Pre-Board Examination (2025-26)
Subject-Biology
Class-XII

MM: 70 **Time: 3 hours**

General Instructions:

(i) All questions are compulsory.
(ii) The question paper has five sections and 33 questions.
(iii) Section–A has 16 questions of 1mark 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; and Section–E has 3 questions of 5 marks each.
(iv) 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.
(v) Wherever necessary, neat and properly labeled 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.

Q. No.	Question	Marks
1.	The sequence of nitrogenous bases in a segment of a coding strand of DNA is - 5′ – AATGCTAGGCAC – 3′. Choose the option that shows the correct sequence of nitrogenous bases in the mRNA transcribed by the DNA. A. 5′ – UUACGAUCCGUG – 3′ B. 5′ – AAUGCUAGGCAC – 3′ C. 5′ – UUACGUACCGUG – 3′ D. 5′ – AACGUA GGCAGC – 3′	1
2.	How many pollen grains and ovules are likely to be formed in the anther and the ovary of an angiosperm bearing 50 microspore mother cells and 50 megaspore mother cells respectively? A. 100, 25 B. 200, 50 C. 50, 50 D. 200, 100	1
3.	The process of splicing in eukaryotes represents the dominance of the: A. DNA world B. RNA world C. Protein world D. Lipid world	1
4.	A characteristic property that distinguishes a malignant tumor from a benign tumor is**:**	1

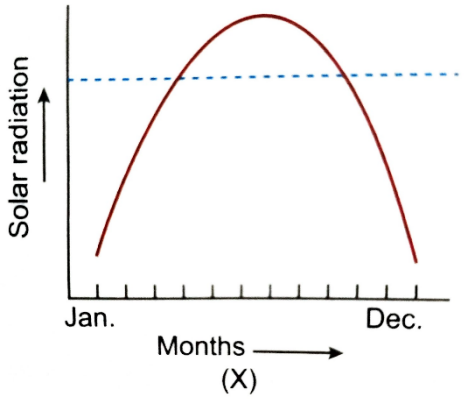
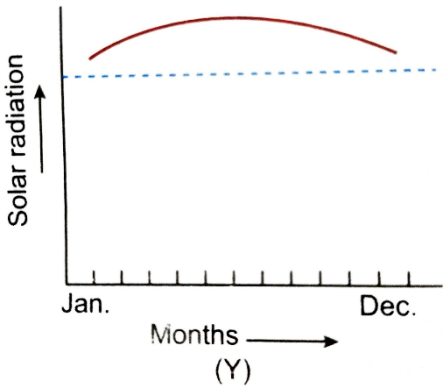
	A. Metamorphosis B. Metastasis C. Metabolism D. Metagenesis	
5.	About 15 mya during human evolution, the primates which used to walk like gorillas and chimpanzees were: A. *Australopithecine* and *Neanderthal* B. *Dryopithecus* and *Ramapithecus* C. *Homo erectus* and *Homo sapiens* D. *Homo habilis* and *Homo erectus*	1
6.	Which of the following statements related to HIV infection is incorrect? A. HIV infection leads to a progressive decrease in the number of $CD4^+$ T-lymphocytes. B. The DNA formed by reverse transcriptase integrates into the host genome and directs viral replication. C. Antiretroviral therapy (ART) completely eliminates HIV from the body in the early stages of infection. D. Opportunistic infections in AIDS occur because of the suppression of the immune system.	1
7.	A man whose father was colour-blind marries a woman who had a colour-blind mother and normal father. What percentage of male children of this couple will be colour-blind? A. 25% B. 0% C. 50% D. 75%	1
8.	Which of the following evidences does not favour the Lamarckian concept of inheritance of acquired characters? A. Lack of pigment in cave-dwelling animals B. Melanisation in peppered moth C. Absence of limbs in snakes D. Presence of webbed toes in aquatic birds	1
9.	In angiosperms, the development of the female gametophyte occurs in a definite sequence. Identify the correct sequence.	1

