

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

Maximum Marks: 70

General Instructions

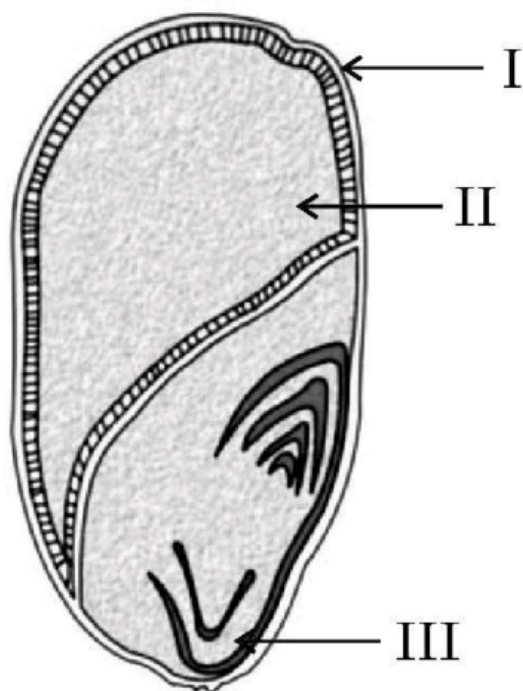
- (i) This question paper contains **33 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 16 carry 1 mark each.
- (iii) Section B: Questions 17 to 21 carry 2 marks each.
- (iv) Section C: Questions 22 to 28 carry 3 marks each.
- (v) Section D: Questions 29 to 30 carry 4 marks each.
- (vi) Section E: Questions 31 to 33 carry 5 marks each.
- (vii) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (viii) Draw neat, properly labelled diagrams wherever necessary.

Section A

1. The number of autosomes present in a human secondary spermatocyte

- (A) 44 (B) 22
(C) 23 (D) 46

2. Given below is a diagram of T.S. of a monocot seed with parts I, II & III labelled:



Choose the option where parts I, II and III are identified correctly.

- (A) Pericarp, Endosperm, Scutellum (B) Pericarp, Endosperm, Coleorhiza
(C) Scutellum, Pericarp, Coleorhiza (D) Coleorhiza, Scutellum, Pericarp

3. Given below is a heterogeneous RNA formed during Eukaryotic transcription:



How many introns and exons respectively are present in the hnRNA?

- (A) 7, 7 (B) 8, 7
(C) 8, 8 (D) 7, 8

4. If Meselson and Stahl's experiment is continued for 80 minutes (till III generation) then what would be the ratio of DNA containing N^{15}/N^{15} : N^{15}/N^{14} : N^{14}/N^{14} in the medium?

- (A) 1 : 1 : 0 (B) 0 : 1 : 3
(C) 0 : 1 : 8 (D) 1 : 4 : 0

5. A child with blood group A has father with blood group B and the mother with blood group AB. Choose the option that gives the correct genotypes of father, mother and the child:

- (A) $I^A i$, $I^B i$, $I^A i$ (B) $I^A I^B$, $I^A i$, $I^A I^A$
(C) $I^B i$, $I^A I^B$, $I^A i$ (D) $I^B I^B$, $I^A I^B$, $I^A I^A$

6. Which one of the following options shows the correct evolutionary order of the plants mentioned below?

- (i) Ferns (ii) Ginkgo (iii) Zosterophyllum
(iv) Gnetales

Choose the correct option.

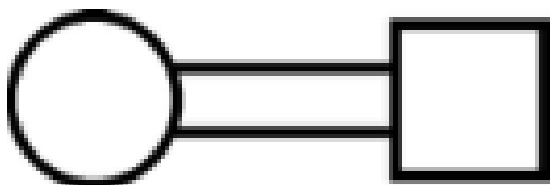
- (A) (i), (iii), (ii), (iv) (B) (iii), (i), (ii), (iv)
(C) (i), (ii), (iii), (iv) (D) (iv), (ii), (i), (iii)

7. Study the items of Column-I and those of Column-II:

Choose the option that correctly matches the items of Column-I with those of Column-II:

- (A) (a)-(i), (b)-(ii), (c)-(iii) (B) (a)-(iii), (b)-(ii), (c)-(i)
(C) (a)-(ii), (b)-(iii), (c)-(i) (D) (a)-(i), (b)-(iii), (c)-(ii)

8. In a pedigree chart represents:



- (A) unrelated mating (B) affected individuals
(C) mating between relatives (consanguineous mating) (D) Non-identical twins

9. The foetus receives some antibodies from their mother through the placenta during pregnancy. Choose the correct option that shows the type of immunity developed in the foetus.

- (A) Naturally acquired active immunity (B) Artificially acquired passive immunity
(C) Naturally acquired passive immunity (D) Artificially acquired active immunity

10. A diploid organism is heterozygous for three loci, how many types of gametes can be produced by that organism?

- (A) 4 (B) 8
(C) 16 (D) 32

11. During gel electrophoresis migration of DNA fragments leading to their separation takes place on the agarose gel. Choose the correct option:

- (A) The smaller the fragment size, the farther it moves. (B) Positively charged fragments moves to farther end.
(C) The larger the fragment size, the farther it moves. (D) The negatively charged fragments do not move.

