विद्या सर्वार्थि साधिका

ANANDALAYA

PERIODIC TEST – 2

Class: XII

Subject: Biology (044) MM: 70

Date : 18-09-2025 Time:3 Hours

General Instructions:

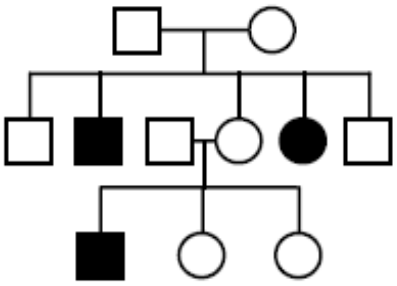
1. There are 33 questions in all. All questions are compulsory.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.
3. Section A consists of 12 MCQs and 4 Assertion and Reason questions of 1 mark each, Section B consists of 5 questions of 2 marks each, Section C consists of seven questions of 3 marks each, Section D consists of two case study-based questions of 4 marks each and Section E consists of two long questions of 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 choices in such questions.
5. Draw neat diagrams wherever necessary.

SECTION A

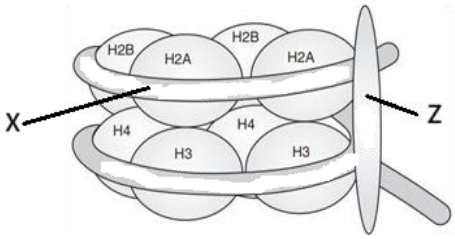
1. When the vegetative nucleus of a pollen grain is damaged, fertilization will not occur because: (1)
   (A) Male gametes cannot be formed (B) The pollen tube cannot grow towards the ovule
   (C) Egg cell will degenerate (D) Synergids cannot attract the pollen tube

2. A population shows low maternal mortality but high infant mortality. What does this indicate? (1)
   (A) Rapid increase in growth rate (B) Population explosion
   (C) No change in population size (D) Decline in growth rate

3. What do you conclude from the given pedigree chart? (1)
   (A) The pedigree chart is wrong, as this is not possible.
   (B) Inheritance of a recessive sex-linked disease like haemophilia
   (C) Inheritance of a sex-linked inborn error of metabolism like phenylketonuria
   (D) Inheritance of a condition like phenylketonuria as an autosomal recessive trait



4. In the diagram of a nucleosome, identify the correctly labelled parts X and Z. (1)
   (A) X - DNA helix ; Z - H1 Histone
   (B) X - H1Histone ; Z - DNA helix
   (C) X - DNA helix ; Z - H4A Histone
   (D) X - H1 Histone ; Z - Histone octamer



5. If in a DNA molecule cytosine is 18%, the percentage of adenine would be _____. (1)
   (A) 18% (B) 32% (C) 36% (D) 64%

6. The change of the light-coloured variety of peppered moth (*Biston betularia*) to its darker variety (*Biston carbonaria*) is due to _____. (1)
   (A) Mutation (B) Natural Selection (C) Genetic isolation (D) Regeneration

7. During 16th to 28th day of menstrual cycle _____ is/are at peak. (1)
   (A) FSH and LH (B) Estrogen and Progesterone
   (C) Estrogen (D) Progesterone

8. Which statement/s is/are incorrect? (1)
(i) The urethra in human males acts as a urogenital canal.
(ii) In human males, testis are extra-abdominal
(iii) The region outside the seminiferous tubules contains Leydig cells
(iv) In human males, testis slips down into the scrotal sacs during certain breeding seasons only.
(A) (i), (ii) and (iii) (B) (iv) only (C) (ii), (iii) and (iv) (D) (i), (ii), (iii) and (iv)

9. A host cell normally does not take up foreign DNA until it has been made competent to do so. This is because _____. (1)
(A) DNA is a hydrophilic molecule (B) DNA is a biomolecule
(C) DNA is a hydrophobic molecule (D) DNA is an inert molecule

10. When a section of DNA is linked to the _____ area, it can begin to duplicate. (1)
(A) Alu 1 (B) Bam H1 (C) Hind II (D) ORI

11. Why are the DNA of bacteria and humans analysed using the same fundamental methods? (1)
(A) Every cell in every creature is identical.
(B) Every organism has the same quantity of DNA.
(C) All creatures have the same DNA sequence.
(D) All organisms have the same DNA structure.