	I (Stage in ovule before meiosis)	**II (Product of meiosis)**	**III (Surviving haploid spore)**	**IV (Fusion of gametes)**
A.	Megaspore mother cell	4 Megaspores	Functional megaspore	Embryo sac
B.	Megaspore mother cell	Embryo sac	Zygote	Ovule
C.	Megaspore mother cell	Megaspores	Egg cell	Endosperm
D.	Nucellus	Megaspores	Embryo sac	Seed formation

10.	Use the given information to select the amino acid attached to the 3′ end of tRNA during the process of translation, if the coding strand of the structural gene being transcribed has the nucleotide sequence TAC. Codons for the amino acids: • AUC – Isoleucine • AUG – Methionine • UAC – Tyrosine	1

	• GUA – Valine Options: A. Isoleucine B. Methionine C. Tyrosine D. Valine	
11.	The sequence that controls the copy number of the linked DNA in the vector, is termed A. Selectable marker B. Recognition site C. Palindromic sequence D. Ori site	1
12.	Seminal plasma in humans is rich in: A. fructose and calcium but has no enzymes B. glucose and certain enzymes but has no calcium C. fructose and certain enzymes but poor in calcium D. fructose, calcium and certain enzymes.	1
Question No. 13-16 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 and R is not the correct explanation of A.** **C. A is true but R is false.** **D. A is false and R is true.**		
13.	**Assertion:** Exine of a pollen grain is made up of sporopollenin which is resistant to high temperatures, strong acids or alkali as well as enzymatic degradation. **Reason: S**poropollenin is absent in the region of germ pores.	1
14.	**Assertion (A):** Darwin's finches represent divergent evolution. **Reason (R):** They evolved from different ancestral species present on the Galápagos Islands.	1
15.	**Assertion (A):** In organ transplantation, donor and recipient should be genetically as close as possible. **Reason (R):** In immunosuppression, immune system rejects the transplanted organ.	1
16.	**Assertion (A):** Bt toxin kills insects by creating pores in their gut epithelium. **Reason (R):** The Bt toxin is active in plant cells and directly damages insect nervous tissue when eaten.	1

Section-B		
17.	***Attempt either option A or B.*** A. Why are some seeds referred to as apomictic seeds? Mention one advantage and one disadvantage to a farmer who uses them. **OR** B. In many flowering plants, self-pollination is prevented to maintain genetic diversity. Explain how dioecy and self-incompatibility act as out breeding devices in such plants.	2

18.	The length of DNA in a human diploid cell is about 2 metres, yet it fits inside a nucleus of only ~6 µm diameter. How is this extremely long DNA efficiently packaged within the nucleus?	2
19.	The table below shows a hypothetical blood report of a patient suffering from frequent sneezing, watery eyes, and breathing difficulty. **Test description** / **Observed value** / **Unit** / **Reference range** Total leukocyte count / 9000 / Per microliter / 4400–11,000 Neutrophils / 58 / % / 55–70 Lymphocytes / 30 / % / 20–40 Eosinophils / 12 / % / 1–4 Basophils / 2 / % / 0.5–1 IgE antibody concentration / 380 / IU/mL / < 150 A. Looking at the values, suggest which condition the patient is suffering from? Explain the immune mechanism behind this condition. B. Name the chemicals responsible for causing the symptoms.	2
20.	***Attempt either option A or B.*** A. A patient with ADA deficiency requires periodic infusion of genetically engineered lymphocytes. Explain why such periodic infusion is required and also suggest a permanent cure for such ADA deficiency. **OR** B. Describe in brief any two techniques that can be utilised to transfer recombinant DNA into the host cell directly without using any vector.	2
21.	***Attempt either option A or B.*** A. Study the given graphs (X) and (Y) depicting the annual variation in solar radiation on earth from January to December and answer the under mentioned questions.   (i) Compare the graphs (X) and (Y) above and identify which of the two regions – (X) and (Y), will show greater biological diversity giving suitable reasons? (ii) Construct a flow chart showing connection between a grazing food chain and detritus food chain.	2

For visually impaired students

(i) What is primary productivity? Why does it vary in different types of ecosystems?

(ii) Construct a flow chart showing connection between a grazing food chain and detritus food chain.

