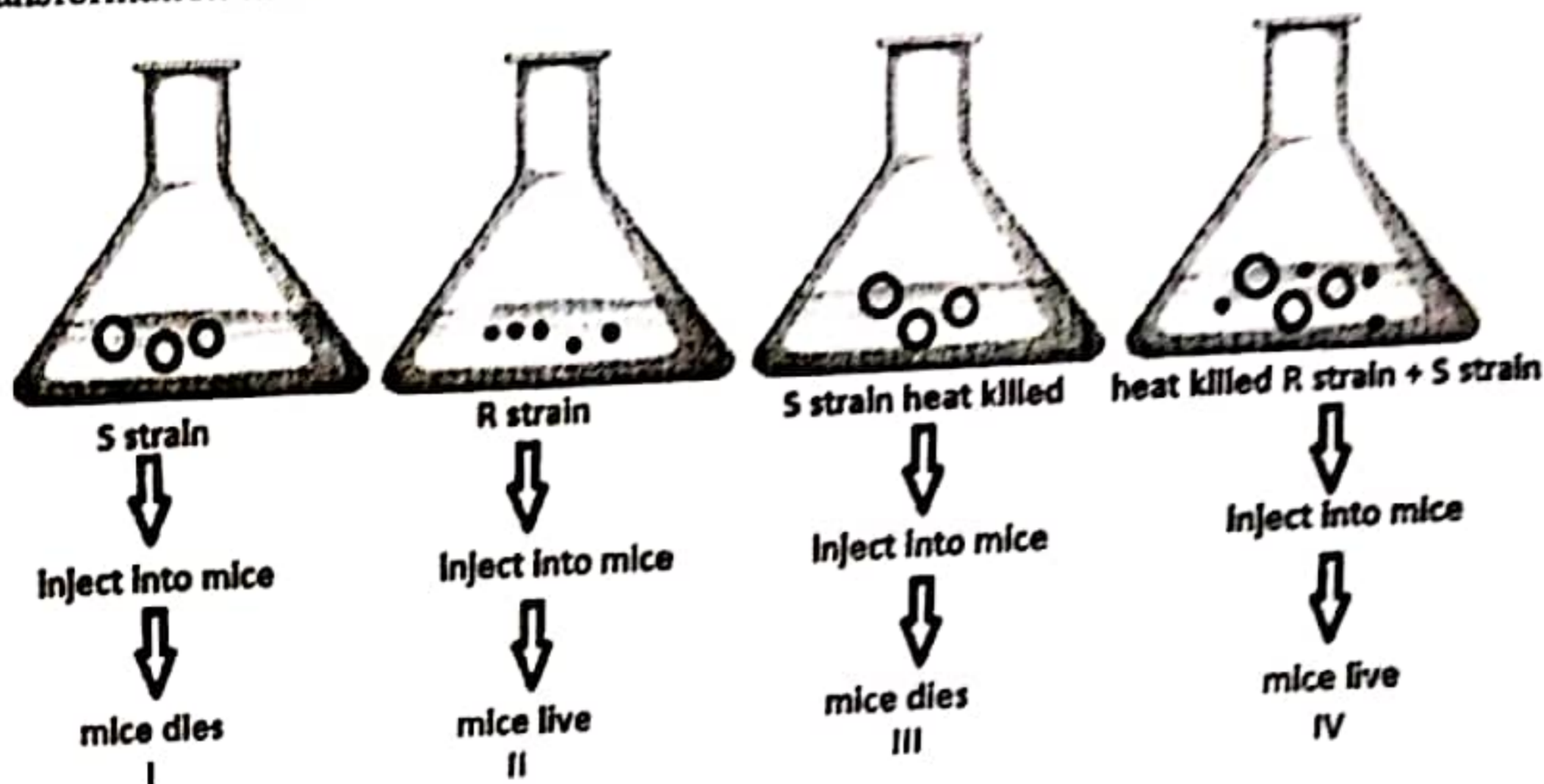
How many of them are correctly matched?

- (a) 2 (b) 1 (c) 4 (d) 3
3. The feature of the genetic code that allows bacteria to produce human insulin by recombinant DNA technology is 1
- (a) genetic code is redundant
 - (b) genetic code is universal
 - (c) genetic code is specific

