

# BIOLOGY

**TIME : 3:00 Hrs.**

**M.M. : 70**

**General Instructions:-**

- All questions are compulsory.
- The question paper has four sections: A, B, C and D. There are 33 questions in the question paper.
- Section–A has total 16 questions, 10 are very short, 4 A&R based MCQs and 02 case-based question which further have 5 MCQ type of questions, attempt only 4 out of 5 and each question have 1 marks.
- Section–B has 9 questions of 2 marks each. Section–C has 5 questions of 3 marks each and Section–D has 3 questions of 5 marks each.
- 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.
- Wherever necessary, neat and properly labeled diagrams should be drawn.

Section	Question Type	Que. Numbering	Marks	No. of Que. × Marks	Total Marks
A	Very Short Ans. Que. (VSA)	01 to 10	1	10×1	10
	Assertion/ Reason type- MCQ.	11 to 14	1	4×1	4
	Case-based questions. (Passage - Attempt any 4 out of 5)	15 -(i) to(v)	1	4×1	4
	Case-based questions. (Passage - Attempt any 4 out of 5)	16-(i) to(v)	1	4×1	4
B	Short Ans. Que. Type -I (SA-I)	17 to 25	2	9×2	18
C	Short Ans. Que. Type -II (SA-II)	26 to 30	3	5×3	15
D	Long Ans. Que. (LA)	31 to 33	5	3×5	15
<b>Total No. of Questions</b>		<b>33</b>	<b>Total Marks</b>		<b>70</b>

**SECTION A**

1. What was the speciality of the milk produced by the transgenic cow Rosie? [1]

**OR**

How do neutrophils act as a cellular barrier to pathogens in humans?

- Name an IUD that you would recommend to promote the cervix hostility to the sperm. [1]
- When do the oogenesis and the spermatogenesis initiate in human females and males, respectively. [1]
- State the chromosomal defects in individuals with Turner's syndrome. [1]
- Who developed a graphical representation of a genetic cross called "Punnett Square". [1]
- Name the condition in vertebrates where the body attacks self-cells. [1]

7. State the role of C- peptide in human insulin. [1]
8. Name two enzymes that are essential for constructing a recombinant DNA. [1]
9. How does the moderate and high dosage of cocaine affect the human body? [1]
10. Why is tropical environment able to support greater species diversity? [1]

**Directions: In the following questions 11-14, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as :-**

- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
- (b) Both assertion (A) and reason (R) are true but reason (B) is not the correct explanation of assertion (A).
- (c) Assertion (A) is true but reason (R) is false
- (d) Assertion (A) is false but reason (R) is true.

11. **Assertion (A):** *Thermus aquaticus* is used in PCR technique.

**Reason (R):** It is a heat-stable DNA polymerase. [1]

12. **Assertion (A):** Bt-toxins are released as inactive crystals in the bacterial body.

**Reason (R):** It is converted into an active protein (due to alkaline pH of the gut of the bollworm). [1]

OR

**Assertion :** In a DNA molecule, A–T rich parts melt before G–C rich parts.

**Reason :** In between A and T there are three H–bond, whereas in between G and C there are two H-bonds.

13. **Assertion (A):** 'Saheli' is considered as an improved form of contraceptive for human females.

**Reason:** It is a non-steroidal preparation and is once a week pill. [1]

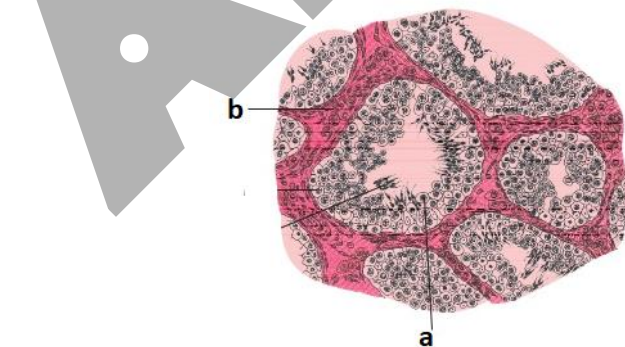
14. **Assertion :** Haemophilia is an autosomal disorder.

**Reason:** A haemophilic father can never pass the gene for haemophilia to his son. [1]

15. Read the following and answer any four questions : [4]

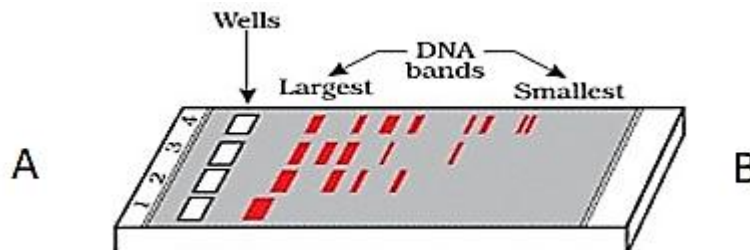
Humans are sexually reproducing and viviparous it involves male and female reproductive systems. The male reproductive system is located in the pelvis region. It includes a pair of testis along with accessory ducts, glands and the external genitalia. The testes are situated outside the abdominal cavity within a pouch called the scrotum. The testis is covered by a dense covering. Each testis has about 250 compartments. Each lobule contains one to three highly coiled seminiferous tubules in which sperms are produced. Each seminiferous tubule is lined on its inside by two types of cells. The regions outside the seminiferous tubules called interstitial spaces contain small blood vessels. Seminiferous tubules of the testis open into the vasa efferentia through rete testis. The vasa efferentia leave the testis and open into epididymis located along the posterior surface of each testis.