OR

B. Use the information provided in the table given below to answer the following questions.

Trophic Level	Net Production (KJ m^{-2} y^{-1})	Respiration (KJ m^{-2} y^{-1})
Top carnivore	50	35
Carnivores	420	378
Herbivores	4490	4041
Producers	45000	40,367

(i) Calculate the gross primary productivity.

(ii) Analyse the trend in the net production from producers to top carnivore. Give reason for your observation.

Section - C

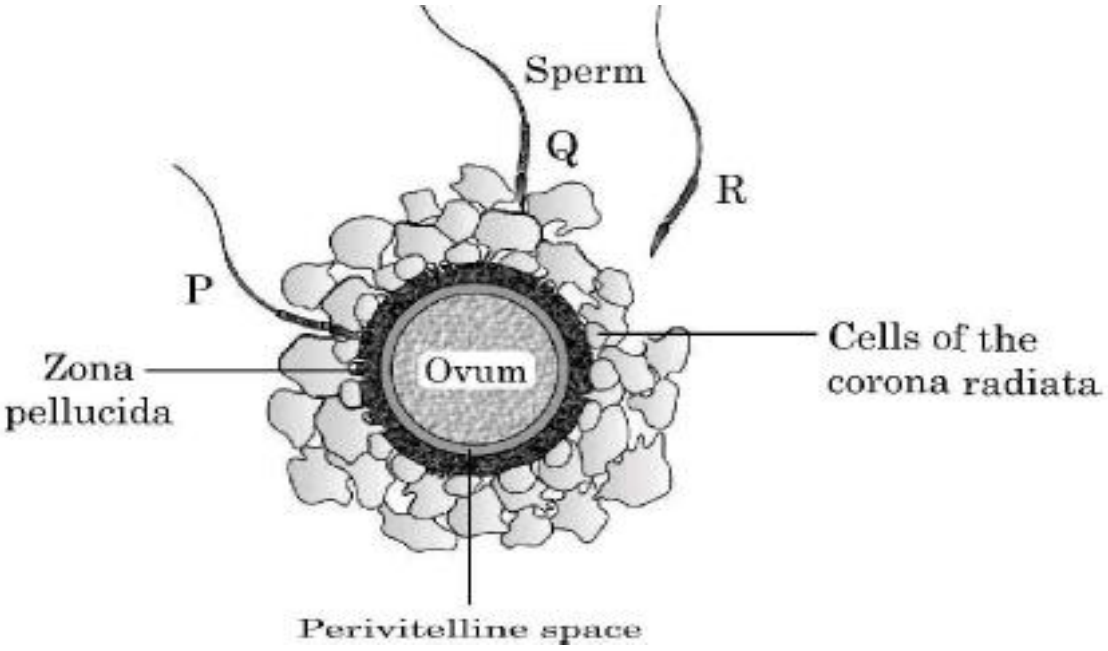
22. Suggest suitable reproductive health measures for the following cases with justification: 3

A. Ramesh and his wife live in a rural area with very little awareness about sexually transmitted infections (STIs). Which government programme could help them, and how?

B. Anita and Raj want to conceive but are facing difficulty due to blocked fallopian tubes. Which assisted reproductive technology (ART) would be most suitable for them?

C. Doctors suspect that a developing foetus may have a chromosomal abnormality. Which prenatal diagnostic technique would help confirm this, and how?

