

ROLL NUMBER				
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SET	A
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INDIAN SCHOOL MUSCAT  
FINAL EXAMINATION 2022  
BIOLOGY(044)



CLASS : XII  
DATE: 28.11.2022

TIME ALLOTTED : 3 HRS.  
MAXIMUM MARKS:70

**GENERAL INSTRUCTIONS:**

- (i) All questions are compulsory.
- (ii) The question paper has five sections and 33 questions. All questions are compulsory.
- (iii) Section–A has 16 questions of 1 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; and Section-E has 3 questions of 5 marks each.
- (iv) There is no overall choice. 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**

1. Sterilization techniques are generally fool-proof methods of contraception with least side effects. Yet this is the last option for couples because:

- i) It is almost irreversible
- ii) Of the misconception that it will reduce the sexual urge
- iii) It is a surgical procedure
- iv) Of lack of facilities in many parts of our country.

Choose the correct option

- a) i and iii
- b) ii and iii
- c) ii and iv
- d) i,ii,iii and iv

2. Assisted Reproductive Technology helps couples to have children through certain special techniques. 1  
Find the correct statement regarding ZIFT procedure.

- a) Ova collected from a female donor are transferred to the fallopian tube to facilitate zygote formation
- b) Zygote is collected from a female donor and transferred to the fallopian tube.
- c) Zygote is collected from a female donor and transferred to the uterus.
- d) Ova collected from a female donor are transferred to the uterus.

3. Match the following RNA polymerase with their transcribed products. 1

Enzyme	synthesis
1. RNA polymerase I	(i) tRNA
2. RNA polymerase II	(ii) rRNA
3. RNA polymerase III	(iii) hnRNA

Select the correct option from the following :

- a) 1-i, 2-iii, 3-ii
- b) 1-i, 2-ii, 3-iii
- c) 1-ii, 2-iii, 3-i
- d) 1-iii, 2-ii, 3-i

4. In Hardy-Weinberg equation, the frequency of heterozygous individual is represented by 1

- a)  $p^2$
- b)  $2pq$
- c)  $pq$
- d)  $q^2$

5. Innate immunity is nonspecific and brought about by different means. Body secretes different 1  
chemicals, proteins and other substances to give immunity to us. Interferons are kind of innate  
immunity and it is secreted when body is infected with

- a) Mycoplasma
- b) Bacteria
- c) Virus
- d) Fungi

6. Which one of the following is not a property of cancerous cells, whereas the remaining three are? 1
- They compete with normal cells for vital nutrients.
  - They do not remain confined in the area of formation.
  - They divide in an uncontrolled manner
  - They show contact inhibition

7. Match the following columns and select the correct options. 1

Column I	Column II
A <i>Clostridium butylicum</i>	(i) Cyclosporin A
B <i>Trichoderma polysporum</i>	(ii) Butyric acid
C <i>Monascus purpureus</i>	(iii) Citric acid
D <i>Aspergillus niger</i>	(iv) Cholesterol lowering agent

- A(iii) B (iv) C (ii) D (i)
  - A(ii) B (i) C (iv) D (iii)
  - A(i) B (ii) C (iv) D (iii)
  - A(iii) B (i) C (ii) D (iv)
8. The first clinical gene therapy was given for treating 1
- diabetes mellitus
  - chicken pox
  - rheumatoid arthritis
  - Adenosine deaminase deficiency.
9. In a growing population of a country, 1
- pre-reproductive individuals are more than the reproductive individuals
  - reproductive individuals are less than the post- reproductive individuals
  - reproductive and pre-reproductive individuals are equal in number
  - pre-reproductive individuals are less than the reproductive individuals.
10. Two closely related species competing for the same resource cannot live for long duration in the same 1  
niche or habitat. This law is
- Allen's law
  - Gause's hypothesis
  - Dollo's rule
  - Weismann's theory.

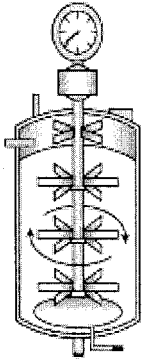
11. Which of the following is not an attribute of a population? 1
- a) Sex ratio
  - b) Natality
  - c) Mortality
  - d) Species interaction
12. Identify the correct statement from the following: 1
- a) Commensalism when none of the interacting populations affect each other.
  - b) Symbiosis when the interaction is useful to both the interacting species.
  - c) Ammensalism when useful to one species and detrimental to the other species.
  - d) Parasitism when harmful to both the interacting species.

**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 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. Assertion: Wind pollination is quite common in grasses. 1  
Reason: They possess well exposed stamens and large feathery stigma to easily trap air-borne pollen grains.
14. Assertion: Human skin colour is an example of Pleiotropy. 1  
Reason: Skin colour trait is controlled by more than one genes.
15. Assertion: Cancer patients are given substances called alpha-interferon. 1  
Reason: Tumor cells avoid detection and destruction by immune system.

16.

1



The given diagram shows simple stirred tank bioreactor. Bioreactors are huge vessels where large volumes of culture can be processed.

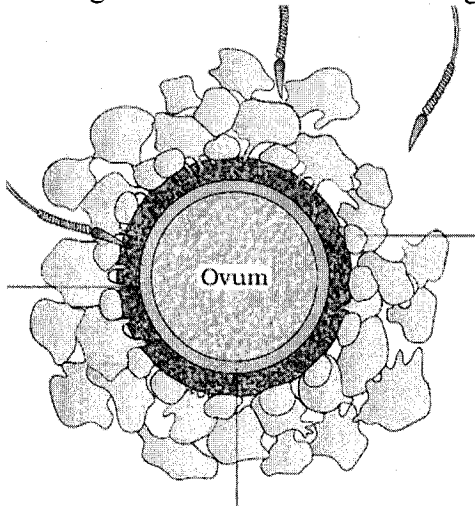
Assertion: Stirred-tank bioreactors have a stirrer.

Reason: Stirrer facilitates even mixing and oxygen availability throughout the bioreactor.

### SECTION – B

17. Observe the figure and answer the following questions:

2



- Name the layer through which sperm enters an ovum to fertilise it.
- Entry of sperm induces the completion of the meiotic division. Which are the daughter cells formed after this process.

18. In human's widow's peak (W) is dominant over straight hairline (w). A heterozygous man for this trait marries a woman who is also heterozygous. Give the genotypic and phenotypic ratios of the offspring.

OR

Identify the sex of organism as male or female in which the sex chromosome are found as  
 (i) ZW in bird (ii) XY in Human (iii) ZZ in birds. (iv) XO in human.

