17-12-25

Delhi Public School, Howrah

PERIODIC TEST III (2025-26)

CLASS XII

Care must be taken not to write anything on the question paper. All the questions must be attempted in the correct sequence.

Subject: Biology (Code No. 044)

Time:- 3 Hours **F.M. - 70**

General Instructions:

1. **All questions are compulsory.**
2. **The question paper has five sections: Section A, Section B, Section C, Section D and Section E.There are 33 questions in the question paper.**
3. **Section- A' has 16 questions containing MCQs and Assertion-Reasoning type questions of one 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 questions of 4 marks each; Section 'E' has 3 questions of 5 marks each.**
4. **There is no overall choice. Answer all 33 questions. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.**
5. **Wherever necessary, neat and properly labelled diagrams should be drawn.**

SECTION A

Q. No. 1 to 12 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1. What type of ecological pyramid would be obtained with the following data? 1
   Secondary consumer: 120 g Primary consumer: 60 g Primary producer: 10 g
   A. Upright pyramid of numbers
   B. Pyramid of energy
   C. Inverted pyramid of biomass
   D. Upright pyramid of biomass
2. A child with blood Group A has father with blood group B and mother with blood group AB. Choose the option that gives the correct genotypes of parents and the child. 1

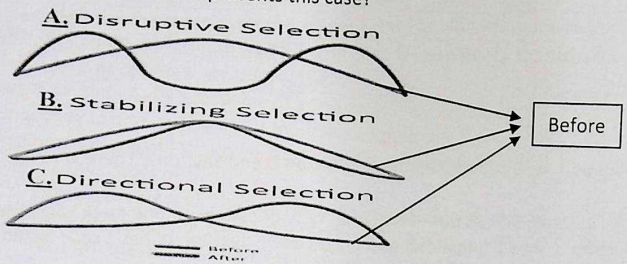
	Father	Mother	Child
A.	$I^A i$	$I^B i$	$I^A i$
B.	$I^A I^B$	$I^A i$	$I^A I^A$
C.	$I^B i$	$I^A I^B$	$I^A i$
D.	$I^B I^B$	$I^A I^B$	$I^A I^A$

3. Which of the following is correct for the condition when plant YyRr is back crossed with the double recessive parent? 1
   A. 9:3:3:1 ratio of phenotypes only
   B. 9:3:3:1 ratio of genotypes only
   C. 1:1:1:1 ratio of phenotypes only
   D. 1:1:1:1 ratio of phenotypes and genotypes
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? 1
   A. 1:1:0 B. 0:1:3 C. 0:1:8 D. 1:4:0
5. Given below are few statements with reference to the human sperm. 1
   (i) Sperm head contains a large nucleus and a lot of cytoplasm.
   (ii) Mitochondria in the middle piece of a sperm provides ATP for the sperm motility.

(iii) Posterior part of the sperm head is covered by acrosome.
(iv) Spermatids undergo maturation into spermatozoa by the process of spermiogenesis.
(v) Acrosomal secretions help in the entry of the sperm into the ovum at the time of fertilization.
Choose the option with all true statements from the given options:

A. (i), (ii) and (iv) B. (ii), (iv) and (v) C. (ii), (iii) and (v) D. (i), (iii) and (iv)

6. Fossil records show that the size of the black bears in Europe increased during each glacial period. Which of the following graphs represents this case? 1

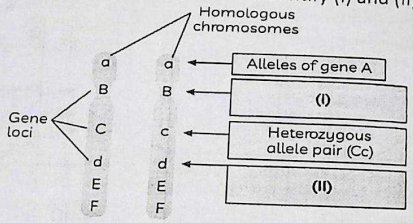


A. Graph A B. Graph B C. Graph C D. None of the above.

7. Rupal says that in marine food chains where the pyramid of biomass is inverted, the 10% rule of energy transfer is not applicable. Is she CORRECT and why? 1

A. No, because every level still gets 10% of the energy from the lower level.
B. Yes, because there are more consumers and so more energy is transferred.
C. No, because the pyramid of biomass can never be inverted for any food chain.
D. Yes, because there is lower biomass of producers in these food chains so less energy is transferred.

