विद्या सर्वार्थ साधिका

ANANDALAYA
PRE-BOARD EXAMINATION
Class : XII

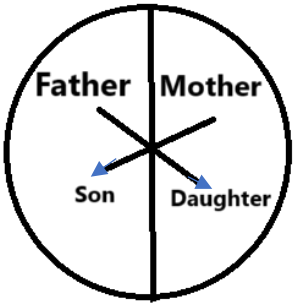
Subject: Biology (044) MM : 70
Date : 21-12-2024 Time: 3 Hrs

General Instructions:

1. This question paper contains 33 questions in all. All questions are compulsory.
2. Question paper is divided into five sections - Section A, B, C, D and E.
3. In Section A - question number 1 to 16 are Multiple choice (MCQ) type questions carrying 1 mark each. In Section B - question number 17 to 21 are Very Short Answer (VSA) type questions carrying 2 marks each. In Section C - question number 22 to 28 are Short Answer (SA) type questions carrying 3 marks each. In Section D - question number 29 and 30 are case-based questions carrying 4 marks each and in Section E - question number 31 to 33 are Long Answer (LA) type questions carrying 5 marks each.
4. There is no overall choice. However, an internal choice has been provided in Section B, C, D and E. You must attempt only one of the alternatives in such questions.
5. Wherever necessary, neat and properly labelled diagrams should be drawn.

SECTION A

1. Represented below is the inheritance pattern of certain traits in humans. Which one of the following conditions is an example of this pattern? (1)



(A) Haemophilia
(B) Thalassemia
(C) Phenylketonuria
(D) Sickle cell anaemia

2. Match the items of column I with column II: (1)

Column I	Column II
(P) XX-XO method of sex determination	(i) Turner's syndrome
(Q) XX-XY method of sex determination	(ii) Female heterogametic
(R) Karyotype - 45	(iii) Grasshopper
(S) ZW-ZZ method of sex determination	(iv) Female homogametic

Select the correct option from the following:
(A) P- ii, Q - iv, R - i, S – iii
(B) P - i, Q - iv, R - ii, S - iii
(C) P - iii, Q - iv, R - i, S – ii
(D) P - iv, Q - ii, R - i, S - iii

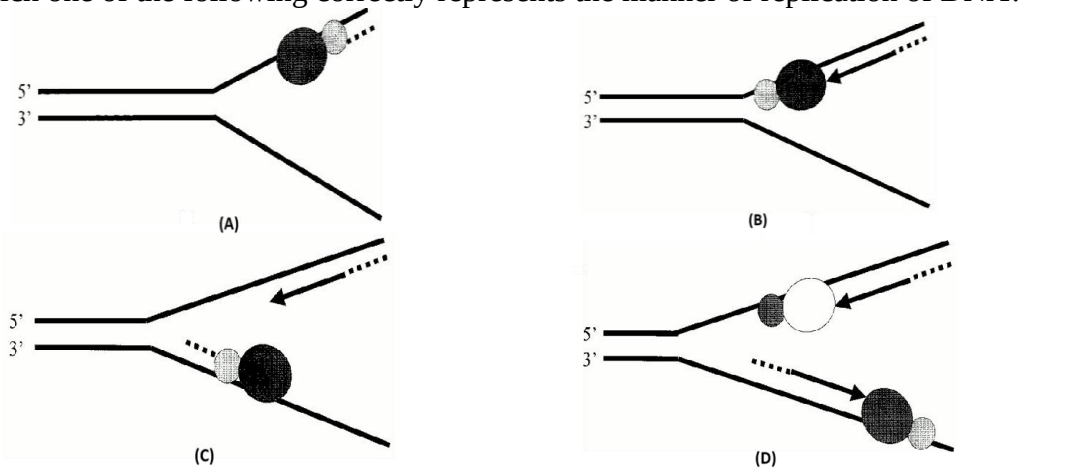
3. The limitations of the ecological pyramid include all the following except that it _____. (1)
(A) does not take into account the same species belonging to two or more trophic levels
(B) does not represent relationships between organisms at different trophic levels
(C) assumes a simple food chain and does not consider food webs
(D) does not give any place to saprotrophs

4. How many meiotic divisions would be required for a plant that undergoes monosporic development to give rise to 200 functional eggs? (1)
(A) 50 (B) 200 (C) 100 (D) 400