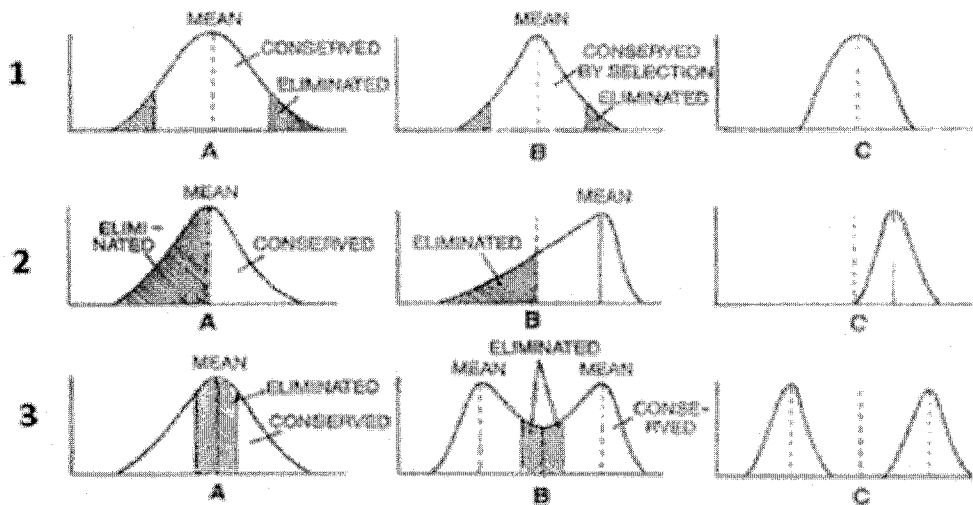
19. More and more children in metro cities of India suffer from allergies and asthma due to sensitivity to the changing environment. Write any two responses of the human body when exposed to allergens. Mention two drugs used to reduce the symptoms of allergy. 2
20. Define BOD. How is BOD reduced in the secondary treatment of STP? 2
21. Explain how proinsulin is structurally different from mature insulin? How did Eli Lilly company produce human insulin? 2

### SECTION – C

22. Spermatogenesis is controlled by hormones. Justify. 3
23. Mention three strategies evolved to prevent self-pollination in flowers. 3
24. (a) Name the selectable markers in the cloning vector pBR322. 3  
 (b) Mention the role they play.  
 (c) Why is the coding sequence of an enzyme  $\beta$ -galactosidase a preferred selectable marker in comparison to the ones named above?
25. What are homologous organs? Give one example each from plants and animals. 3

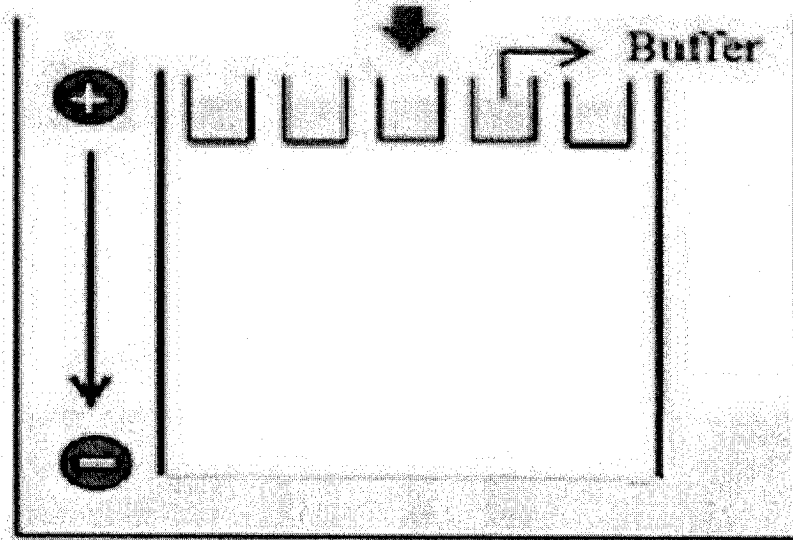
OR

The given picture is a representation of three types of natural selection. Observe the figures 1, 2 and 3 and explain the type of natural selection they represent.



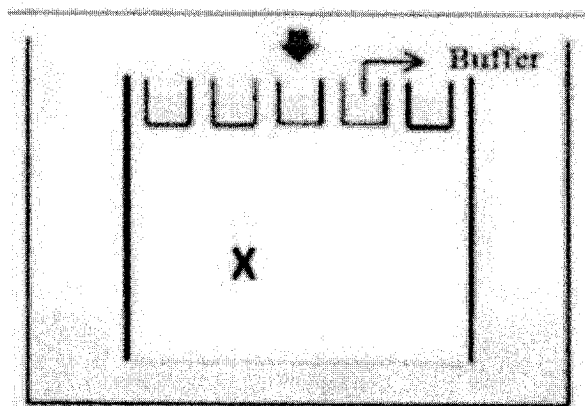
Three types of natural selection.

26. (a) List any two situations when a medical doctor could recommend injection of preformed antibodies into the body of a patient. Name this kind of immunization and mention its advantages. 3  
 (b) Name the kind of immunity attained when instead of antibodies, weakened antigens are introduced into the body.
27. Carefully observe the given picture. A mixture of DNA with fragments ranging from 200 base pairs to 2500 base pairs was electrophoresed on agarose gel with the following arrangement. 3



- (a) What result will be obtained on staining with ethidium bromide? Explain with reason.

The above set-up was modified and a band with 250 base pairs was obtained at X.



- (b) What change(s) were made to the previous design to obtain a band at X? Why did the band appear at the position X?

28. a) Write the use of PCR. 3  
b) Write the source of polymerase enzyme used and its source.

**SECTION – D**

Q.no 29 and 30 are case based questions. Each question has subparts with internal choice in one sub part.

29. There are 4 main blood groups (types of blood) – A, B, AB and O. Your blood group is determined by the genes you inherit from your parents. Each group can be either RhD positive or RhD negative. Blood is made up of red blood cells, white blood cells and platelets in a liquid called plasma. Your blood group is identified by antibodies and antigens in the blood. Antibodies are proteins found in plasma. They're part of your body's natural defenses. They recognize foreign substances, such as germs, and alert your immune system, which destroys them. Antigens are protein molecules found on the surface of red blood cells. Blood group O is the most common blood group. Receiving blood from the wrong ABO group can be life-threatening. To work out your blood group, your red cells are mixed with different antibody solutions. 4
- a) How many alleles are involved in blood grouping? This is an example of \_\_\_\_\_.
- b) A person having AB blood group has both dominant alleles. What is the inheritance type called?
- c) A man with 'A' blood marries a woman with 'B' blood. Can they have a child with 'O' blood group? How?