8. Study the following figure and identify (I) and (II). 1

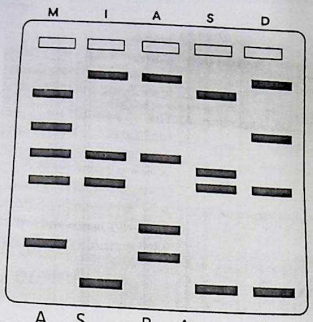


A. (I)- Homozygous recessive (II)- Homozygous dominant
B. (I)- Homozygous dominant (II)- Homozygous recessive
C. (I)- Heterozygous dominant (II)- Heterozygous recessive
D. (I)- Heterozygous recessive (II)- Heterozygous dominant

9. A gene locus has two alleles A and a. If the frequency of dominant allele A is 0.4, then what will be the frequency of homozygous dominant, heterozygous and homozygous recessive individuals in the population 1

A. 0.16 (AA), 0.36 (Aa), 0.48 (aa)
B. 0.36 (AA), 0.48 (Aa), 0.16 (aa)
C. 0.16 (AA), 0.24 (Aa), 0.36 (aa)
D. 0.16 (AA), 0.48 (Aa), 0.36 (aa)

10. In a family court, the mother 'M' of a newborn 'I' filed a case against three men 'A', 'S' and 'D' and claimed that one of the three is the father of the child, who is now refusing to accept it. The judge immediately ordered a DNA fingerprinting test to confirm the paternity dispute. Below is the result of the DNA fingerprinting analysis. Identify the person who is the true father of baby 'I'. 1



A. S B. A C. D D. Can't be determined from the given result.

11. A research team working on a quick diagnostic test to detect *Salmonella typhi* is looking for suitable volunteers to provide patient samples. After collecting samples from four different individuals, their symptoms were summarized in the table below.

Patients	Age Group	Recorded Symptoms
Patient O	23-30	Recurring fever, chills, joint and muscular pain
Patient P	25-32	Sore throat, cough, hoarseness, headache
Patient Q	16-20	Fever, chills, cough, headache
Patient R	22-25	High fever, constipation, loss of appetite, intestinal perforation

The sample from which patient will prove useful for the research team?

A. Patient O B. Patient P C. Patient Q D. Patient R

12. Read the following statements regarding the potential consequences of a malfunctioning PCR machine with insufficient denaturation temperature. 1

I. The hydrogen bonds between the two strands of the DNA will not break.
II. The primers will be unable to anneal to their specific DNA sequences.
III. The *Taq* polymerase will be denatured and become non-functional.
IV. The extension step will not be able to proceed as new strands cannot be synthesized.

Choose the correct answer from the options given below:

A. (I), (II), (III), and (IV) are correct.
B. (I) and (IV) are correct.
C. (II) and (III) are correct.
D. (I), (II), and (IV) are correct.

Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions 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 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.

13. **Assertion (A):** *Agrobacterium tumefaciens* is a pathogen of several monocot plants. 1
Reason (R): It is able to deliver a piece of DNA known as T-DNA to transform normal plant cells into a tumor.

14. **Assertion (A):** Broadly utilitarian arguments say we should conserve biodiversity because it provides many ecosystem services. 1
Reason (R): Exploring molecular, genetic, and species-level diversity for economic products is included in the broadly utilitarian category.

15. **Assertion(A):** Louis Pasteur showed that in flask open to air, new living organisms appeared in the heat killed 1

yeast culture.

Reason(R): Life arises from pre-existing life.

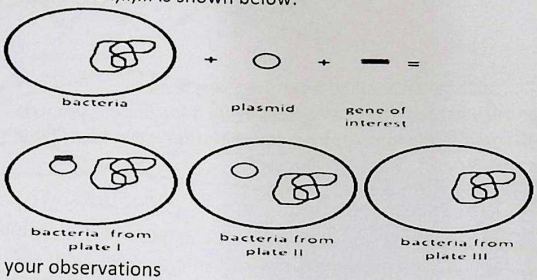
16. **Assertion (A):** Copper-T is an example of an emergency contraceptive. 1

Reason (R): Copper ions released by the device suppress ovulation.