12. Identify the organism whose product has been commercialised as blood cholesterol lowering agent.

- (A) Trichoderma polysporum (B) Monascus purpureus
(C) Saccharomyces cerevisiae (D) Aspergillus niger

13. Assertion (A): 'XX-XY' type of sex-determination mechanism is an example of male heterogamety.

Reason (R): In birds male heterogamety is observed as males produce two different types of gametes.

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|--|---|
| (A) Both (A) and (R) are true and (R) is the correct explanation of (A). | (B) Both (A) and (R) are true, but (R) is not the correct explanation of (A). |
| (C) (A) is true, but (R) is false. | (D) (A) is false, but (R) is true. |
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14. Assertion (A): The number of white winged moths decreased after industrialisation in England.

Reason (R): Effects of industrialisation were more marked in rural areas of England.

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|--|---|
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| (C) (A) is true, but (R) is false. | (D) (A) is false, but (R) is true. |
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15. Assertion (A): Secondary immune response is quicker and stronger than the primary immune response.

Reason (R): Our body appears to have the memory of the first encounter therefore response to the subsequent encounter with the same pathogen is quick.

- | | |
|--|---|
| (A) Both (A) and (R) are true and (R) is the correct explanation of (A). | (B) Both (A) and (R) are true, but (R) is not the correct explanation of (A). |
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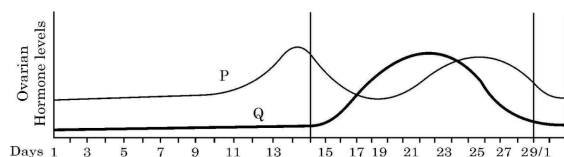
16. Assertion (A): A patient of ADA-deficiency requires periodic or repeated infusion of genetically-engineered lymphocytes.

Reason (R): Lymphocytes are not immortal, but have life span.

- | | |
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| (A) Both (A) and (R) are true and (R) is the correct explanation of (A). | (B) Both (A) and (R) are true, but (R) is not the correct explanation of (A). |
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Section B

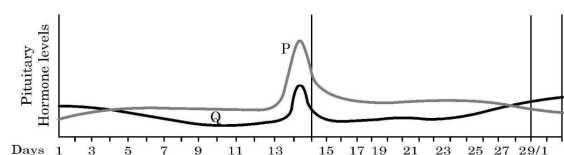
17(A).



- (i) Identify 'P' and 'Q' labelled in the diagram.
- (ii) Specify the source of the hormone 'P' and 'Q' marked in the diagram.

OR

17(B).



- (i) Identify 'P' and 'Q' labelled in the above diagram.
- (ii) Write down the role of hormone 'P' in both males and females.

18. (a) Write two closely linked genes that control α -thalassemia.
- (b) Differentiate between thalassemia and sickle cell anaemia on the basis of their effect on globin molecule of Haemoglobin.

19(A). Describe any two situations where a medical doctor would recommend injection of a pre-formed antibodies (antitoxins) into the body of a patient.

OR

19(B). The symptoms of malaria do not appear immediately after the entry of sporozoites into the human body when bitten by female Anopheles mosquito. Explain why it happens.

20. Observe the given sequence of nitrogenous bases on a DNA fragment and answer the following questions:

5'	C	A	G	A	A	T	T	C	T	T	A	3'
3'	G	T	C	T	T	A	A	G	A	A	T	5'

- (a) Name the restriction enzyme which can recognise the DNA sequence.
- (b) Write the sequence after restriction enzyme cut the palindrome.
- (c) Why are the ends generated after digestion called as 'Sticky Ends'?

21(A). Construct a pyramid of biomass starting with phytoplankton, label its three trophic levels. Is the pyramid upright or inverted? Justify your answer.

OR

21(B). Draw a pyramid of number where a large population of insects feed upon a very big tree. The insects in turn, are eaten by small birds which in turn are fed upon by big birds.

Section C

22. (a) A bilobed dithecal anther has 200 microspore mother cells per microsporangium. How many male gametophytes can be produced by this anther?

(b) Write the composition of intine and exine layers of a pollen grain.

23. (a) Abbreviations used for the different modes of assisted reproductive technology are given below. Expand the abbreviations:

(i) ZIFT (ii) ICSI (iii) IUT (iv) GIFT

(b) Why is there a statutory ban on Amniocentesis? Give at least two reasons.

24. Using a Punnett square work out the distribution of an autosomal phenotypic feature in the first filial generation after a cross between a homozygous female and a heterozygous male for a single locus.