- (d) genetic code is not unambiguous
4. Round seed trait (R) is dominant over wrinkled (r) seed trait in Pea. Heterozygous round seeded plant (Rr) is crossed with wrinkled seed plant (rr). What is the possible progeny? 1
 (a) 306 round 102 wrinkled
 (b) 210 round 95 wrinkled
 (c) 103 round 99 wrinkled
 (d) 103 round 315 wrinkled
5. The process of splicing in eukaryotes 1
 (a) is reminiscent of antiquity
 (b) represents dominance of RNA world
 (c) is an indicator of the complexity of human genome
 (d) is a legacy of organic evolution
6. Which one of the following microbes forms symbiotic association with plants and helps them in their nutrition? 1
 (a) *Azotobacter*
 (b) *Aspergillus*
 (c) *Glomus*
 (d) *Trichoderma*
7. Polymerase chain reaction is not used in 1
 (a) confirming presence of a pathogen during early infection
 (b) identifying the mutated genes in suspected cancer patients
 (c) isolating the gene of interest from host DNA to be cloned by recombinant procedures
 (d) detection of the presence of HIV in suspected AIDS patient
8. What is the correct sequence of the formation of female gametophyte in angiosperms? 1
 (a) Nucellus, megaspore tetrad, megaspore mother cell, megaspore, female gametophyte
 (b) Megaspore tetrad, nucellus, megaspore mother cell, megaspore, female gametophyte
 (c) Nucellus, megaspore mother cell, megaspore tetrad, megaspore, female gametophyte
 (d) Megaspore mother cell, megaspore tetrad, megaspore, nucellus, female gametophyte
9. Select the correct match regarding adaptive radiation of Australian marsupials corresponding to placental mammals. 1

- (a) Numbat-Flying squirrel
- (b) Tasmanian wolf-Bobcat
- (c) Marsupial mouse-mole
- (d) Spotted cucus-lemur

10. Study the given diagrammatic representation of Griffith's experiment to demonstrate the transformation in bacteria.



Select the option which is incorrectly representing the experiment.

- (a) I and III
 - (b) II and III
 - (c) III and IV
 - (d) II and IV
11. The main reason for the presence of both a leading and a lagging strand during DNA replication is
- (a) DNA polymerase can read only in the direction of 3' to 5'
 - (b) DNA polymerase can only synthesize one strand at a time.
 - (c) Only one strand is available to be read at any given time.
 - (d) There are not enough RNA primers to have both strands be synthesized simultaneously.
12. Select the correct statement/s regarding the mutation theory of evolution.

- I. This theory was proposed by Alfred Wallace.
- II. Variations are small directional changes.
- III. Single-step large mutation is a cause of speciation.
- IV. Large differences due to mutations arise gradually in a population.

- (a) Both I and II are correct
- (b) Only III is correct
- (c) Both II and III are correct
- (d) I, II and III are correct

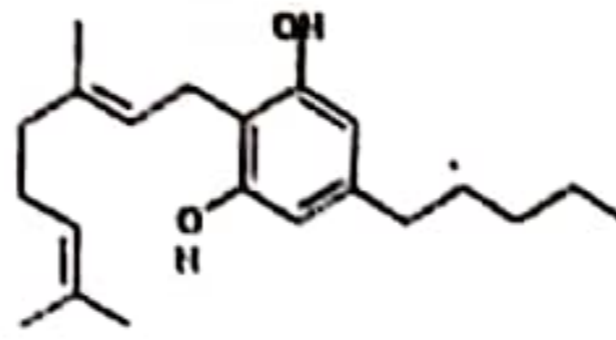
13. **Assertion:** Cry gene expressing crop is resistant to a group of insects. 1
Reason: Cry proteins produced from *Bacillus thuringiensis* are toxic to larvae of certain insects.
14. **Assertion:** When an infected female anopheles mosquito bites, it releases sporozoites into the healthy person. 1
Reason: The female anopheles mosquito takes up the sporozoites of *Plasmodium* with blood meal from an infected person, suffering from malaria.
15. **Assertion:** A typical microsporangium of angiosperms is generally surrounded by four wall layers. 1
Reason: The outer three wall layers perform the function of protection and help in dehiscence of anther to release the pollen.
16. **Assertion:** The annual net primary productivity of the whole biosphere is approximately 170 billion tones 1
Reason: Majority of this is contributed by the oceans as they occupy larger area of earth.

SECTION B

17. Illustrate the structure of a dicot embryo. 2
OR
- (a) List any two adaptive features of water pollinated flowers.
(b) State one advantage and one disadvantage of cleistogamy.
18. What will happen if somehow the pH of the gut of caterpillar is sustained acidic rather than alkaline and they are subjected to carry protein produced by *Bacillus thuringiensis*? 2
19. Explain the factors that affect the rate of decomposition of the organic matter. 2

20. Given below is an outline structure of a drug.

2



(a) Which group of drugs does this represent and which part of the body will be affected by these drugs?

(b) What will be the modes of consumption of these drugs?

21. Normally humans have 46 chromosomes arranged in 23 pairs, the pairs vary in size and shape. 22 pairs are autosomes and 1 pair is sex chromosome. Any variation in this pattern causes genetic abnormalities.

(a) Name the genetic disorder in human female having 47 chromosome karyotype with one symptom.

(b) Explain the cause of such chromosomal disorder.

SECTION C

22. Ashanthi De Silvia was diagnosed with a genetic defect that caused deletion of a gene crucial for the immune system. With the help of recombinant DNA technology how can this defect be rectified? What is the permanent cure for this defect?