Section – B

17. ***Attempt either option A or B.*** 2

A. The image below shows the result of plating bacteria in chromogenic medium after incorporating the gene of interest in plasmid. Some plates had blue colonies; some plates had white colonies. A single bacterium extracted from Plate I,II,III is shown below:



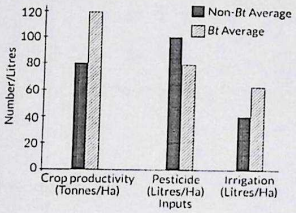
Based on your observations

I. Identify the plate(s) which is/are white. Give a reason.

II. Identify the plate(s) which is/are blue. Give a reason.

OR

B. There are two different farmlands, one where Bt-cotton crop was cultivated and the other where non Bt-cotton crop (indigenous) was cultivated. Farmers responsible for this experimental cultivation were free to use the farming practices of their choice. During the cultivation period, the data was collected with respect to the amount of pesticide used, water required for irrigation and at harvesting time, crop productivity. Based on the data collected, a bar graph was plotted which is shown below.

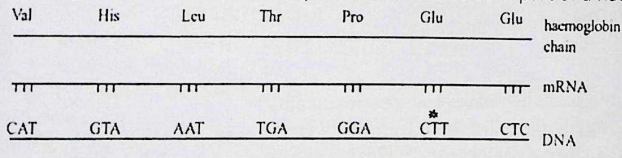


Answer the following questions:

I. Write your interpretation, with reason, on the basis of the three parameters plotted in the graph.

II. Which one out of these two crops would a farmer from Rajasthan like to cultivate and why?

18. The diagram below shows the sequence of amino acids in part of a haemoglobin molecule. 2

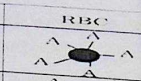
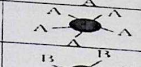
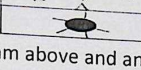
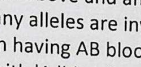


Key: Val = valine; His = histidine; Leu = leucine; Thr = threonine; Pro = proline; Glu = glutamic acid

A. If the base T* was substituted with A, how would it affect the haemoglobin chain?

B. Name the condition and the effects associated with the above substitution.

19. 2

Genotype	RBC	Phenotype
I^AI^A		A
I^Ai		A
I^BI^B		B
I^Bi		B
I^AI^B		AB
ii		O

Study the diagram above and answer the following questions:

A. How many alleles are involved in blood grouping?

B. A person having AB blood group has both dominant alleles. What is this inheritance type called?

C. A man with 'A 'blood group marries a woman with 'B' blood group. Can they have a child with 'O' blood? Explain with the help of a cross.

20. ***Attempt either option A or B.*** 2

A. Shown below is a food chain.

Fallen leaf ⟶ Millipedes ⟶ Fungi ⟶ Earthworm ⟶ Soil
(A) (B) (C) (D)

I. Millipedes have a hard exoskeleton whose composition is different from that of the leaves Considering all other conditions to remain the same, which step is likely to be slower between A to B and B to C and why?

II. What would be the direction of the flow of energy in this food chain?

OR

B. I. A coral reef can be regarded as an ecosystem. Mention any TWO reasons why.

II. The net primary productivity (NPP) of a coral reef is approximately 2000 g C/m2 /year, and the gross primary productivity (GPP) is 4000 g C/m2 /year. Calculate the respiration losses (R) of this ecosystem.

21. ***Attempt either option A or B.*** 1+1

A. I. Hybrid seed companies prevent self-pollination in crops like wheat. Mention one technique and its purpose.

II. A plant in a windy habitat produces small, light pollen grains. Explain the adaptive advantage.

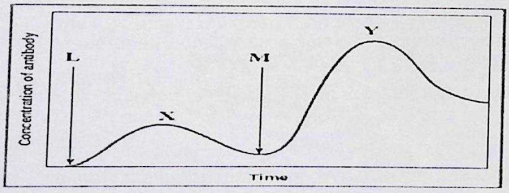
OR

B. I. Immature embryos are supplied with synthetic endosperm medium in tissue culture. Why?

II. A flowering plant has bright petals and sweet nectar. What does this indicate and what is the advantage?

Section - C

22. A. The graph given below indicates the administration of the first (L) and second dose (M) of a vaccine. The corresponding response of the body is indicated by X and Y. Interpret the graph and explain the reason for such a response shown by the body. 3

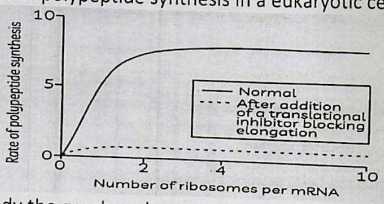


B. After returning from a forest trek, Rohan develops high fever and red rashes. Blood tests show *Plasmodium vivax*. Why does the fever occur in cyclic patterns?