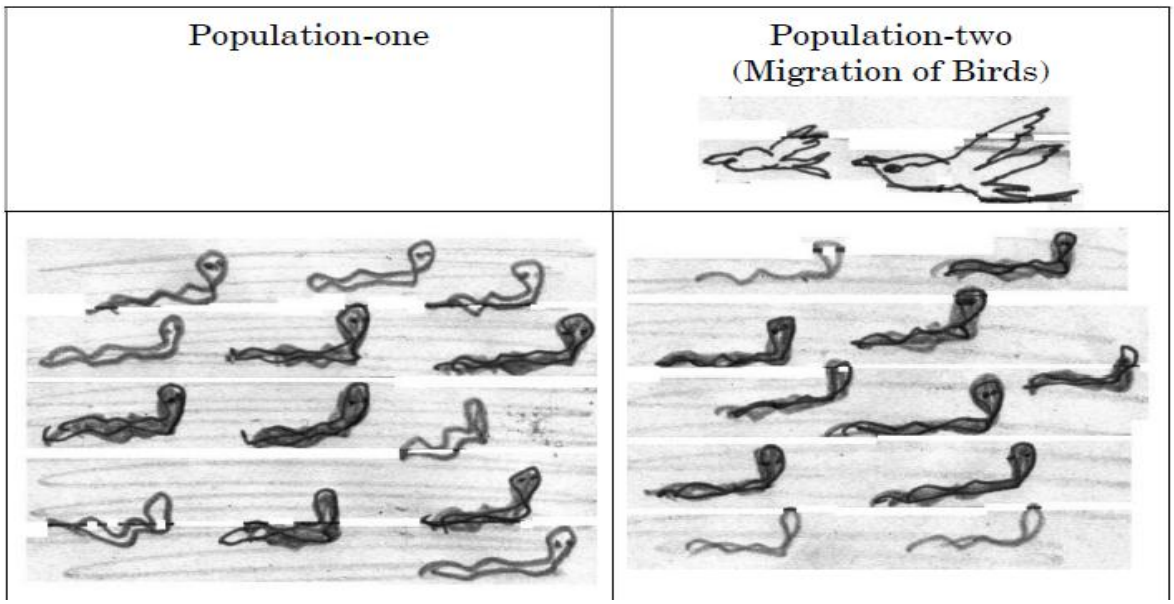
23 Given below is the diagram of a human ovum surrounded by sperms. Observe it carefully and answer the following: 3