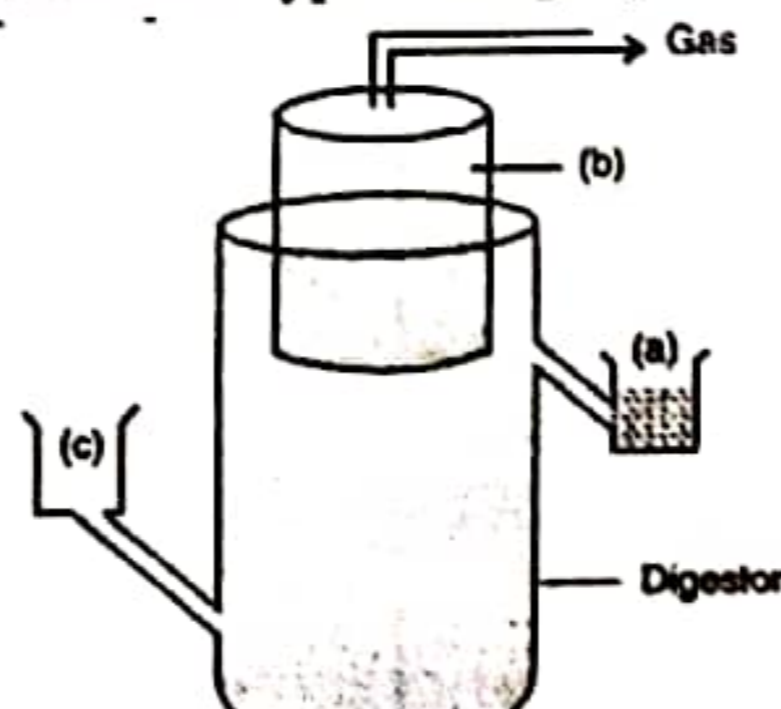
23. STD are a threat to the reproductive health. Describe any three such diseases and suggest preventive measures.

24. (a) Embryo Transfer is a technique of ART. What are the ways by which ET can be done in cases of couples dealing with infertility?

(b) How does LNG-20 work as a contraceptive?

25. The diagram given below is that of a typical biogas plant.

3

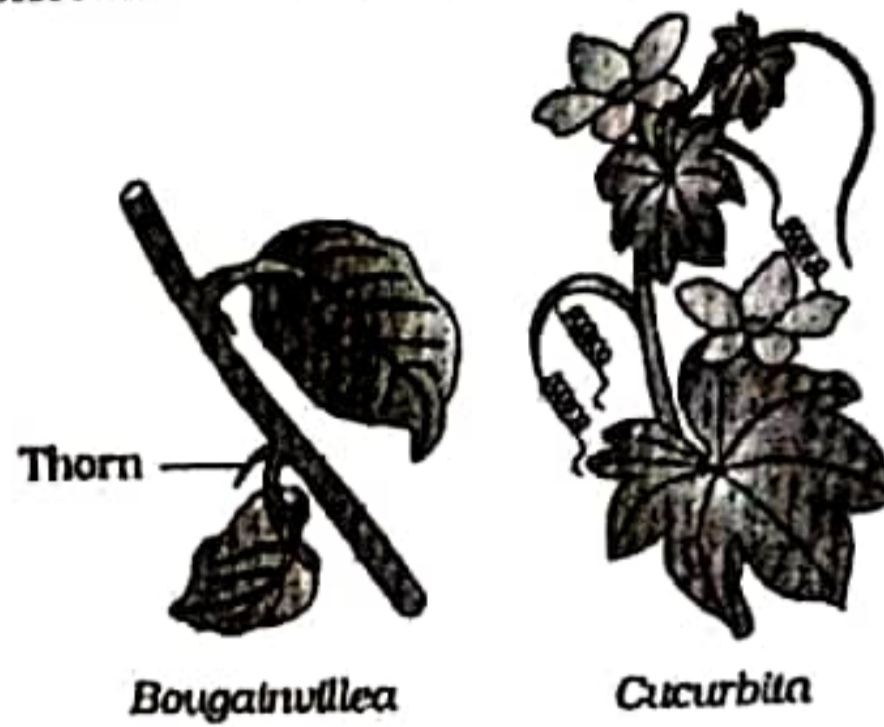


(a) Identify (b) and (c).

(b) Write the sequence of events occurring in it.