5. What will mRNA sequence be produced by the following stretch of DNA? (1)
3'ATGCATGCATGCATG 5' → TEMPLATE STRAND
5'TACGTACGTACGTAC 3' → CODING STRAND
(A) 3' AUGCAUGCAUGCAUG 5' (B) 5' UACGUACGUACGUAC 3'
(C) 5' AUGCAUGCAUGCAUG 3' (D) 3' UACGUACGUACGUAC 5'

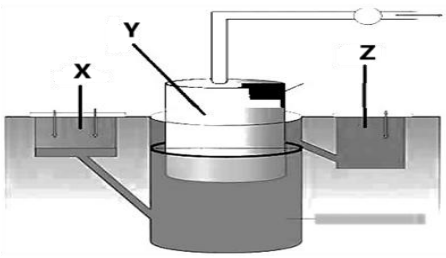
6. Which of the following is not a pair of contrasting traits studied by Mendel? (1)
(A) Green and yellow pods (B) Full and constricted pods
(C) Axial and terminal flowers (D) Pink and white flowers

7. Which one of the following correctly represents the manner of replication of DNA? (1)



8. Intensely lactating mothers do not generally conceive due to the _____. (1)
(A) suppression of gonadotropins (B) suppression of gametic transport
(C) hypersecretion of gonadotropins (D) suppression of fertilisation

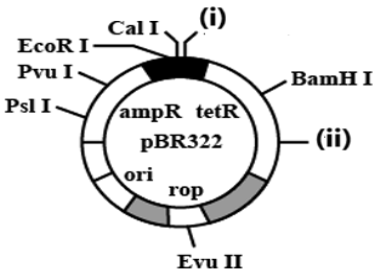
9. The diagram below shows a typical biogas plant. (1)
Identify the structures labelled as X, Y and Z.
(A) Z – Sludge; Y - Methane, Oxygen; X - Dung
(B) Z – Sludge; Y - Methane, Carbon-dioxide; X -Dung
(C) Z – Sludge; Y - Ethylene, Carbon dioxide; X - Dung
(D) Z – Sludge; Y - Methane, Carbon-dioxide; X - Sewage



10. Which one of the following is commonly used in transfer of foreign DNA into crop plants? (1)
(A) *Meloidogyne incognita* (B) *Agrobacterium tumifaciens*
(C) *Penicillium expansum* (D) *Trichoderma harzianum*

11. What is the function of filiform apparatus in an angiosperm embryo sac? (1)
(A) Brings about the opening of the pollen tube
(B) Guides the pollen tube into a synergid
(C) Prevents entry of more than one pollen tube into a synergid
(D) Guides the pollen tube towards antipodals

12. *E.coli* cloning vector pBR 322 diagram is given below. The parts labelled as (i) and (ii) represent recognition sequences of _____ and _____. (1)



(A) (i) Sal I; (ii) Hind III
(B) (i) Hind III; (ii) Sal I
(C) (i) Sal II; (ii) Hind II
(D) (i) Hind III; (ii) Sal II

Question Nos. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:
(A) Both (A) and (R) are true and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true and (R) is not the correct explanation of (A).
(C) (A) is true, but (R) is false.
(D) (A) is false, but (R) is true.

13. (A): Antipodal cells and egg cell are haploid in nature. (1)
(R): Both are formed from functional megaspore through meiotic division.

14. (A): Diversity observed in the entire geographical area, is called gamma diversity. (1)
(R): Bio-diversity decreases from high altitude to low altitude.

15. (A): DNA fingerprinting is very useful in forensic sciences. (1)
(R): It is a method in which individual pattern of DNA fragments is determined through the number and position of specific repeated sequences.

16. (A): Genetic Drift refers to changes in allele frequency. (1)
(R): Heritable variations enable the survival of the fittest.

SECTION B

17. ***Attempt either option (A) or (B).***
(A) What are cry genes? In which organisms are they present? (2)

OR

(B) State the role of transposons in silencing of mRNA in eukaryotic cells.

18. IVF is becoming more popular in the current scenario that is helping childless couples to bear a child. Would you consider GIFT as an IVF? Give a reason to support your answer. (2)

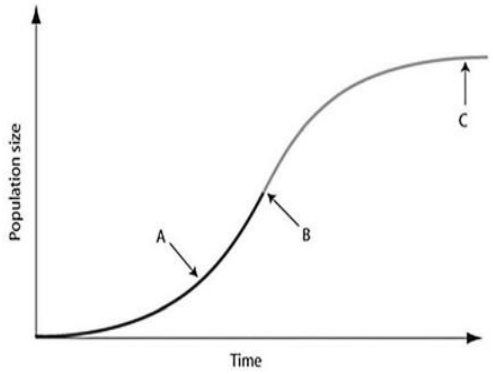
19. (a) Mention any two families whose pollens are viable for months. (2)
(b) Storage of pollen grains for longer periods is of great importance. Give a scientific reason in support of the statement.