OR

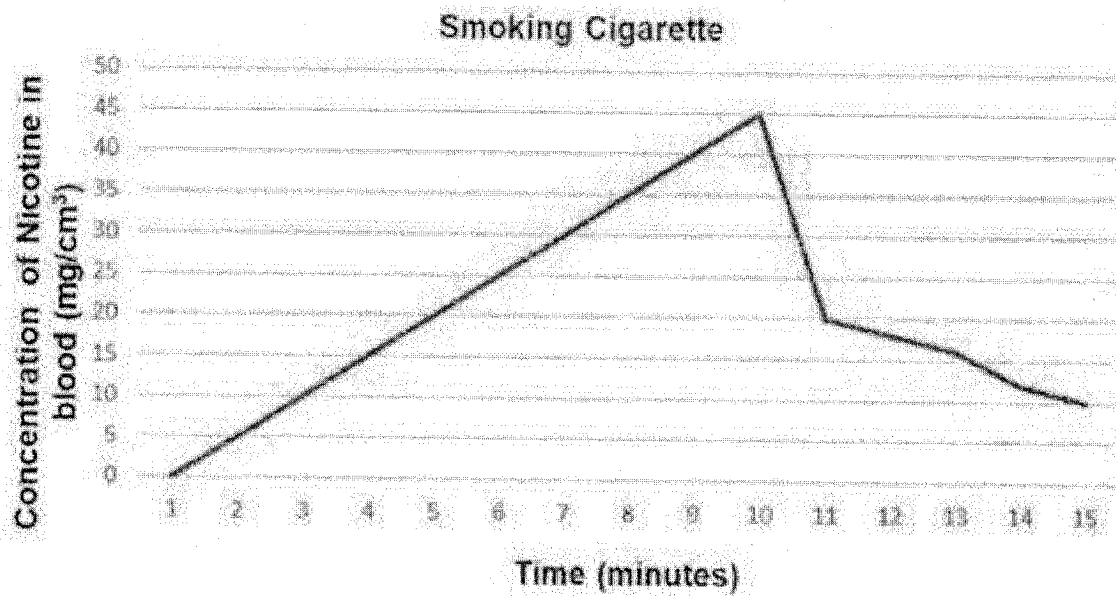
- c) Where do you find antigens in the blood and state what it is made up of.

30. The data below shows the concentration of nicotine smoked by a smoker taking 10 puffs/ minute. 4
- (a) With reference to the above 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?
- (c) How does cigarette smoking result in high blood pressure and increase in heart rate?

OR

- (c) How does cigarette smoking result in lung cancer and emphysema?





**SECTION – E**

31. a) Name the wall layers of anther.  
 b) Absence of which layer will prevent the formation of mature pollen grains?  
 c) Describe the process of microsporogenesis.

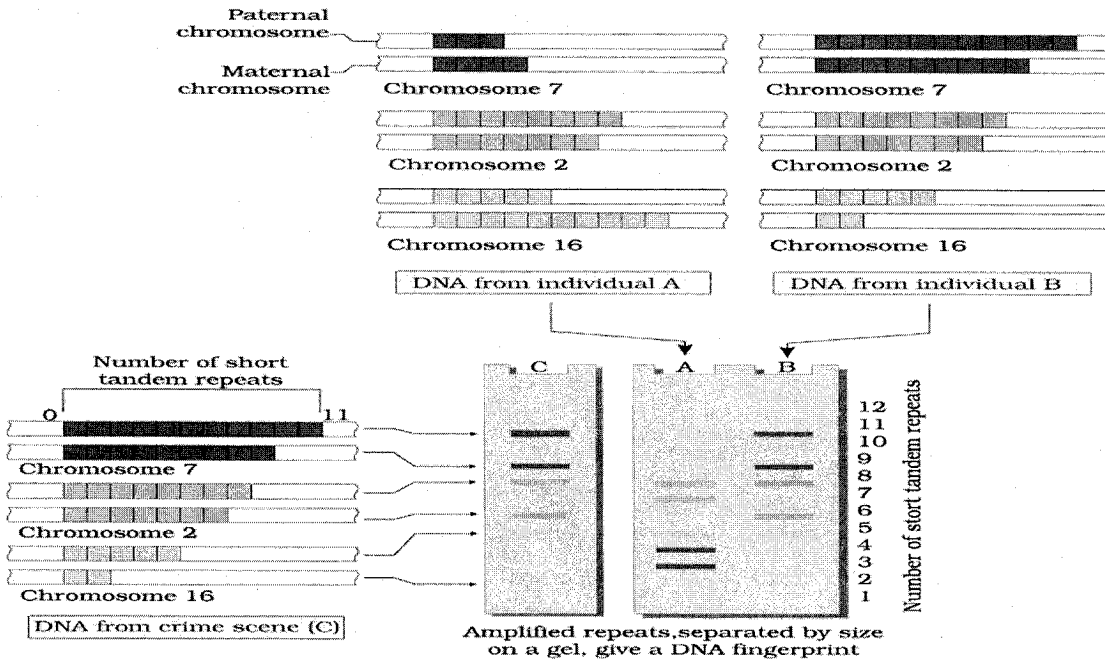
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**OR**

- a) Define parturition.  
 b) Which hormone is involved in induction of parturition?  
 c) Describe the process of parturition.

32.

5



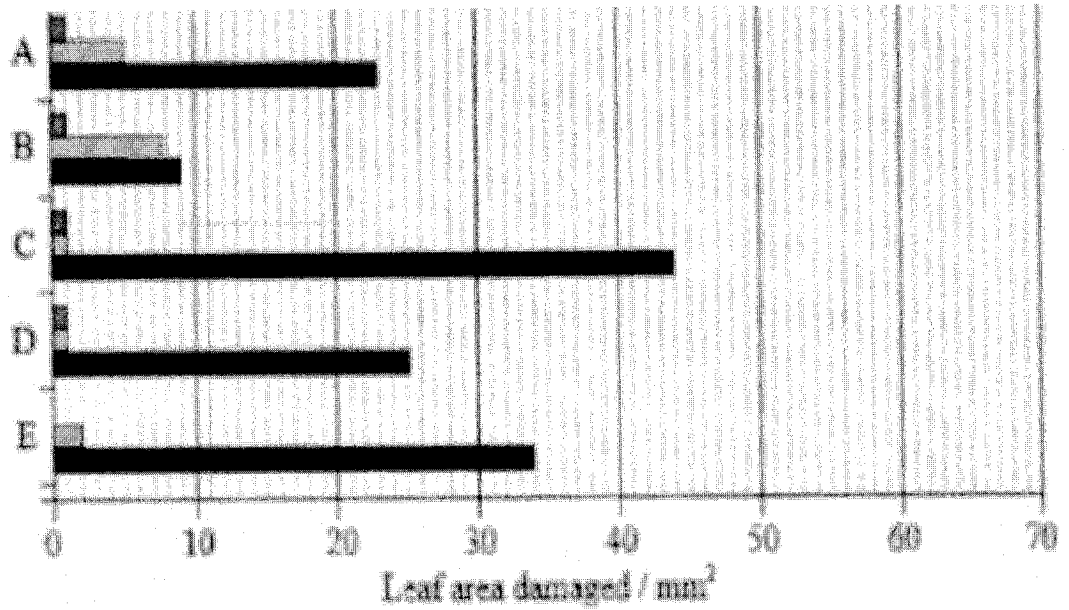
The diagram depicts the process of DNA fingerprinting. Based on the difference in the copy numbers of VNTR we can determine identity of an individual. List the steps involved in DNA fingerprinting.

OR

What are the post transcriptional modifications required for eukaryotic hnRNA before undergoing translation. Explain why they are required and how it happens.