3

26. Given below are the modifications in different organisms.



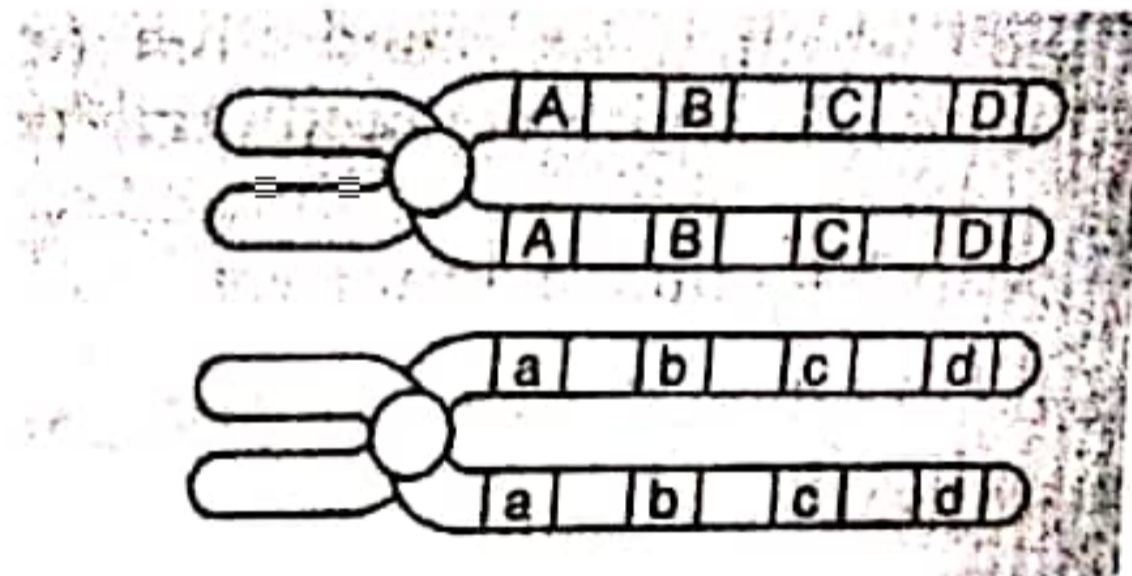
(a) What conclusions can you derive with respect to these organisms?

(b) How is the comparative study of morphology and anatomy helpful in evolutionary studies?

OR

Who proposed that the first form of life could have come from pre-existing non-living organic molecules? Who created similar conditions in a laboratory scale to experimentally prove it?

27. Given below is the diagram that shows a pair of homologous chromosomes during 3 meiosis.



(a) Which of the genes will show maximum crossing over?

(b) How does the strength and weakness of linkage depend on linked genes?

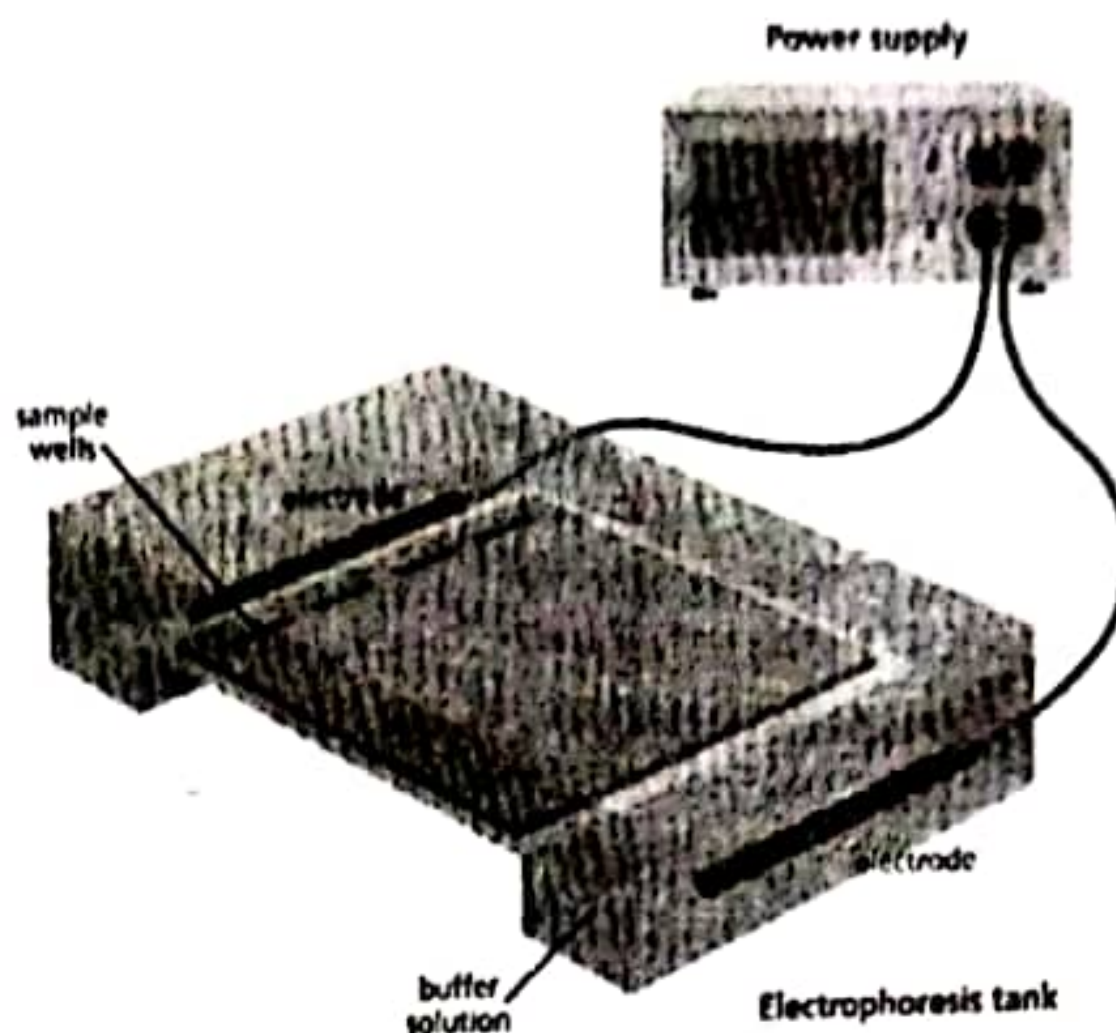
28. (a) National parks and zoological parks both are meant for the purpose of conservation of biodiversity but differ in their approach. Justify.