20. ***Attempt either option (A) or (B).***
(A) Life originated from the earth's inorganic atmosphere in the past, but this no longer happens today. State two suitable reasons. (2)

OR

(B) List the two main propositions of Oparin and Haldane.

21. The given graph refers to the logistic growth rate of a population of pine trees. (2)

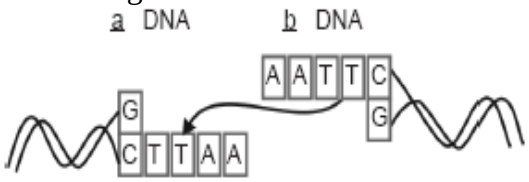


At which point in the graph shown above would there be (i) zero population growth (ii) maximum population growth (iii) minimum carrying capacity and (iv) maximum carrying capacity?

SECTION C

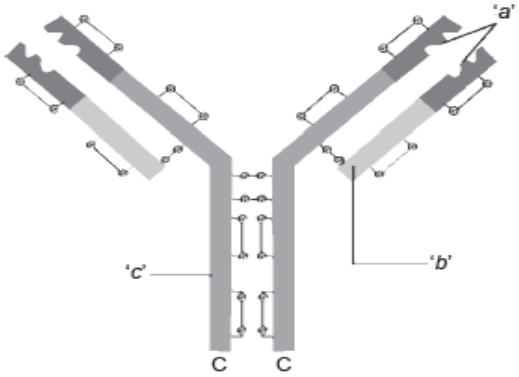
22. Describe the process of decomposition of detritus under the following heads: fragmentation, leaching, catabolism, humification and mineralisation. (3)

23. Study the linking of DNA fragments shown below: (3)



(i) Identify 'a' and 'b' DNA in the given picture.
(ii) Name the restriction enzyme that recognises this palindromic sequence.
(iii) Name the enzyme that links these two DNA fragments.

24. (i) Identify 'a', 'b' and 'c' in the given schematic diagram of an antibody. (3)



(ii) Write the chemical nature of an antibody.
(iii) Name the cells that produce antibodies in humans.
(iv) Mention the type of immune response provided by an antibody.

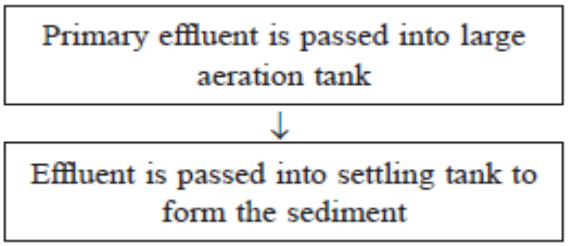
25. ***Attempt either option (A) or (B).***

(A) Name the type of interaction seen in each of the following examples: (3)
(i) *Ascaris* worms living in the intestine of humans
(ii) Wasp pollinating fig inflorescence
(iii) Clown-fish living among the tentacles of sea-anemone
(iv) Mycorrhizae living on the roots of higher plants
(v) Orchid growing on a branch of a mango tree
(vi) Disappearance of smaller barnacles when *Balanus* dominated on the coast of Scotland.

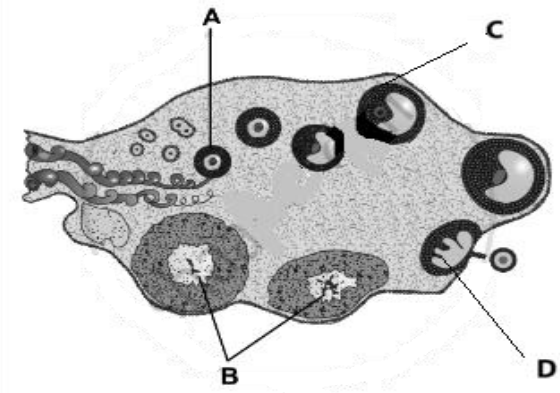
OR

(B) (i) Explain the "birth rate" in a population by taking a suitable example.
(ii) Write the other *two* characteristics that only a population shows but not in an individual.
(iii) If 8 individuals in a laboratory population of 80 fruit flies died in a week, then what would be the death rate of the population for the said period?