- 33 Insects in the Lepidopteran group lay eggs on maize crops. The larvae on hatching feed on maize leaf and tender cob. In order to arrest the spread of three such Lepidopteran pests, Bt maize crops were introduced in an experimental field. A study was carried out to see which of the three species of lepidopteran pests was most susceptible to Bt genes and its product. The lepidopteran pests were allowed to feed on the same Bt-maize crops grown on 5 fields (A-E). The graph below shows the leaf area damaged by these three pests after feeding on maize leaves for five days. Insect gut pH was recorded as 10, 8 and 6 respectively for Species I, II and III respectively.
- Evaluate the efficacy of the Bt crop on the feeding habits of the three species of stem borer and suggest which species is least susceptible to Bt toxin.
  - Which species is most susceptible to Bt-maize, explain why?
  - Using the given information, suggest why similar effect was not seen in the three insect species?

Types of  
maize



Key for lepidopteran insect pest species

■ Species I

■ Species II

■ Species III

OR

- Explain the process of isolation of DNA from a plant cell.
- Write the vectorless transfer of gene of interest into plant cell and animal cell.
- How can we make use of *Agrobacterium tumefaciens* as a cloning vector in plants?

\*\*\*\*END OF THE QUESTION PAPER\*\*\*\*



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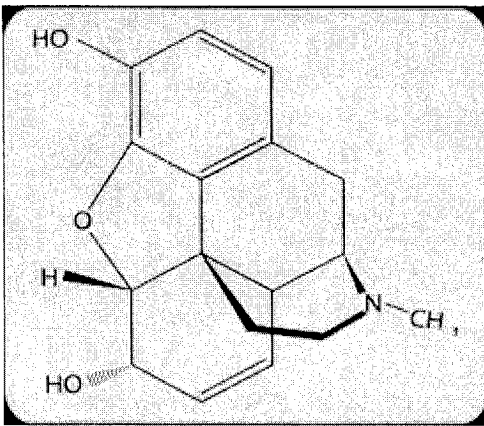
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**SECTION A**

1. In human female, the blastocyst 1
  - a) forms placenta even before implantation
  - b) gets implanted into uterus 3 days after ovulation
  - c) gets nutrition from uterine endometrial secretion after fertilization
  - d) gets implanted in endometrium by the trophoblast cells.
  - e)
2. Select the correct match. 1
  - a) Ribozyme - Nucleic acid
  - b) F2 × Recessive parent- Dihybrid cross
  - c) T.H.Morgan - Transduction
  - d) G. Mendel – Transformation

3. The part of life cycle of malarial parasite *Plasmodium vivax*, that is passed in female Anopheles is 1
- (a) sexual cycle
  - (b) pre-erythrocytic schizogony
  - (c) exoerythrocytic schizogony
  - (d) post-erythrocytic schizogony.

4. Identify the given molecule and choose the correct option giving their source and use. 1



options	Molecule	Source	Use
a)	Coca	<i>Erythroxylum coca</i>	Stimulant
b)	Heroin	<i>Cannabis sativa</i>	Depressant and slows down body
c)	Cannabinoids	<i>Atropa belladona</i>	Create hallucination
d)	Morphine	<i>Papaver somniferum</i>	Sedative and painkiller

5. Silencing of mRNA has been used in producing transgenic plants resistant to 1
- a) boll worms
  - b) nematodes
  - c) white rusts
  - d) bacterial blights

6. Mycorrhiza exhibits the phenomenon of 1
- (a) parasitism
  - (b) symbiosis
  - (c) antagonism
  - (d) endemism.

7. Assisted Reproductive Technology helps couples to have children through certain special techniques. 1  
Find the correct statement regarding ZIFT procedure.
- Ova collected from a female donor are transferred to the fallopian tube to facilitate zygote formation
  - Zygote is collected from a female donor and transferred to the fallopian tube.
  - Zygote is collected from a female donor and transferred to the uterus.
  - Ova collected from a female donor are transferred to the uterus.
8. Identify the correct statement from the following: 1
- Commensalism when none of the interacting populations affect each other.
  - Symbiosis when the interaction is useful to both the interacting species.
  - Amensalism when useful to one species and detrimental to the other species.
  - Parasitism when harmful to both the interacting species.
9. In a growing population of a country, 1
- pre-reproductive individuals are more than the reproductive individuals
  - reproductive individuals are less than the post-reproductive individuals
  - reproductive and pre-reproductive individuals are equal in number
  - pre-reproductive individuals are less than the reproductive individuals.
10. In Hardy-Weinberg equation, the frequency of heterozygous individual is represented by 1
- $p^2$
  - $2pq$
  - $pq$
  - $q^2$

11. Match the following columns and select the correct options. 1

Column I	Column II
A <i>Clostridium butylicum</i>	(i) Cyclosporin A
B <i>Trichoderma polysporum</i>	(ii) Butyric acid
C <i>Monascus purpureus</i>	(iii) Citric acid
D <i>Aspergillus niger</i>	(iv) Cholesterol lowering agent

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

c) A(i) B (ii) C (iv) D (iii)

d) A(iii) B (i) C (ii) D (iv)

12. Which of the following is not an attribute of a population? 1

a) Sex ratio

b) Natality

c) Mortality

d) Species interaction

**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 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. Assertion: The endosperm of angiosperms is generally triploid (3n) 1

Reason: It develops from primary endosperm nucleus formed by fusion of haploid male gamete and diploid secondary nucleus.

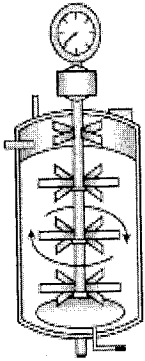
14. Assertion: In four o'clock plant or Snap dragon plant, a cross between homozygous white flowered individual and a homozygous red flowered one, produces pink flowered plants. 1

Reason: In these plants, the flower colour is determined by three alleles.

15. Assertion: Cancer patients are given substances called alpha-interferon. 1

Reason: Tumor cells avoid detection and destruction by immune system.





The given diagram shows simple stirred tank bioreactor. Bioreactors are huge vessels where large volumes of culture can be processed.

Assertion: Stirred-tank bioreactors have a stirrer.

Reason: Stirrer facilitates even mixing and oxygen availability throughout the bioreactor.

### SECTION – B

17. The map distance in certain organisms between gene A and B is 4 units, B and C is 2 units and between C and D is 8 units which one of these gene pairs will show more recombination frequency? Give reasons in support of your answer. 2

18. (a) Name and explain giving reasons, the type of immunity provided to the newborn by the colostrum and vaccinations. 2  
(b) Name the type of antibody present in colostrum.

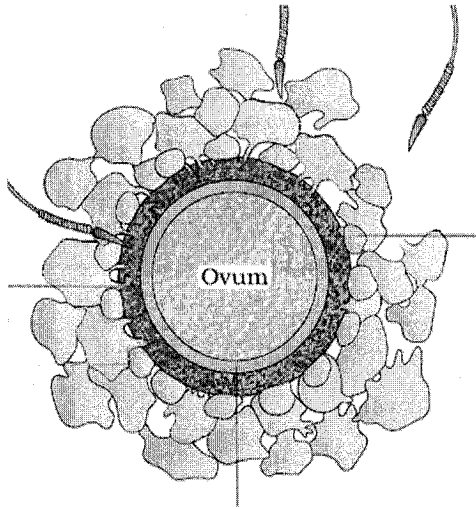
OR

Lactic Acid Bacteria (LAB) is commonly used in the conversion of milk into curd. Mention any two other functions of LAB that are useful to humans.