(b) Elaborate the finding of Alexander von Humboldt in context to pattern of biodiversity.

SECTION D

29. Observe the picture given below and answer the following questions.

4

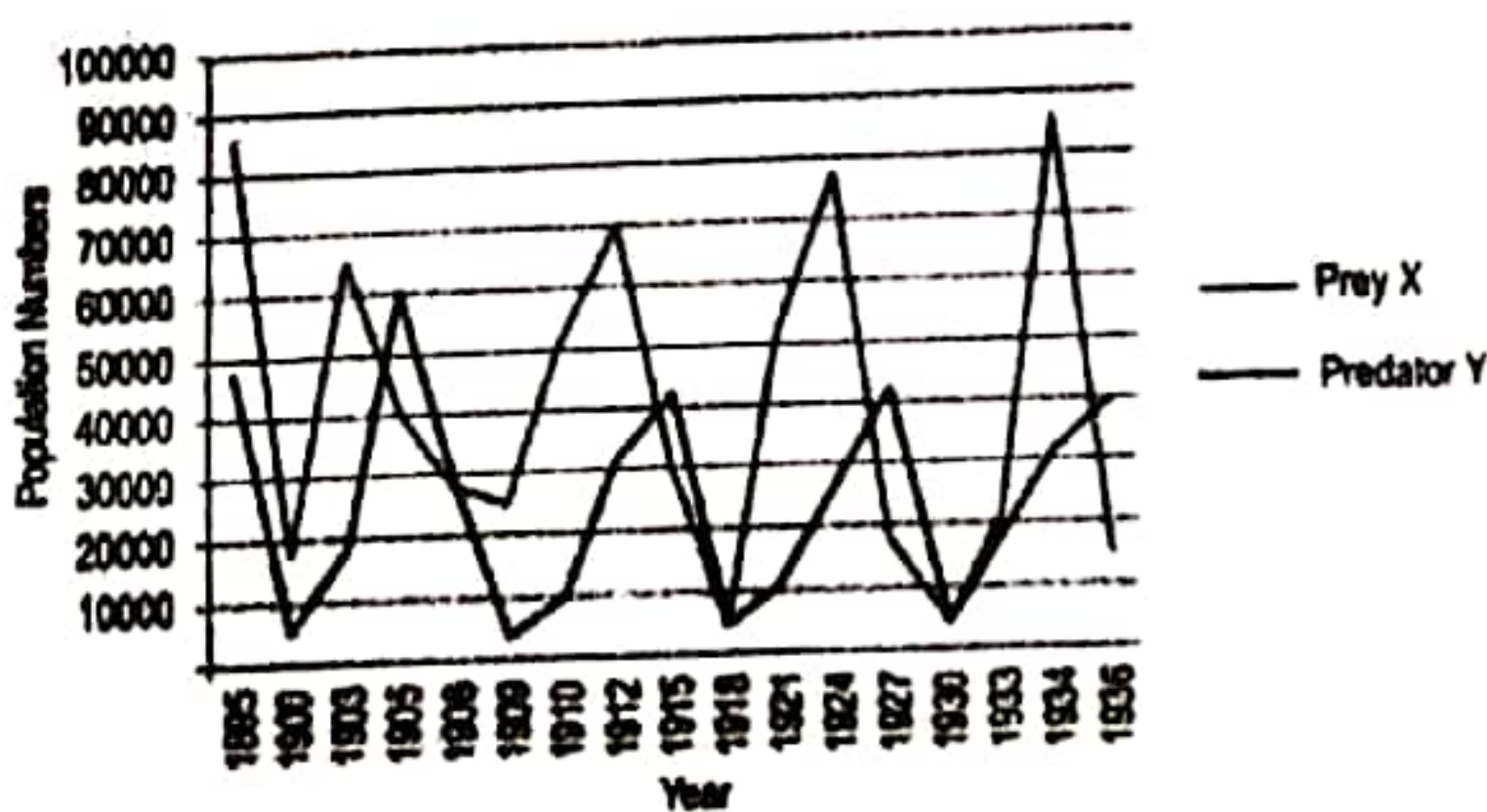


- (a) What is the direction of the movement of the DNA fragments with reference to electrode?
- (b) Write the medium used on which DNA fragments separate.
- (c) Mention how the separated DNA fragments can be visualised for further technical use.
- (d) Elaborate the step which succeed the process shown in the diagram.

OR

- (d) Explain the step that precedes the process shown in the diagram.