12. If the fruit of a tomato plant had 120 viable seeds, how many megaspore mother cells contributed to their formation? (1)
(A) 240 (B) 360 (C) 120 (D) 480

For question nos. 13 to 16, select 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): Louis Pasteur showed that in the flask open to air, new living organisms appeared in the heat killed the yeast culture. (1)
(R): Life arises from pre-existing life.

14. (A): Template or antisense strand, having $3' \rightarrow 5'$ polarity, takes part in transcription. (1)
(R): Non-template or sense strand, having $5' \rightarrow 3'$ polarity, does not take part in transcription.

15. (A): Nucleases are of two kinds, exonucleases and endonucleases. (1)
(R): Endonucleases remove nucleotides from the ends of the DNA.

16. (A): The process of oogenesis is markedly different from spermatogenesis. (1)
(R): Oogenesis begins in the foetal stage and is completed at the time of fertilization.

SECTION B

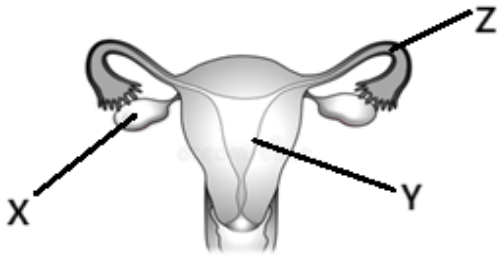
17. In a dihybrid cross, when would the proportion of parental gene combinations be much higher than non-parental types, as experimentally shown by Morgan and his team? Define the phenomenon that resulted from such a combination. (2)

18. (a) Name the enzyme that transcribes hnRNA in eukaryotes. (2)
(b) Why is RNA more reactive than DNA?

19. A gardener noticed that fruits were formed from some flowers that never opened. Name this phenomenon and explain its advantage. (2)

20. (a) Which technique is used to transfer an ovum collected from a donor into the fallopian tube of another female who cannot produce ova but can provide a suitable environment for fertilisation and development? (2)
(b) Write the name of the prenatal diagnostic technique developed to detect congenital anomalies.

21. (A) The diagram shows the human female reproductive system. (2)



(a) Name the cell that is extracted for IVF from 'X'.
(b) Explain the changes that occur in 'Y' during the menstrual cycle.
(c) Write the significance of 'Z'.

OR

(B) Medically, it is advised to all young mothers that breastfeeding is the best for their newborn babies. Do you agree? Write two scientific reasons in support of your answer.

SECTION C

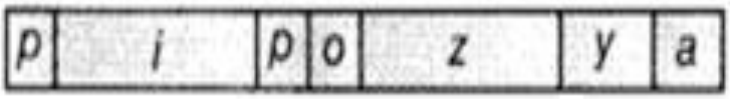
22. In some flowering plants, the embryo develops from diploid cells of the nucellus without involving fertilization. Explain this phenomenon and write any two of its potential advantages and disadvantages compared to sexual reproduction. (3)

23. (i) An apple fruit is referred to as a false fruit. Justify the statement. Give another example. (3)
(ii) If a farmer wants to produce seedless tomatoes, which technique would you suggest? Why?

24. The Department of Education organised an interschool seminar for students on 'Reproductive Health Problems and Practices'. List three appropriate reasons and explanations to justify that such a seminar is essential. (3)

25. How many kinds of phenotype would you expect in F_2 generation in a monohybrid cross exhibiting codominance? Explain your answer with an example. (3)

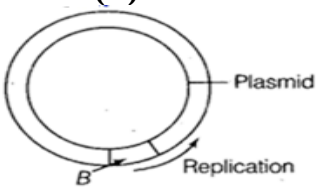
26. Given below is the schematic representation of the lac operon of E.coli: (3)



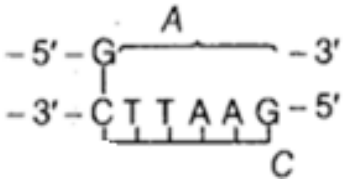
Explain the functioning of this operon when lactose is provided in the growth medium of the bacteria and support your answer with the appropriate diagrams.