23. A. Why is natural contraceptive method considered safer than hormonal contraceptive pills? Compare with respect to side effects, accessibility, and effectiveness. 3

B. Why is breastfeeding immediately after birth and for up to 6 months considered a natural contraceptive method? Is it reliable? Explain.

24. The graph given below shows the relationship between the number of ribosomes bound to an mRNA and the rate of polypeptide synthesis in a eukaryotic cell under different experimental conditions. 3



Study the graph and answer the given questions.

A. Explain why the rate of polypeptide synthesis initially increases with the number of ribosomes per mRNA.

B. Why does the rate plateau after a certain number of ribosomes even under normal conditions?

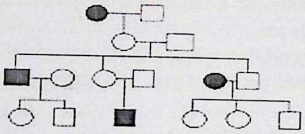
C. How does the addition of translational elongation inhibitor affect the graph, and what does this indicate about the role of elongation in translation?

25. A. If genetic drift plays a major role in evolution in small populations, what might happen to rare alleles when a population is suddenly reduced due to a natural disaster (bottleneck effect)? Predict the outcome. 3

B. If 98 out of 200 individuals in a population express the recessive phenotype, what percent of the population are heterozygotes?

C. Miller simulated early Earth conditions and obtained amino acids. If oxygen had been added to the experimental setup, predict how the results would change and explain the reason.

26. What does the below pedigree conclude? 3



B. In cattle, roan coat (R^RR^W) results from co-dominance between red (R^R) and white (R^W). Two roan cattle ($R^RR^W \times R^RR^W$) are crossed.

A. What percent will be roan?

B. If 60 calves are born, how many are expected to be red?

27. ***Attempt either option A or B.*** 3

A. Differentiate between the structure of dicot and monocot seed with the help of diagrams.

OR

B. With the help of diagrams show the stages in embryo development in a dicot.

28. A gene has 900 nucleotides in its coding sequence. 3

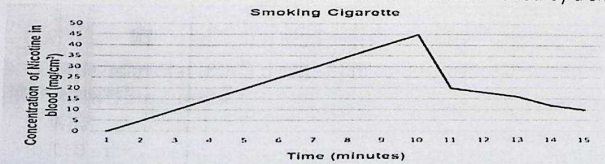
i. How many codons will be formed from this gene?

ii. How many amino acids will be present in the polypeptide formed?

iii. If a deletion mutation removes 6 nucleotides, how many codons and amino acids will now be formed?

Section - D

29. The data below shows the concentration of nicotine smoked by a smoker taking 10 puffs/ minute. 4



A. With reference to the given graph, explain the concentration of nicotine in blood at 10 minutes.

B. How will this affect the concentration of carbon monoxide and haembound oxygen at 10 minutes?

Attempt either subpart C or D.

C. Arya lived in Agra and had high blood pressure. He started smoking at the age of 15 and quit at age 39, after his leg amputated due to poor circulation, made worse by smoking. How does cigarette smoking result in high blood pressure and increase in heart rate?

OR

D. How does cigarette smoking result in lung cancer and emphysema?

30. **Read the passage given below and answer the following questions:** 4

A scientist is attempting to clone a gene from a plant with high oil content. They use EcoRI to cut both the gene and the plasmid. During the process, the ligation step fails repeatedly, reducing the number of successful recombinant clones.

A. State one reason why ligation may fail in this experiment.

B. What is the function of the restriction enzyme EcoRI in cloning? Why is a plasmid commonly used as a vector in gene cloning?

Attempt either subpart C or D.