30. Predator Y shown in the image below is a type of wild cat that inhabits the forests and preys primarily on prey X which are herbivores. Shown below is data on their respective populations over time. 4



- (a) What is the likely cause for the pattern seen in the prey and predator populations through the years?
- (b) Hypothetically, if all the predators of the forests become extinct, what will happen to the vegetation of the forest?
- (c) Consider a situation where another similar species of predator immigrates to the forest. What is likely to happen over time and why?
- (d) Enlist two important functions of predators in an ecosystem.

OR

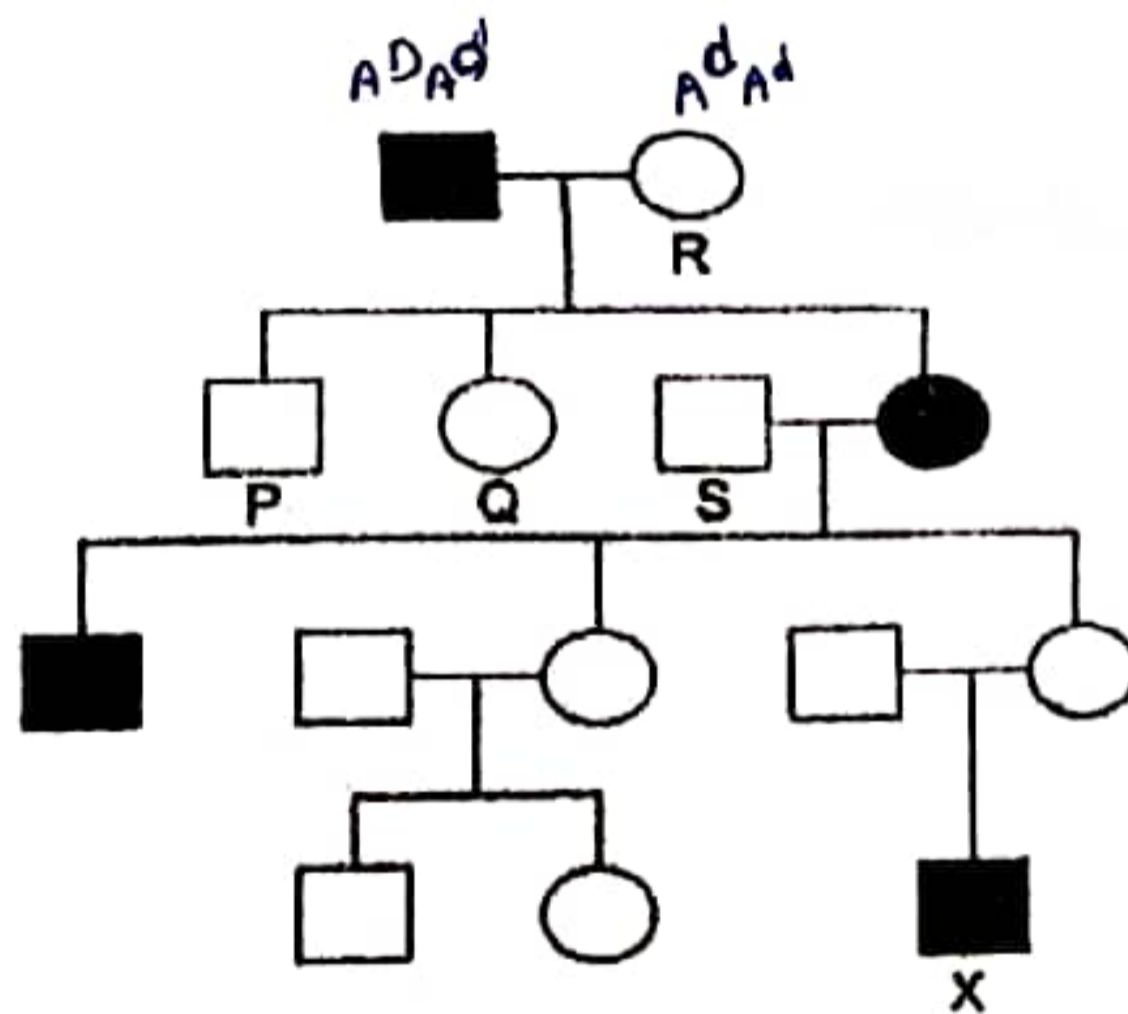
- (d) Mention one morphological and chemical defence evolved by the plants against their herbivores.