27. (i) Identify the figures **X** and **Y** given below. (3)

(X)

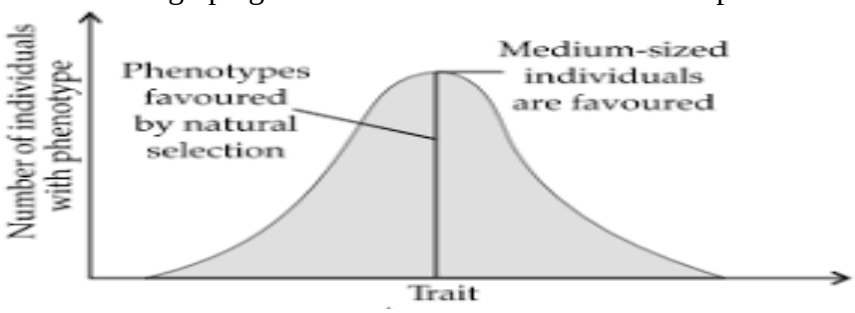


(Y)



(ii) Write the term given to A and B.
(iii) Write any two ways the products obtained through gel electrophoresis.

28. (A) Explain the three different ways natural selection can affect the frequency of a heritable trait in a population shown in the graph given below. Illustrate with an example. (3)



OR

(B) (i) Write three differences between *Homo erectus* and *Homo habilis.*
(ii) List the periods of the Mesozoic era from early to the late geological periods.

SECTION D

Question No. 29 and 30 are case based questions. Each question has 3 sub-questions with internal choice in one sub-question.

29. In recombinant DNA technology, selectable markers are crucial components of cloning vectors. They are genes, typically encoding antibiotic resistance, that allow scientists to identify and select host cells that have successfully taken up the vector carrying the desired DNA. This process of isolating cells containing the recombinant DNA, saves time and resources. Selectable markers in recombinant DNA technology ensure the successful introduction and expression of desired genes.

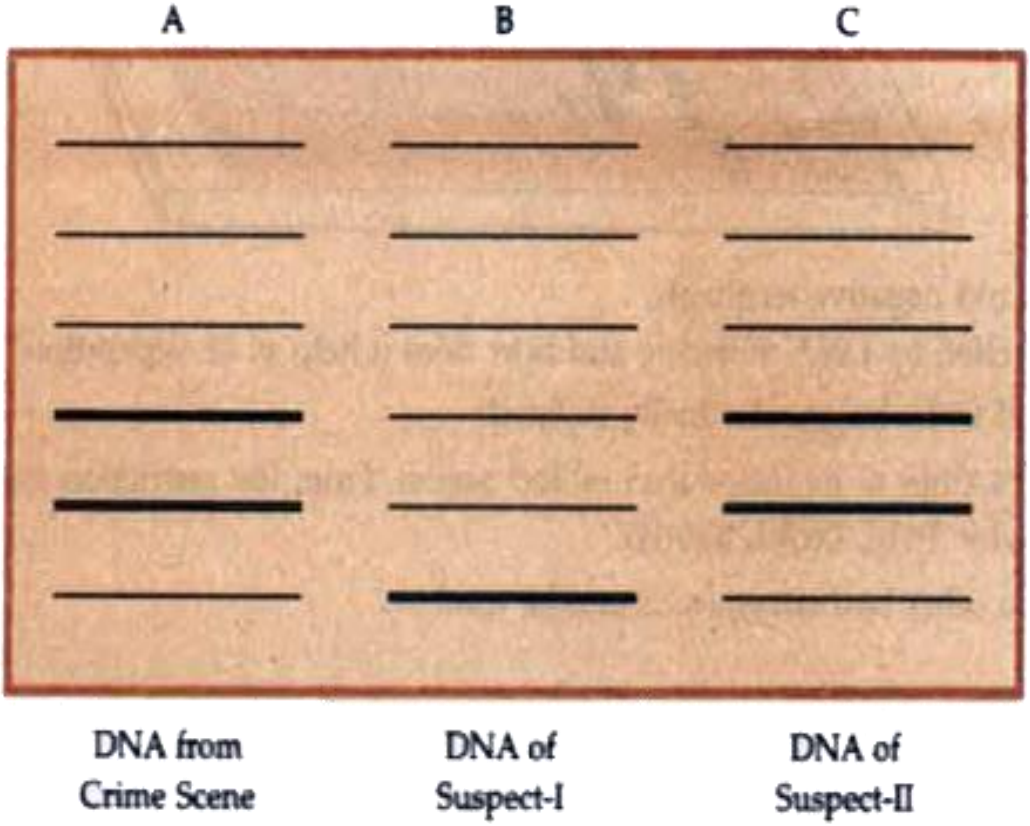
(A) Which are the two selectable markers widely used in genetic engineering? (1)
(B) Write two examples of vectors of rDNA technology. (1)
(C) What are the four key tools in Recombinant DNA technology? (2)