C. Why is it important to cut both vector and insert with the same enzyme?

OR

D. Name a technique used to confirm whether the ligation was successful.

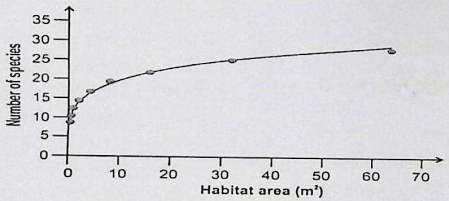
Section - E

31. ***Attempt either option A or B.*** 5

A. Diversity is seen in the living world at various levels. The distribution of biodiversity shows specific patterns that account for the species richness or paucity across the globe.

I. Explain, with reasons, how species diversity changes with changing altitudes.

II. The graph given below represents species-area relationship. What does such a graph signify?



III. If the area of a habitat is doubled, how will it affect the species richness? Explain with proper reasoning.

OR

B. "Logistic growth is more reasonable for the animal population than exponential growth." Based on the given statement answer the following questions:

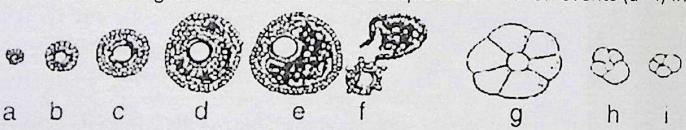
I. Explain the given statement with a suitable reason.

II. Write the equation responsible for the representation of logistic growth for animal population.

III. Write and explain any three population attributes.

32. ***Attempt either option A or B.*** 5

A. The following is the illustration of the sequence of ovarian events (a - i) in a human female.



I. Identify the figure that illustrates ovulation and mention the stage of oogenesis it represents.

II. Name the ovarian hormone and the pituitary hormone that have caused the above-mentioned event.

III. Explain the changes that occur in the uterus simultaneously in anticipation.

IV. Write the difference between 'c' and 'h'.

V. Draw a labelled sketch of the structure of a human ovum prior to fertilization.

OR

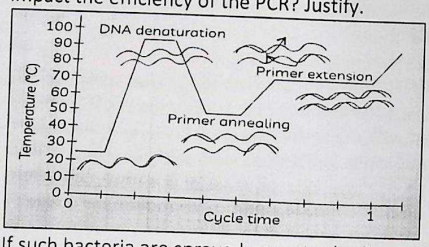
B. Give reason for the following statements:

I. Ovulation usually occurs around the 14th day of the menstrual cycle in a normal 28-day cycle.
II. Fertilization normally takes place in the ampullary region of the fallopian tube and not in the uterus.
III. Sperm cannot fertilize the ovum immediately after ejaculation.
IV. The placenta is indispensable for the survival of the embryo.
V. Multiple embryos are not normally formed even though many follicles begin to develop every menstrual cycle.

33. ***Attempt either option A or B.*** 5

A. Oil spills are a major environmental concern. It has been shown that different strains of *Pseudomonas* bacteria contain genes capable of breaking down the four primary hydrocarbon groups found in oil. Trails are underway to employee various biotechnological techniques to include these jeans and generate a genetically engineered stain of *Pseudomonas*, a superbug that might be sprayed over all oil-contaminated surfaces to remove thin layers of oil.

I. List two advantages of using bacteria for such biotechnological studies.
II. For amplification of the gene of interest PCR was carried out as shown in the graph below. The PCR was run with the help of polymerase which was functional only at a very low temperature. how will this impact the efficiency of the PCR? Justify.



III. If such bacteria are sprayed on water bodies with oil spills, how will these have a positive or negative effect on the environment? discuss.

OR

B. RNA interference (RNAi), also known as post-transcription gene silencing (PTGs), is a conserved biological response to double standard RNA that provides resistance to both endogenous parasite and exogenous pathogenic nucleic acid while also regulating protein-coding gene expression. This natural mechanism for sequence specific gene silencing has the potential to revolutionize experimental biology, with substantial practical applications in functional genomics and other related sectors.

I. What can be the source of dsRNA for this process?
II. What effect will this interaction between dsRNA and mRNA have on the mRNA and overall cellular machinery of the host plant?
III. What is the economic significance of the technique described in the case above? Also provide justification for your answer.
IV. How may dsRNA of a nematode-specific gene be introduced into a host cell, as per the given diagram?