SECTION E

31. Describe Meselson and Stahl's experiment that was carried in 1958 on *E.coli*. Write the conclusion they arrived at after the experiment. 5

OR

Shown below is a pedigree of an individual X who is suffering from ocular albinism which results in permanent vision loss. Use the pedigree to answer the questions that follow:



- (a) Complete the following statement about this disease:
The trait for the disease is linked to _____ (X-chromosome/Y chromosome/autosome) and is _____ (dominant/recessive).
- (b) Give a reason to support your answer to (a).
- (c) Identify the genotypes of individuals P, Q, R and S marked in the pedigree.
32. In human females, menstruation is repeated at an average interval of about 28/29 days, and the cycle of events starting from one menstruation till the next one is called the menstrual cycle. 5
- (a) Explain the menstrual phase in a human female.

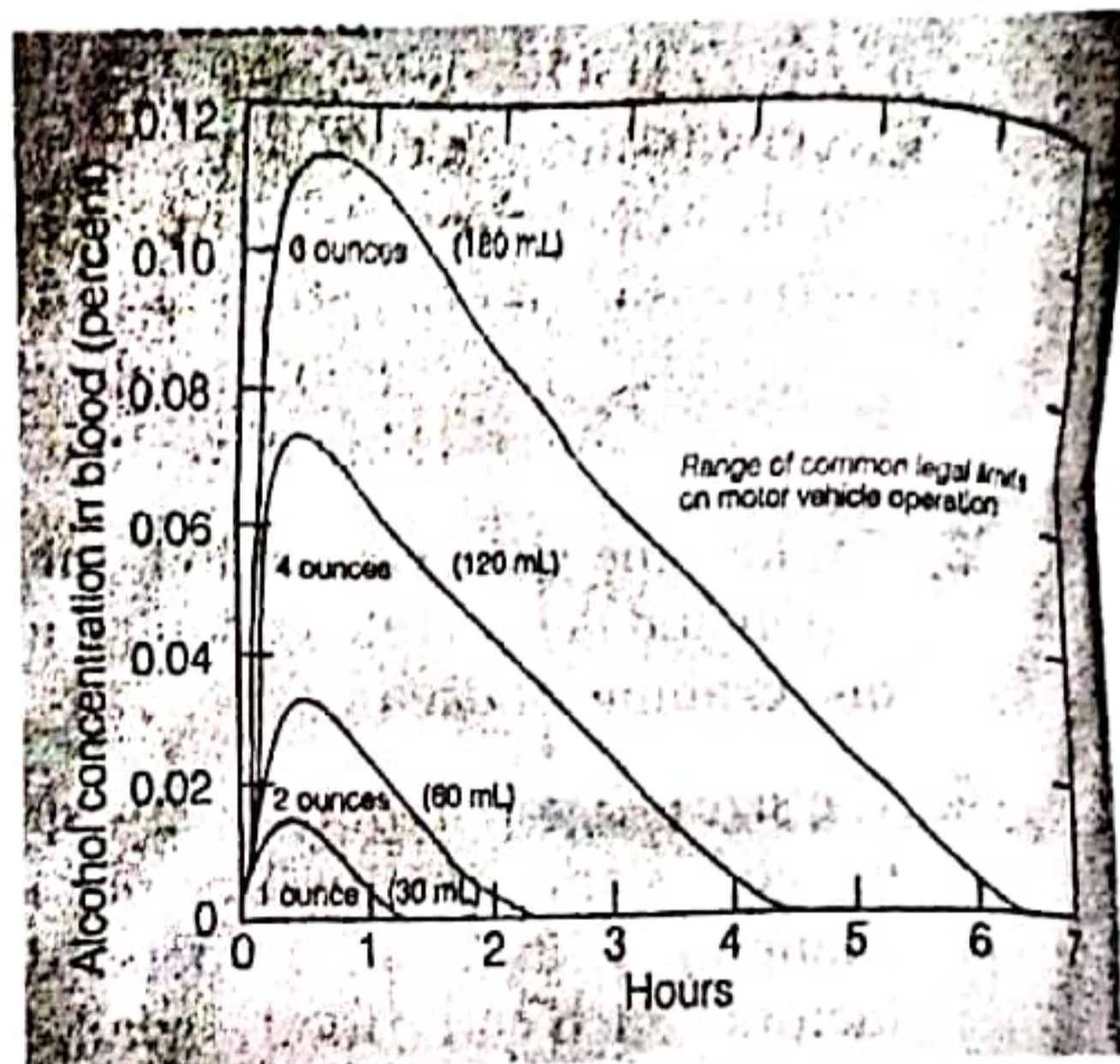
(b) Why is follicular phase in the menstrual cycle also referred as proliferative phase? State the level of ovarian and pituitary hormones during this phase.