OR

(D) What are clones? How are they different from cloning vectors?

30. DNA Fingerprinting is a technique used to identify and distinguish individuals based on their unique DNA sequence patterns. It relies on analysing variable regions of DNA, especially STRs and VNTRs, which differ greatly among individuals. The process involves extracting DNA, cutting it with restriction enzymes, separating fragments using gel electrophoresis, and then detecting them with probes. Since no two people (except identical twins) have the same DNA profile, DNA fingerprinting is widely applied in forensic investigations, paternity testing, criminal identification, and genetic research.

(A) What do you understand by the term 'Probe' in genetic fingerprinting? (1)
(B) What is your conclusion about the suspects based on the DNA Fingerprint given below? (1)



(C) What are Satellite DNAs? How are they different from genomic DNA? (2)

OR

(D) What is a VNTR? Write their significance in DNA fingerprinting.

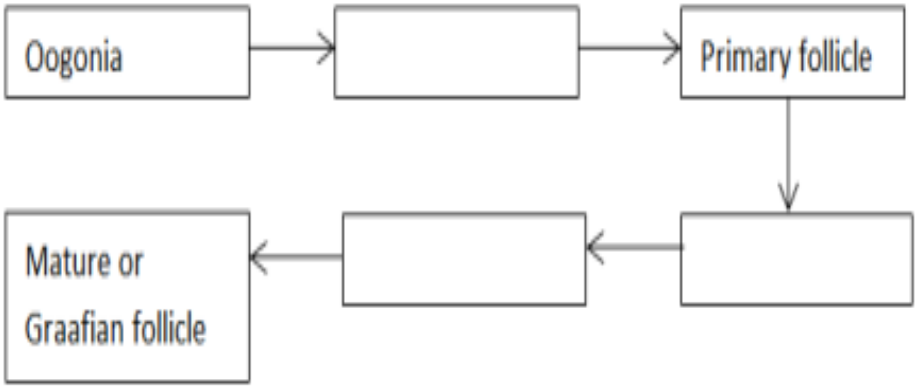
SECTION E

31. (A) (i) List the names of the hormones, endocrine glands, along with the functions of the hormones that are crucial in causing spermatogenesis. (5)

(ii) State the role of the epididymis in male fertility.

OR

(B) (i) Fill in the missing boxes for the levels in the transformation of mother germ cells into a mature follicle.



(ii) How is a primary oocyte different from a secondary oocyte?

(iii) What are the events that cause the chromosome number of gametes to go from 2n, n, and back to 2n during reproduction?

32. (A) (i) Two pea plants with yellow, round seeds were crossed, and in the F_2 generation, some green wrinkled seeds appeared. Explain the genotypes of the parents and how this result can be obtained. (5)

(ii) Perform the test cross between the F1 generation and the recessive parent of (a) to derive the phenotypic ratios of offspring.

(iii) Why is the 9:3:3:1 ratio considered evidence for independent assortment and not dependent assortment?

OR

(B) (i) Explain the genetic causes, gender affected and symptoms of Klinefelter's Syndrome and Turner's Syndrome.

(ii) What is Phenylketonuria? Write its cause and effects.

33. (A) (i) State Darwin's theory of natural selection (5)

(ii) Why is variation important in natural selection?

(iii) How did the Industrial Revolution affect the peppered moth population in England?

OR

(B) (i) Define adaptive radiation.

(ii) How do Darwin's finches demonstrate adaptive radiation?

(iii) Explain how adaptive radiation leads to biodiversity.