19. Explain how proinsulin is structurally different from mature insulin? How did Eli Lilly company produce human insulin? 2
20. (i) Give the scientific names of the microbes 2  
a) Baker's yeast  
b) Baculoviruses  
(ii) Which enzymes are used for clarifying bottled juices?

21. Observe the figure and answer the following questions:

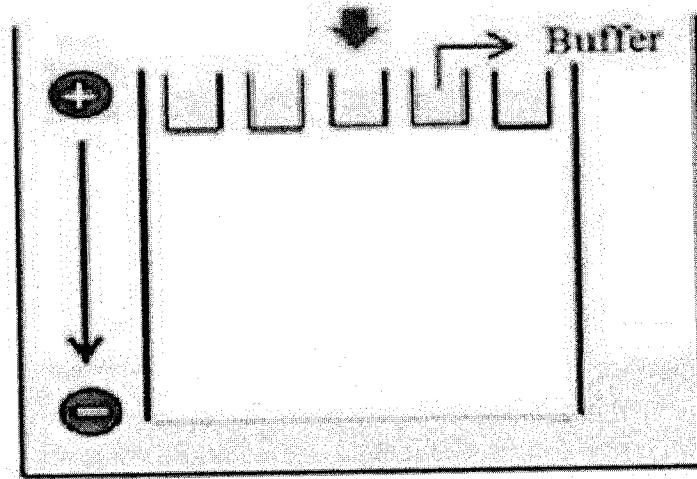
2



- a) Name the layer through which sperm enters an ovum to fertilize it.
- b) Entry of sperm induces the completion of the meiotic division. Which are the daughter cells formed after this process.

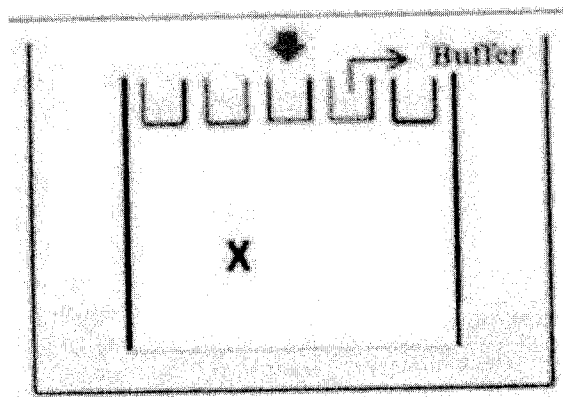
### SECTION – C

22. An ecologist while exploring a forest area was bitten by a poisonous snake. The workers in the farm immediately rushed him to the nearby health centre. The doctor right away gave him an injection to save his life. What did the doctor inject and why? Explain. What do you call the immunity provided in this case? 3
23. Carefully observe the given picture. A mixture of DNA with fragments ranging from 200 base pairs to 2500 base pairs was electrophoresed on agarose gel with the following arrangement. 3



(a) What result will be obtained on staining with ethidium bromide? Explain with reason.

The above set-up was modified and a band with 250 base pairs was obtained at X.

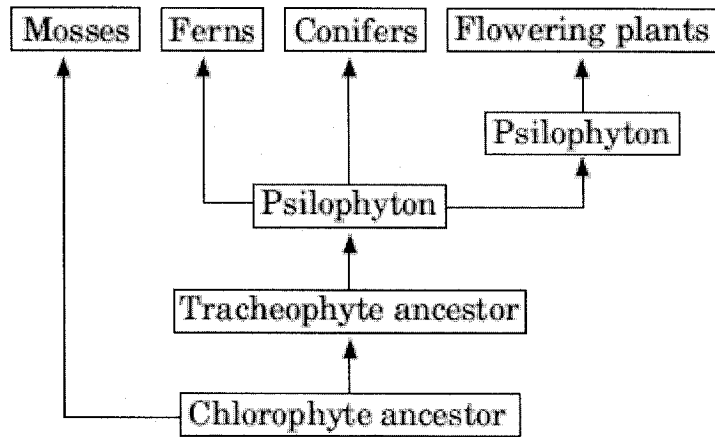


(b) What change(s) were made to the previous design to obtain a band at X? Why did the band appear at the position X?

24. Differentiate between the explanations of evolution given by Darwin and de Vries respectively on the mechanism of evolution. 3

OR

Study the schematic representation of evolutionary history of plant forms given below and mention:



- (a) The plant form Ferns and Conifers are most related to.
- (b) The nearest ancestors of flowering plants.
- (c) The most primitive group of plants.
- (d) Common ancestry of Psilophyton provides to.
- (e) The common ancestor of Psilophyton and seed ferns.
- (f) The common ancestors of mosses and tracheophytes.
25. Mention three strategies evolved to prevent self-pollination in flowers. 3
26. Name the selectable markers in the cloning vector pBR322. 3
- (a) Mention the role they play.
- (b) Why is the coding sequence of an enzyme  $\beta$ -galactosidase a preferred selectable marker in comparison to the ones named above?
27. Spermatogenesis is controlled by hormones. Justify. 3
28. What is EcoR1? What does R represent in this? Explain its action. 3

#### SECTION – D

Q.no 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.

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from the wrong ABO group can be life-threatening. To work out your blood group, your red cells are mixed with different antibody solutions.

- a) How many alleles are involved in blood grouping? This is an example of \_\_\_\_\_.
- b) A person having AB blood group has both dominant alleles. What is the inheritance type called?
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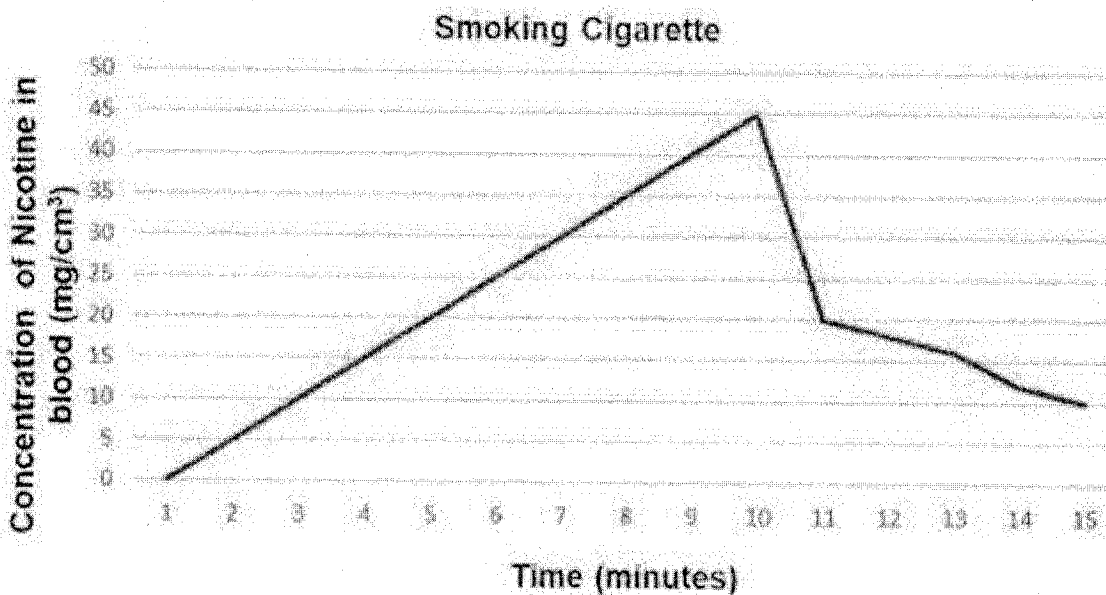
- c) Where do you find antigens in the blood and state what it is made up of.