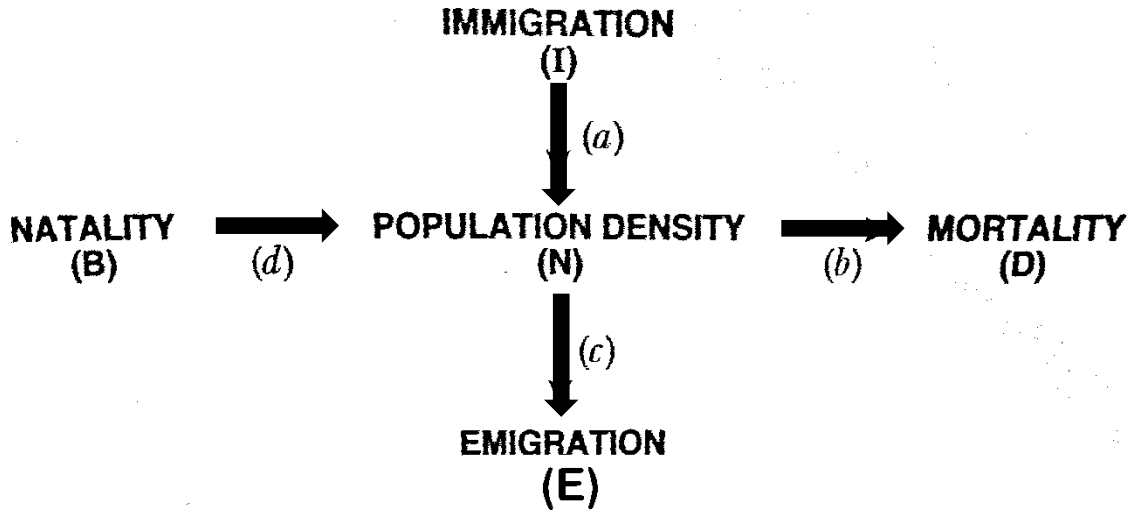


A. Compare the fate of sperms 'P', 'Q', and 'R' shown in the diagram.

B. Write the role of the zona pellucida in this process.

C. Analyse the changes that occur in the ovum after the entry of a sperm.

	--- ***For visually impaired students*** Parturition is induced by a complex neuroendocrine mechanism. Explain.	
24.	In rabbits, if the allele for long fur (**F**) is dominant over short fur (**f**), and the allele for black coat colour (**B**) is dominant over brown coat (**b**). These two genes assort independently. If two heterozygous rabbits (**FfBb × FfBb**) are crossed, determine the probability of obtaining an offspring with **short fur and brown coat**. Find the probability using a Punnett square.	3
25.	A population of snakes lived in a desert with brown sand. Study the drawings given below showing the change in the population from 'one' to 'two' over time and answer the questions that follow. Brown snakes and grey snakes are represented by alleles A/a (Dominant/recessive).  A. If the frequency of the recessive trait is 9% in population-one, work out the frequency of homozygous dominant and heterozygous dominant snakes. B. Name the mechanism of evolution that must have operated so that Population –two evolved from population-one. --- ***For visually impaired students*** A. How does the study of fossils help to understand evolution? B. How did SL Miller provide an experimental evidence in favour of Oparin and Haldane's hypothesis? Explain.	3
26.	Biogas is considered a clean and sustainable fuel. Enumerate its major gaseous components, name the main bacteria involved in its production and explain the processes that are used to transform organic waste into biogas?	3
27.	Explain the process of RNA interference (RNAi). How is this biological process exploited to develop resistance in plants against nematode infection?	3
28.	The given flow chart depicts the four basic processes that regulate population density in a given area.	3



A. Which of the above represents the increase or decrease of population?
B. If N is the population density at time t, then what would be its density at time (t+1)? Write the formula.
C. In a barn there were 30 rats. 5 more rats enter the barn and 6 out of the total rats were eaten by the cats. If 8 rats were born during the time period under consideration and 7 rats left the barn, calculate the resultant population at time (t+1).
D. If a new habitat is just being colonized, out of the four factors affecting the population growth, which factor contributes the most?

For visually impaired students

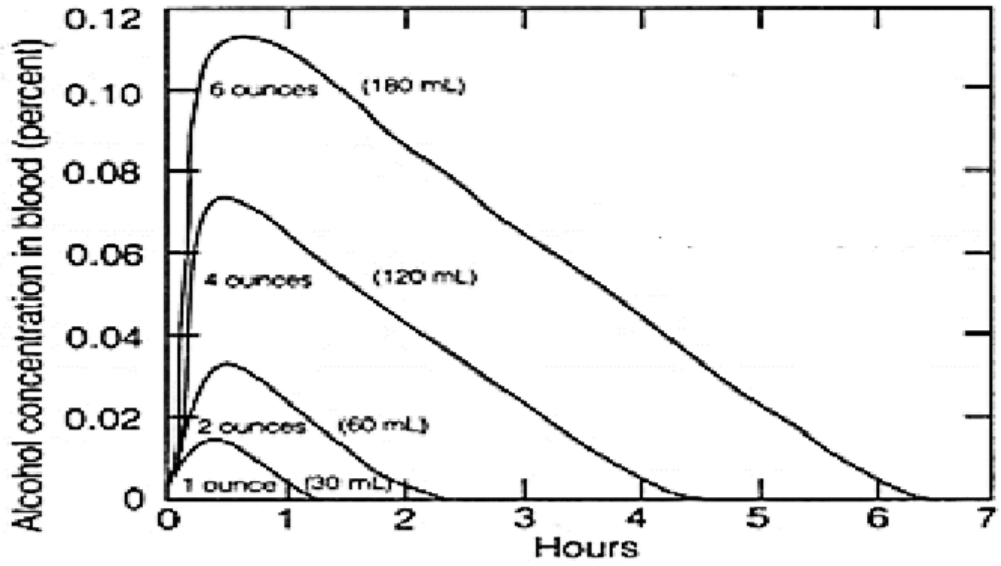
A. It is possible that a species may occupy more than one trophic level in the same ecosystem at the same time. Explain with the help of one example.
B. If N is the population density at time t, then what would be its density at time (t+1)? Write the formula.
C. In a barn there were 30 rats. 5 more rats enter the barn and 6 out of the total rats were eaten by the cats. If 8 rats were born during the time period under consideration and 7 rats left the barn, calculate the resultant population at time (t+1).
D. If a new habitat is just being colonized, out of the four factors affecting the population growth, which factor contributes the most?