26. Sewage is generated in large quantities in the urban areas. It is treated in Sewage Treatment Plants (STPs) to make it less polluted, before discharging into any natural water body. Observe the flow-chart given below and answer the questions that follow: (3)
(i) What is primary effluent?
(ii) Why is the primary effluent passed into large aeration tanks? Mention the treatment given to it.
(iii) Where is the sediment transferred to, for further treatment? What happens to the sediment there?



27. The following diagram illustrates the sequence of ovarian events in human female: (3)
(a) Identify from the label A to D, only the part that illustrates corpus luteum and name the pituitary hormone that influences its formation.
(b) Specify the endocrine function of corpus luteum.
(c) Draw a neat sketch of the ovum with the following parts labelled:
(i) Zona pellucida (ii) Perivitelline space.



28. The increase in the numbers of melanic (dark-winged) moths over white-winged or dull-grey moths occurred in the urban areas of the post-industrialisation period in England. Explain why? (3)

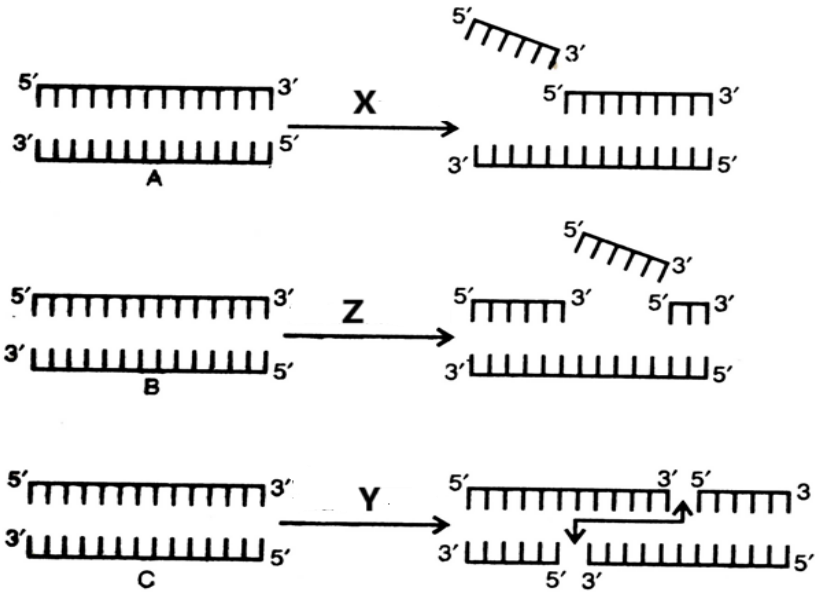
SECTION D

29. According to the Hardy-Weinberg principle, the allele frequencies in a population are stable and remain constant through generations. When the frequency differs from the expected values, the difference indicates the extent (direction) of evolutionary change. Disturbance in the genetic equilibrium or Hardy-Weinberg equilibrium in a population can be interpreted as resulting in evolution.
(A) Write the algebraic equation representing Hardy-Weinberg equilibrium. (1)
(B) List four factors that affect the genetic equilibrium. (2)
Attempt either subpart (C) or (D).
(C) How does Hardy-Weinberg equilibrium relate to evolution? (1)

OR

(D) The Hardy-Weinberg equilibrium, also known as genetic equilibrium. Why?

30. Tools used in the formation of recombinant DNA are of three types. These are enzymes, cloning vectors and competent hosts. Lysing enzymes are used to extract DNA for experimental purposes from the cells. Cleaving enzymes break the DNA molecules. A competent host is required for transformation with recombinant DNA and cloning vectors help to propagate DNA
(A) There are three types of cleaving enzymes. Name any two of them. (1)
(B) The figure given below depicts the cleaving activity of the enzymes X, Y and Z in the DNAs A, B and C. Identify X, Y and Z and write one difference between X and Z. (2)



Attempt either subpart (C) or (D).

(C) Write an example of natural lysing activity in a human body. (1)

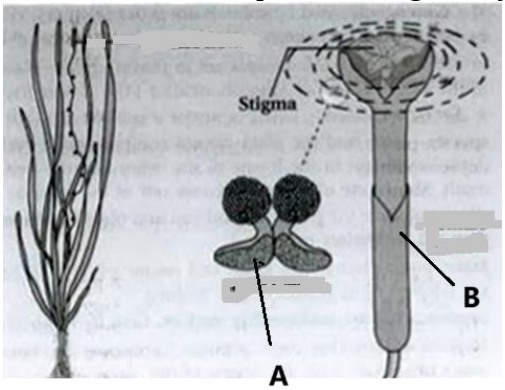
OR

(D) What are cloning vectors?