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

- (a) With reference to the above graph explain the concentration of nicotine in blood at 10 minutes.
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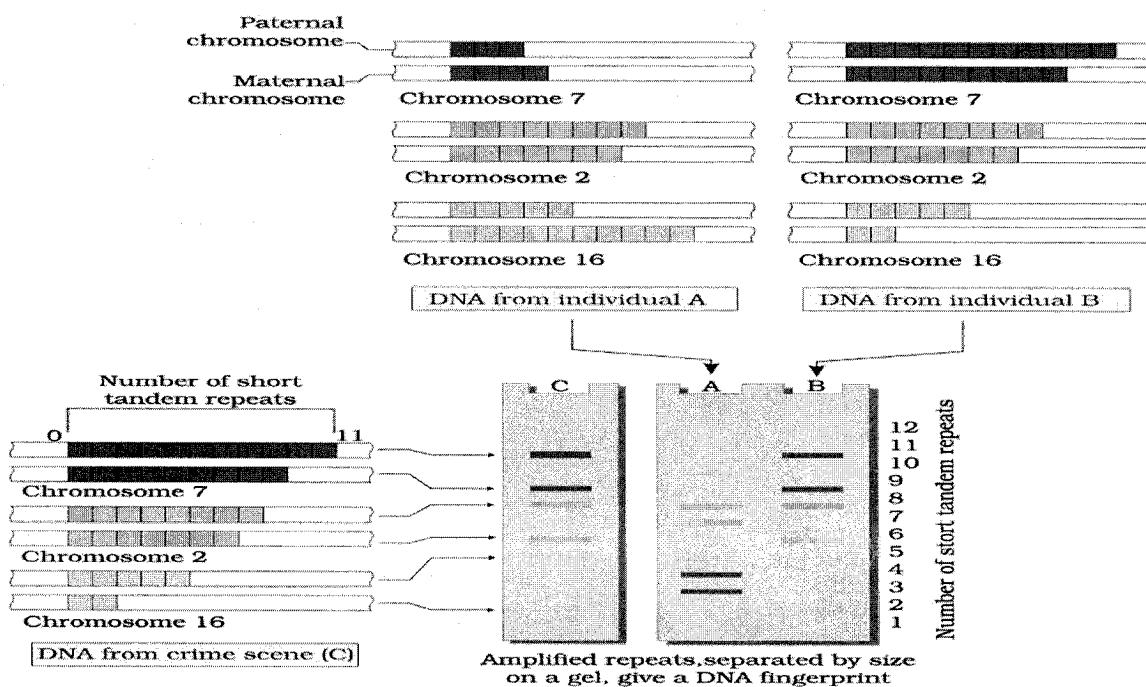
- (c) How does cigarette smoking result in lung cancer and emphysema?



SECTION – E

31.

5



The diagram depicts the process of DNA fingerprinting. Based on the difference in the copy numbers of VNTR we can determine identity. List the steps involved in DNA fingerprinting.

OR

What are the post transcriptional modifications required for eukaryotic hnRNA before undergoing translation. Explain why they are required and how it happen.

32. a) Name the wall layers of anther. 5  
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- a) Define parturition.  
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- 33 Insects in the Lepidopteran group lay eggs on maize crops. The larvae on hatching feed on maize leaf and tender cob. In order to arrest the spread of three such Lepidopteran pests, Bt maize crops were introduced in an experimental field. A study was carried out to see which of the three species of 5

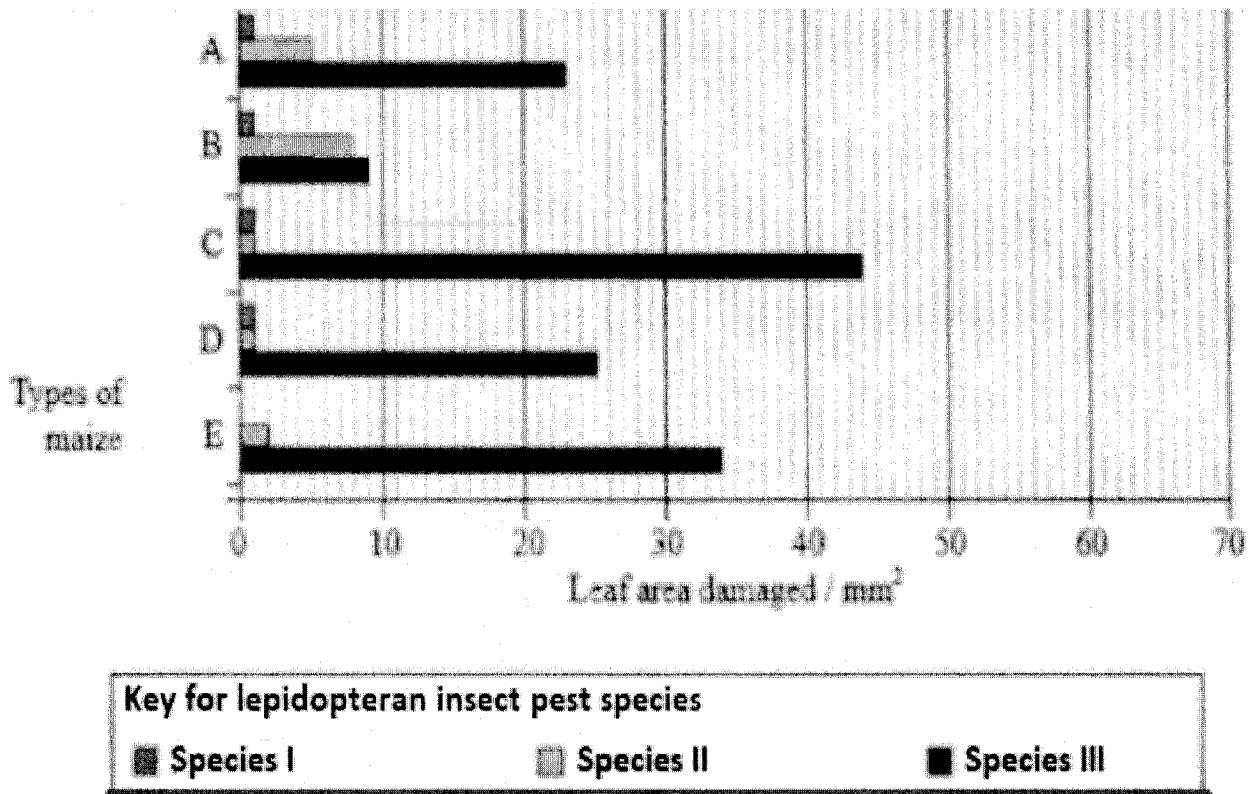
allowed to feed on the same Bt-maize crops grown on 5 fields (A-E). The graph below shows the leaf area damaged by these three pests after feeding on maize leaves for five days.