Section - D

29. Given below is a set of information about some events and structures in human reproduction: 4

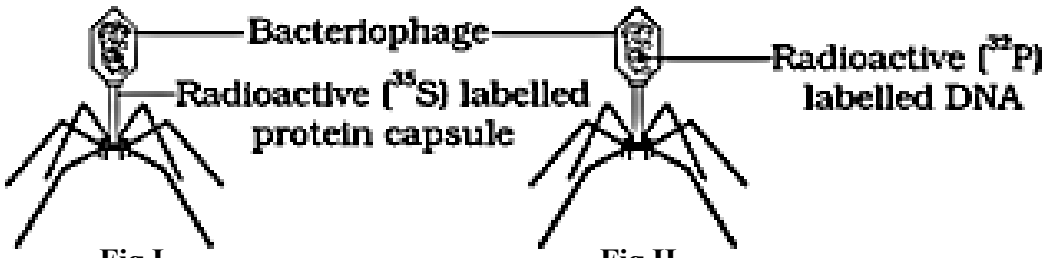
Label	Event/Structure description
P	Spermatogonia undergo repeated mitotic divisions to produce primary spermatocytes.
Q	Secondary oocyte is released from the ovary during ovulation
R	Corpus luteum secretes progesterone after ovulation.
S	Foetus grows in the uterus.

On the basis of the information provided above, answer the following questions:
A. How many spermatozoa will be produced from one primary spermatocyte? How many secondary oocytes are released by a single primary oocyte?

	B. (i) Which of the above (P, Q, R, S) is directly responsible for maintaining pregnancy in the female? Justify. (ii) Which one of the events (P, Q, R, S) is regulated by the surge of luteinising hormone (LH)? ***Attempt either subpart C or D:*** C. How does luteinising hormone (LH) regulate the process of spermatogenesis? **OR** D. When do spermatogenesis and oogenesis initiate in human males and females respectively?	
30.	The graph below shows the percent blood alcohol concentration by quantity of alcohol over time. Study the graph and answer the questions that follow:  A. With reference to the above graph, during which time the concentration of alcohol in blood will be highest and what pattern is observed regarding alcohol concentration in blood later? B. "The addictive potential of alcohol, pull the user into a vicious circle leading to its regular use (abuse) from which he/she may not be able to get out." Justify the statement. ***Attempt either subpart C or D:*** C. What is the average rate of processing of alcohol by the body, as shown in the above graph? Name the main organ where 90% of the absorbed alcohol is metabolised in the body. **OR** D. What are the most common warning signs of alcohol abuse among youth? --- ***For visually impaired students*** A. Alcohol is not a traditional nutrient. Why? B. "The addictive potential of alcohol, pull the user into a vicious circle leading to its regular use (abuse) from which he/she may not be able to get out." Justify the statement. ***Attempt either subpart C or D:*** C. What do you understand by Dependence? **OR** D. What are the most common warning signs of alcohol abuse among youth?	4

Section -E

31. A. A revolutionary experiment was performed in the field of molecular biology by Hershey-Chase. An important type of raw material used in the above experiment is given below: 5



: **Fig.I** **Fig.II**

Draw the part of the above experiment showing results in which a centrifuge was used.

B. What observations in the above experiment provided an unequivocal proof that DNA is the genetic material?

C. You are repeating the Hershey-Chase experiment and are provided with two isotopes: ^{32}P and ^{15}N (in place of ^{35}S in the original experiment). How do you expect your results to be different if hypothetically ^{15}N is radioactive?