OR

Amey and Lalita are expecting their first child, with Lalita being in her second month of pregnancy with no known complications. Amey's family has a history of cystic fibrosis while Lalita's family has a history of Down's syndrome, leading to a concern that the baby may have one of these conditions.

- Suggest and explain a way of testing if their baby is at risk for any genetic disorders.
- In case of the presence of one or both of the abnormality and posing a risk to the mother's health, mention one possible option for them to consider.
- Is the process mentioned in (b) safe for Lalita at the current gestational age? Justify.
- Under what conditions is the process mentioned in (b) illegal?

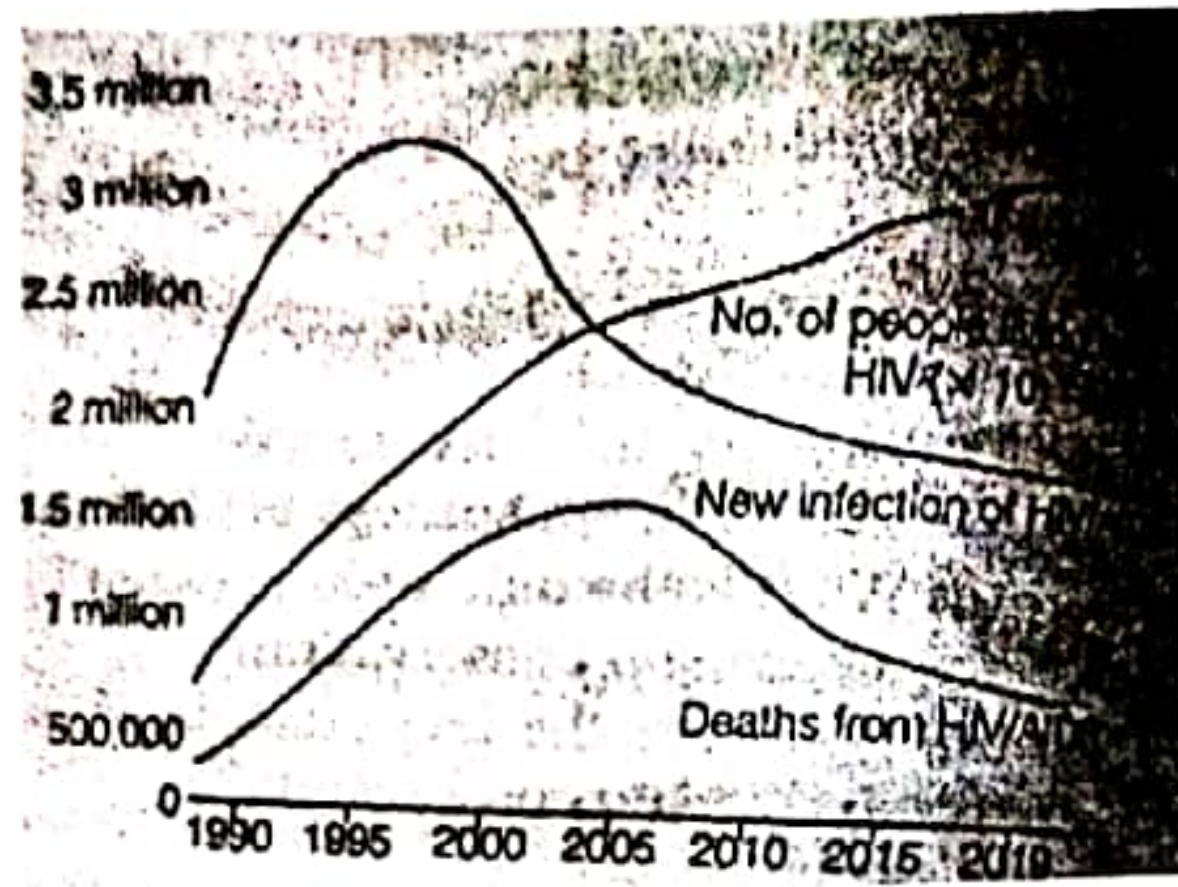
33. The data given below shows the concentration of alcohol in the blood of an alcoholic person.



- With reference to the graph, when will the concentration of alcohol in the blood be highest?
- When will the concentration of alcohol be lowest in blood?
- Enlist the characteristics associated with withdrawal syndrome.
- How does drinking alcohol results in liver failure?

OR

The data below shows the new cases and death from HIV AIDS worldwide.



- With reference to the above graph which cases are decreasing? Explain.
- Elaborate the mode of action of this virus in human body.
- Explain why the people living with AIDS are in increasing number?