Insect gut pH was recorded as 10, 8 and 6 respectively for Species I, II and III respectively.

(a) Evaluate the efficacy of the Bt crop on the feeding habits of the three species of stem borer and suggest which species is least susceptible to Bt toxin.

(b) Which species is most susceptible to Bt-maize, explain why?

(c) Using the given information, suggest why similar effect was not seen in the three insect species?



OR

- Explain the process of isolation of DNA from a plant cell.
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- (i) All questions are compulsory.
- (ii) The question paper has five sections and 33 questions. All questions are compulsory.
- (iii) Section-A has 16 questions of 1 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; and Section-E has 3 questions of 5 marks each.
- (iv) There is no overall choice. 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**

- 1. Which of the following is not an attribute of a population? 1
  - (a) Sex ratio
  - (b) Natality
  - (c) Mortality
  - (d) Species interaction
  
- 2. Which of the following immune responses is responsible for rejection of kidneygraft? 1
  - (a) Cell-mediated immune response
  - (b) Auto-immune response
  - (c) Humoral immune response
  - (d) Inflammatory immune response

(R)

3. The technique that helps in identifying genetic disorders 1
- (a) Amniocentesis
  - (b) X ray
  - (c) GIFT
  - (d) ZIFT

4. Select the incorrect statement. 1
- (a) Human males have one of their sex-chromosomes much shorter than the other.
  - (b) Male fruit fly is heterogametic.
  - (c) In male grasshoppers, 50% of sperms have no sex-chromosome.
  - (d) In domesticated fowls, sex of progeny depends on the type of sperm rather than egg.

5. Match the following columns and select the correct options. 1

Column I	Column II
A <i>Clostridium butylicum</i>	(i) Cyclosporin A
B <i>Trichoderma polysporum</i>	(ii) Butyric acid
C <i>Monascus purpureus</i>	(iii) Citric acid
D <i>Aspergillus niger</i>	(iv) Cholesterol lowering agent

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

6. In RNAi, the genes are silenced using 1
- (a) ds-RNA
  - (b) ss-DNA
  - (c) ss-RNA
  - (d) ds-DNA.

7. In Hardy-Weinberg equation, the frequency of heterozygous individual is represented by 1
- (a)  $p^2$
  - (b)  $2pq$
  - (c)  $pq$
  - (d)  $q^2$

8. In a growing population of a country, 1
- (a) pre-reproductive individuals are more than the reproductive individuals
  - (b) reproductive individuals are less than the post-reproductive individuals
  - (c) reproductive and pre-reproductive individuals are equal in number
  - (d) pre-reproductive individuals are less than the reproductive individuals.
9. Identify the correct statement from the following: 1
- (a) Commensalism when none of the interacting populations affect each other.
  - (b) Symbiosis when the interaction is useful to both the interacting species.
  - (c) Ammensalism when useful to one species and detrimental to the other species.
  - (d) Parasitism when harmful to both the interacting species.
10. Herbivores eating grass is an example of: 1
- a) Commensalism
  - b) Parasitism
  - c) Predation
  - d) Mutualism
11. Cirrhosis of liver is caused by the chronic intake of 1
- (a) opium
  - (b) alcohol
  - (c) tobacco (chewing)
  - (d) cocaine
12. Assisted Reproductive Technology helps couples to have children through certain special techniques. 1  
Find the correct statement regarding ZIFT procedure.
- a) Ova collected from a female donor are transferred to the fallopian tube to facilitate zygote formation
  - b) Zygote is collected from a female donor and transferred to the fallopian tube.
  - c) Zygote is collected from a female donor and transferred to the uterus.
  - d) Ova collected from a female donor are transferred to the uterus.

**Question No. 13 to 16 consist of two** statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

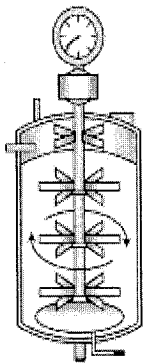
- A. Both A and R are true and R is the correct explanation of A.
- B. Both A and R are true and R is not the correct explanation of A.
- C. A is true but R is false.
- D. A is False but R is true.

13. Assertion: In angiosperms, the ovule develops into a seed after fertilization. 1  
Reason: Fertilization is not essential for the development of fruit.

14. Assertion: There is expression of only one gene of the parental character in a Mendelian Monohybrid cross in F1 generation. 1  
Reason: In a dissimilar pair of factors one member of the pair dominates the other.

15. Assertion: Cancer patients are given substances called alpha-interferon. 1  
Reason: Tumor cells avoid detection and destruction by immune system.

16. 1



The given diagram shows simple stirred tank bioreactor. Bioreactors are huge vessels where large volumes of culture can be processed.

Assertion: Stirred-tank bioreactors have a stirrer.

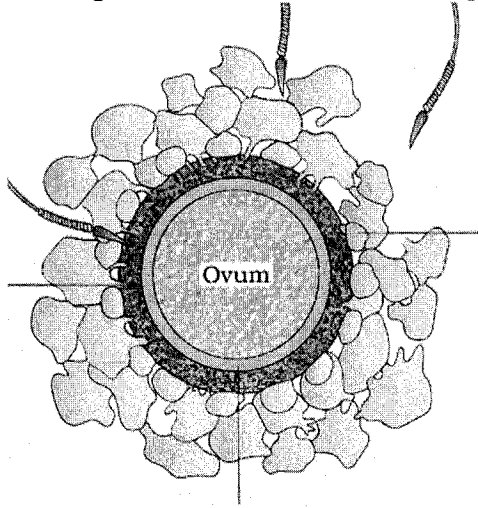
Reason: Stirrer facilitates even mixing and oxygen availability throughout the bioreactor.

### SECTION – B

17. What are primary lymphoid organs? Give two examples. 2

18. Observe the figure and answer the following questions:

2



- a) Name the layer through which sperm enters an ovum to fertilize it.
- b) Entry of sperm induces the completion of the meiotic division. Which are the daughter cells formed after this process.
19. List the events that lead to biogas production from waste water whose BOD has been reduced significantly. 2
20. Explain how proinsulin is structurally different from mature insulin? How did Eli Lilly company produce human insulin? 2
21. A cross was carried out between two pea plants showing the contrasting traits of height of that plant. The result of the cross showed 50% of parental characters. 2
- (i) Work out the cross with the help of a Punnett square
- (ii) Name the type of the cross carried out.

OR

Mention the role of the codons AUG and UGA during protein synthesis.