For visually impaired students

A. Absence of lactose in the culture medium affects the expression of a *lac* operon in *E. coli*. Why and how? Explain.

B. What observations in the Hershey-Chase experiment provided an unequivocal proof that DNA is the genetic material?

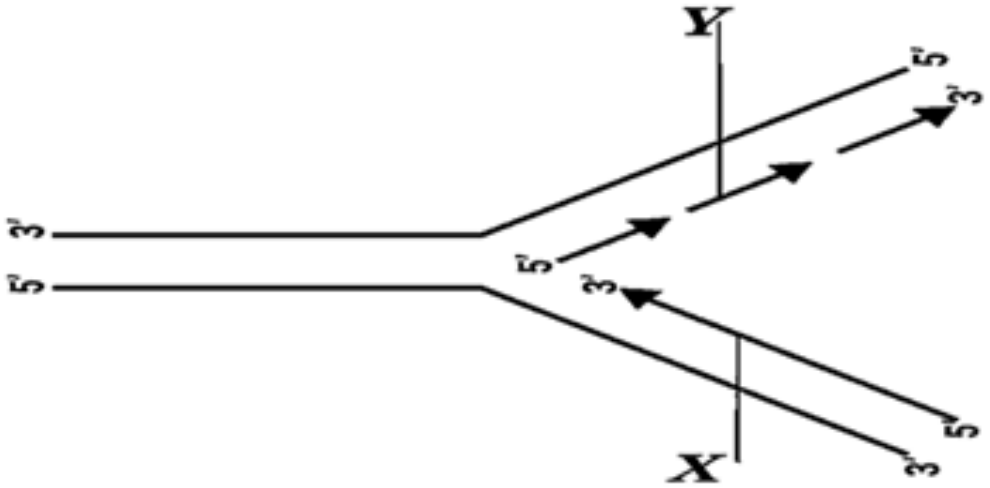
C. You are repeating the Hershey-Chase experiment and are provided with two isotopes: ^{32}P and ^{15}N (in place of ^{35}S in the original experiment). How do you expect your results to be different if hypothetically ^{15}N is radioactive?

OR

A. State the contribution of Meselson and Stahl in proving the semi-conservative nature of DNA replication.

B. Deoxyribonucleoside triphosphates (dNTPs) play a dual role in DNA replication. Explain. Name the enzyme that uses them during replication.

C. The diagram below shows a replication fork. Study it and answer the following:



(i) Identify strands X and Y.

(ii) Why is strand Y synthesised in fragments?

For visually impaired students

A. State the contribution of Meselson and Stahl in proving the semi-conservative nature of DNA replication.

B. Deoxyribonucleoside triphosphates (dNTPs) play a dual role in DNA replication. Explain. Name the enzyme that uses them during replication.

C. (i) How were the two methodologies Expressed Sequence Tags (ESTs) and Sequence annotation which were involved in human genome project, different from each other?

(ii) Expand YAC.

(iii) Which was the last chromosome sequenced of the 24 human chromosomes sequenced under Human Genome Project?

32. Microbes and enzymes are central to recombinant DNA technology. 5

A. Name one bacterium that is the source of restriction enzymes used in genetic engineering. State its significance.

B. How is DNA isolated in purified form from a bacterial cell?

C. A plasmid vector contains both ampicillin and tetracycline resistance genes. Foreign DNA is inserted in the tetracycline resistance gene.

(i) What will be the effect on tetracycline resistance?

(ii) How can recombinants be distinguished from non-recombinants?

OR

Gel electrophoresis is an important tool in biotechnology.

A. What is the principle of gel electrophoresis?

B. Draw a neat, labelled diagram showing the separation of DNA fragments by gel electrophoresis.

C. How are the separated DNA fragments visualized and recovered for use in recombinant DNA experiments?

33. Justify the following statements with suitable examples: 5

A. Predators play an important role in maintaining species diversity in a community.

B. Prey species have evolved special adaptations against predation.

C. Parasitism can significantly affect the survival and reproduction of the host.

D. Commensalism may benefit one species without harming the other.

E. Certain orchids employ sexual deceit to achieve pollination.

OR

A. Certain species of cuckoo lay eggs in the nests of crows, and these eggs closely resemble those of the host in size and colour. Name this interaction and describe how it illustrates the concept of co-evolution.

B. Study the tabulated data of the approximate number of individuals (N) of certain animal populations and maximum support of their habitat. Answer the questions given below.

Species	Population size (N)	K
Rabbit	500	1000
Deer	200	300
Housefly	10000	50000
Elephant	20	50

(i) Which population is likely to face resource competition? Justify your answer.

(ii) If the housefly population grows by 10%, what will be the new population size of housefly in the given area at the given time?

(iii) Explain why populations rarely grow beyond their carrying capacity with reference to the above examples.

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