25. How does the process of Natural Selection affect Hardy-Weinberg equilibrium? Explain with the help of graphs.

26. Samples of blood and urine of a sportsperson are collected before any sports event for drug tests.

(a) Why there is a need to conduct such tests?

(b) Name the drugs the authorities usually look for.

(c) Write the generic names of two plants from which these drugs are obtained.

27. (a) The insulin synthesised in our body is different from that synthesised by Eli Lilly company using recombinant DNA technology. Differentiate between them.

(b) Why the insulin extracted from an animal source is not in use these days?

28. (a) Draw a graph for a population whose population density has reached the carrying capacity.

(b) Out of the two population growth curves, which one is considered a more realistic for most populations? Why?

(c) Draw a growth curve where resources are not limiting for the growth of a population and give its equation.

Section D

29. Immunity in our body is of two types: (i) Innate immunity and (ii) acquired immunity. Innate immunity is a non-specific defence mechanism, whereas acquired immunity is pathogen-specific; it is called specific immunity too. Acquired immunity is characterised by memory. Antibodies are specific to antigens and there are different types of antibodies produced in our body: they are IgA, IgE, IgG and IgM. It shows primary response when it encounters the pathogen for the first time and secondary response during the subsequent encounters with the same Antigen/Pathogen.

(a) Name the two types of specialised cells which carry out the primary and secondary immune response.

(b) Why is the antibody-mediated immunity also called as humoral immune response?

(c) The organ transplants are often rejected if not taken from suitable compatible persons.

(i) Mention the characteristic of our immune system that is responsible for the graft rejection.

(ii) Name the type of immune response and the cell involved in it.

OR

29. Immunity in our body is of two types: (i) Innate immunity and (ii) acquired immunity. Innate immunity is a non-specific defence mechanism, whereas acquired immunity is pathogen-specific; it is called specific immunity too. Acquired immunity is characterised by memory. Antibodies are specific to antigens and there are different types of antibodies produced in our body: they are IgA, IgE, IgG and IgM. It shows primary response when it encounters the pathogen for the first time and secondary response during the subsequent encounters with the same Antigen/Pathogen.

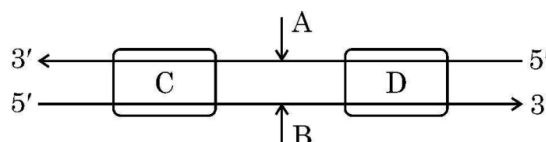
(a) Name the two types of specialised cells which carry out the primary and secondary immune response.

(b) Why is the antibody-mediated immunity also called as humoral immune response?

(d) How is active immunity different from passive immunity?

30. The process of copying the genetic information from one strand of DNA into RNA is termed as transcription. The principle of complementarity of bases governs the process of transcription, also except that uracil comes in place of thymine.

Study the complete transcription unit given below and answer the following questions:



(a) Name the main enzyme involved in the process of transcription.

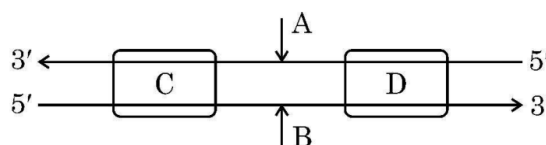
(b) Identify coding strand and template strand of DNA in the transcription unit.

(c) Identify (C) and (D) in the diagram, mention their significance in the process of transcription.

OR

30. The process of copying the genetic information from one strand of DNA into RNA is termed as transcription. The principle of complementarity of bases governs the process of transcription, also except that uracil comes in place of thymine.

Study the complete transcription unit given below and answer the following questions:



(a) Name the main enzyme involved in the process of transcription.

(b) Identify coding strand and template strand of DNA in the transcription unit.

(d) Describe the location of (C) and (D) in the transcription unit.

Section E

31(A). (i) Draw a diagrammatic sectional view of human seminiferous tubule (enlarged) and label the following:

- (a) cell that undergoes spermiogenesis
- (b) cell that nourish male gametes
- (c) cell which undergoes meiosis I and meiosis II.

(ii) State what is seminal plasma. Mention two constituents of seminal plasma. How is it different from semen?

OR

31(B). (i) Mention the event that induces the completion of the meiotic division of the secondary oocyte in humans.

(ii) Trace the journey of the zygote until its implantation inside the uterus.

32(A). (i) Explain how is a bacterial cell made 'competent' to take up recombinant DNA from the medium.

(ii) Explain the steps of amplification of gene of interest using PCR technique.

OR

32(B). (i) What are transgenic animals?

(ii) Why are these animals being produced? Explain any four reasons.

33(A). (i) Explain giving three reasons why tropics show greatest levels of species diversity.

(ii) Draw a graph showing species-area relationship. Name the naturalist who studied such relationship. Write the observation made by him.

OR

33(B). (i) The world is facing the accelerated rate of species extinctions due to human activities. Explain any three major causes of biodiversity losses.

(ii) Describe 'Ex situ' approach for conserving biodiversity. Give any two examples.

- End of Question Paper -