SECTION E

Attempt either option (A) or (B).

31. (A) Observe the picture of the Vallisneria plant bearing two types of flowers given above. (5)



(i) Identify the two types of flowers labelled as A and B in the picture.

(ii) Compare the two types of flowers with reference to their structural features to facilitate a specific mode of pollination in it.

(iii) How does the Mediterranean orchid *Ophrys* flower ensure its pollination by bees?

OR

(B) (i) Explain the events taking place at the time of fertilisation of an ovum in a human female.

(ii) Trace the development of the zygote up to its implantation in the uterus

(iii) Name and draw a labelled sectional view of the embryonic stage that gets implanted.

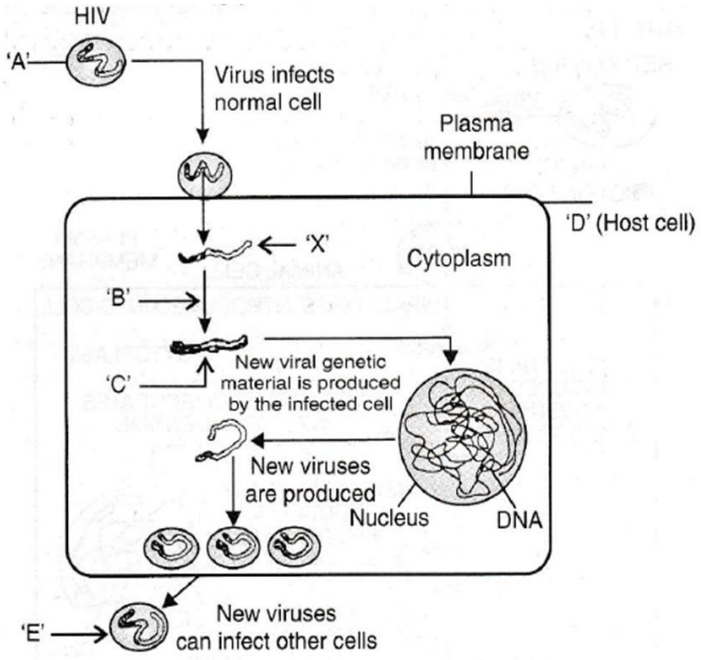
32. ***Attempt either option (A) or (B).***

(A) (i) Write the symptoms of malaria in humans and explain what causes these symptoms. (5)

(ii) Describe the different steps in the sexual mode of reproduction in the life cycle of a malarial parasite from the time of its initiation till when it is completed and ready to start the next cycle.

OR

Study the diagram showing the replication of HIV in Humans and answer the questions that follow:



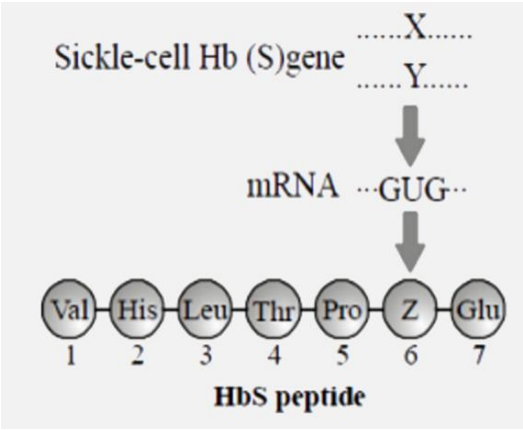
(i) What type of virus causes AIDS? Name its genetic Material.
(ii) Does this virus follow central dogma or deviates from it?
(iii) Name the enzyme 'B' acting on 'X' to produce molecule 'C'.
(iv) What does NACO means and write its role in preventing AIDS?
(v) What do you mean by the statement that "Incubation period for AIDS may vary from one month to ten years"?

33. ***Attempt either option (A) or (B).***

(A) When lactose was added to the medium where *E. coli* was cultured, it was observed that the lac operon was induced. Explain with the help of a schematic diagram, when and how the lac operon shuts down after the addition of lactose in the medium. (5)

OR

(B) The image given below is the micrograph of the amino acid composition of the relevant portion of the β-chain of haemoglobin from an individual with sickle cell anaemia.



(i) Identify X, Y and Z from the schematic diagram.
(ii) Why is the sickle cell anaemia called Mendelian disorder?
(iii) Explain how this defect is caused and transmitted from parents to offspring.