- (i) The vas deferens receives duct from the seminal vesicle and opens into the urethra as
- (a) epididymis
  - (b) ejaculatory duct
  - (c) efferent ductule
  - (d) ureter
- (ii) Which one of the following is not a male accessory gland?
- (a) Seminal vesicle
  - (b) Ampulla
  - (c) Prostate
  - (d) Bulbourethral gland
- (iii) The temperature of the scrotum which is necessary for the functioning of the testis is always around below body temperature.
- (a) 2-2.5°C
  - (b) 4-5°C
  - (c) 6-6.5°C
  - (d) 7-8°C
- (iv) The nutritive cells found in seminiferous tubules are
- (a) Leydig's cells
  - (b) Male germ cells
  - (c) Sertoli cells
  - (d) Chromaffin cells.
- (v) Identify (a) and (b) in the given image.



- (a) a - Sertoli cell, b - interstitial cell
- (b) a - interstitial cell, b - spermatogonia
- (c) a - spermatozoa, b - Sertoli cell
- (d) a - spermatozoa, b – spermatogonia

16. Rajesh was doing gel electrophoresis to purify DNA fragments. Given below is the sketch of the observations of the experiment performed by him. Study the observations and answer any of the four questions asked below. [4]



- (a) Mark the positive and negative terminals.  
 (b) At which end he would have loaded the samples and where?  
 (c) What is the criterion for DNA fragments movement on agarose gel during gel electrophoresis ?  
 (i) The larger the fragment size, farther it moves.  
 (ii) The smaller the fragment size, farther it moves.  
 (iii) Positively charged fragment move to farther end.  
 (iv) Negatively charged fragment do not move.  
 (d) Elaborate the step he would have followed to visualize DNA bands.  
 (e) How are the separated DNA fragments finally isolated?

#### SECTION 'B'

17. A mature embryo-sac in a flowering plant may possess 7-cells, but 8-nuclei. Explain with the help of a diagram only. [2]  
 18. Describe the structure of a nucleosome. [2]  
 19. Name the gas released and the process responsible for puffing up of the bread dough when *Saccharomyces cerevisiae* is added to it. [2]  
 20. Explain with the help of a suitable example the naming of a restriction endonuclease. [2]

#### OR

Name the source organism of Taq polymerase. Explain the specific role of this enzyme in PCR.

21. Name the interaction in each of the following : [2]  
 (a) *Cuscuta* growing on a shoe flower plant.  
 (b) Mycorrhizae living on the roots of higher plants.  
 (c) Clown fish living among the tentacles of sea anemone.  
 (d) *Koel* laying her eggs in crow's nest.  
 22. A plant of *Antirrhinum majus* with red flowers was crossed with another plant of the same species with white flowers. The plants of the  $F_1$  generation bore pink flowers. Explain the pattern of inheritance with the help of a cross? [2]

#### OR

Write the full form of VNTR. How is VNTR different from 'probe'?

23. Why do sports persons often fall victim to cocaine addiction? [2]  
 24. If the advise is not followed by the patient, there is an apprehension that the patient might contract a disease that would destroy the immune system of his/her body. Diagrammatically explain how the immune system would get affected and destroyed. [2]

25. Discuss the role the enzyme DNA ligase plays during DNA replication [2]

**SECTION 'C'**

26. (a) Differentiate between spermatogenesis and spermiogenesis. [3]  
 (b) Mention the function of mitochondria in sperm.
27. DNA separated from one cell, when introduced into another cell is able to bestow some of the properties of former to the latter. What is this change called in technical terms? Describe the experimental evidences which led to the discovery of the above phenomenon. [3]

**OR**

Name a blood related autosomal Mendelian disorder. Why is it called Mendelian disorder? How is this disorder transmitted from parents to offspring?

28. (a) Draw a labelled schematic diagram of a replication fork showing continuous and discontinuous replication of DNA strands. [3]  
 (b) State a reason why is the replication continuous and discontinuous in the diagram drawn.
29. Name and describe any three causes of biodiversity losses. [3]
30. Highlight the differences and a similarity between the following population interactions : competition, predation and commensalism. [3]

**SECTION 'D'**

31. (a) Draw a schematic labelled diagram of a fertilised embryo sac of an Angiosperm. [5]  
 (b) Describe the stages in embryo development in a dicot plant.

**OR**

- (a) Draw a labelled diagram of a sectional view of human seminiferous tubule.  
 (b) Differentiate between gametogenesis in human males and females on the basis of:  
 (i) time of initiation of the process.  
 (ii) products formed at the end of the process. [5]
32. Explain the steps involved in the production of genetically engineered insulin. [5]

**OR**

- (a) Name the nematode that infests and damages tobacco roots.  
 (b) How are transgenic tobacco plants produced to solve this problem?
33. What is 'semi-conservative' DNA replication? How was it experimentally proved and by whom? [5]

**OR**

A homozygous tall pea plant with green seeds is crossed with a dwarf pea plant with yellow seeds:

- (i) What would be the phenotype and genotype of  $F_1$ ?  
 (ii) Work out the phenotypic ratio of  $F_2$  generation with the help of a Punnett Square.