### SECTION – C

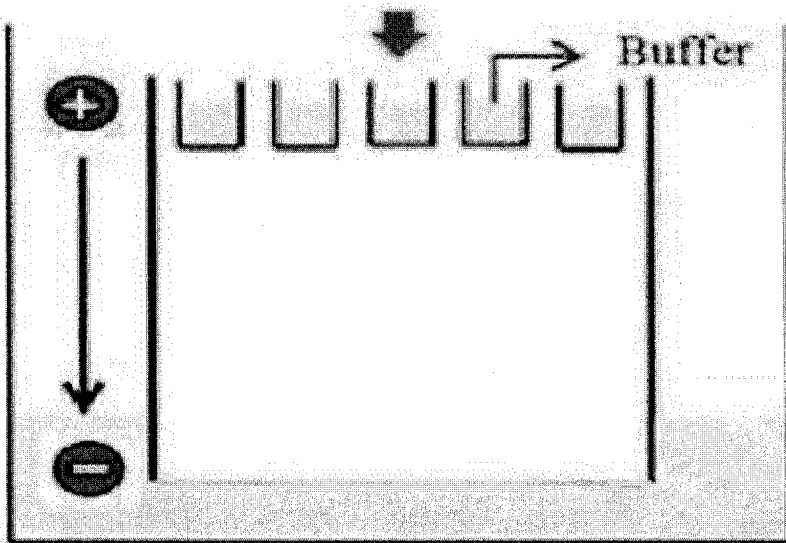
22. Spermatogenesis is controlled by hormones. Justify. 3
23. Name the selectable markers in the cloning vector pBR322. 3
- (a) Mention the role they play.
- (b) Why is the coding sequence of an enzyme  $\beta$ -galactosidase a preferred selectable marker in comparison to the ones named above?

24. Mention three strategies evolved to prevent self-pollination in flowers. 3
25. Explain the process of making the bacterial cell competent to take up the plasmid. Name one vectorless method adopted in gene transfer in animals. 3
26. a) Differentiate between homologous and analogous structures. 3  
 b) Select and write the analogous structures from the list given below:  
 (i) Wings of butterfly and birds  
 (ii) Vertebrate hearts  
 (iii) Tendrils of Bougainvillea and Cucurbita  
 (iv) Tubers of sweet potato and potato

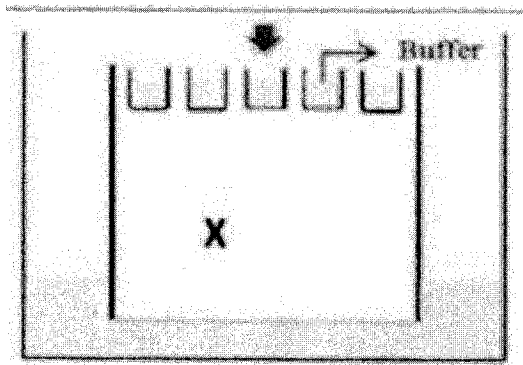
OR

How does industrial melanism support Darwin's theory of Natural Selection? Explain.

27. Carefully observe the given picture. A mixture of DNA with fragments ranging from 200 base pairs to 2500 base pairs was electrophoresed on agarose gel with the following arrangement. 3



- (a) What result will be obtained on staining with ethidium bromide? Explain with reason.  
 (b) The above set-up was modified and a band with 250 base pairs was obtained at X.



What change(s) were made to the previous design to obtain a band at X? Why did the band appear at the position X?

28. (a) Metastasis is the most dreaded property of cancer. What is meant by metastasis? 3  
 (b) Write two techniques used to diagnose cancer.  
 (c) List any two treatment procedures involved in curing the disease.

#### SECTION – D

Q.no 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.

29. There are 4 main blood groups (types of blood) – A, B, AB and O. Your blood group is determined 4  
 by the genes you inherit from your parents. Each group can be either RhD positive or RhD negative  
 Blood is made up of red blood cells, white blood cells and platelets in a liquid called plasma. Your  
 blood group is identified by antibodies and antigens in the blood. Antibodies are proteins found in  
 plasma. They're part of your body's natural defences. They recognise foreign substances, such as  
 germs, and alert your immune system, which destroys them. Antigens are protein molecules found on  
 the surface of red blood cells. Blood group O is the most common blood group. Receiving blood  
 from the wrong ABO group can be life-threatening. To work out your blood group, your red cells are  
 mixed with different antibody solutions.
- a) How many alleles are involved in blood grouping? This is an example of \_\_\_\_\_.
- b) A person having AB blood group has both dominant alleles. What is the inheritance type called?
- c) A man with 'A' blood marries a woman with 'B' blood. Can they have a child with 'O' blood group? How?

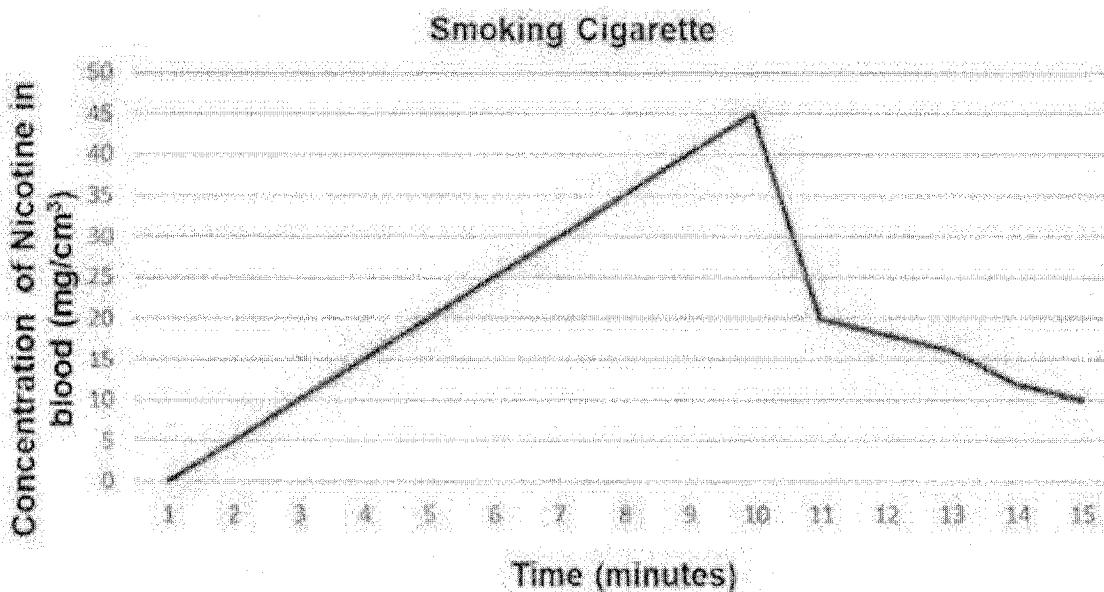
OR

- c) Where do you find antigens in the blood and state what it is made up of.

30. The data below shows the concentration of nicotine smoked by a smoker taking 10 puffs/ minute. 4
- With reference to the above graph explain the concentration of nicotine in blood at 10 minutes.
  - How will this affect the concentration of carbon monoxide and haembound oxygen at 10 minutes?
  - How does cigarette smoking result in high blood pressure and increase in heart rate?

OR

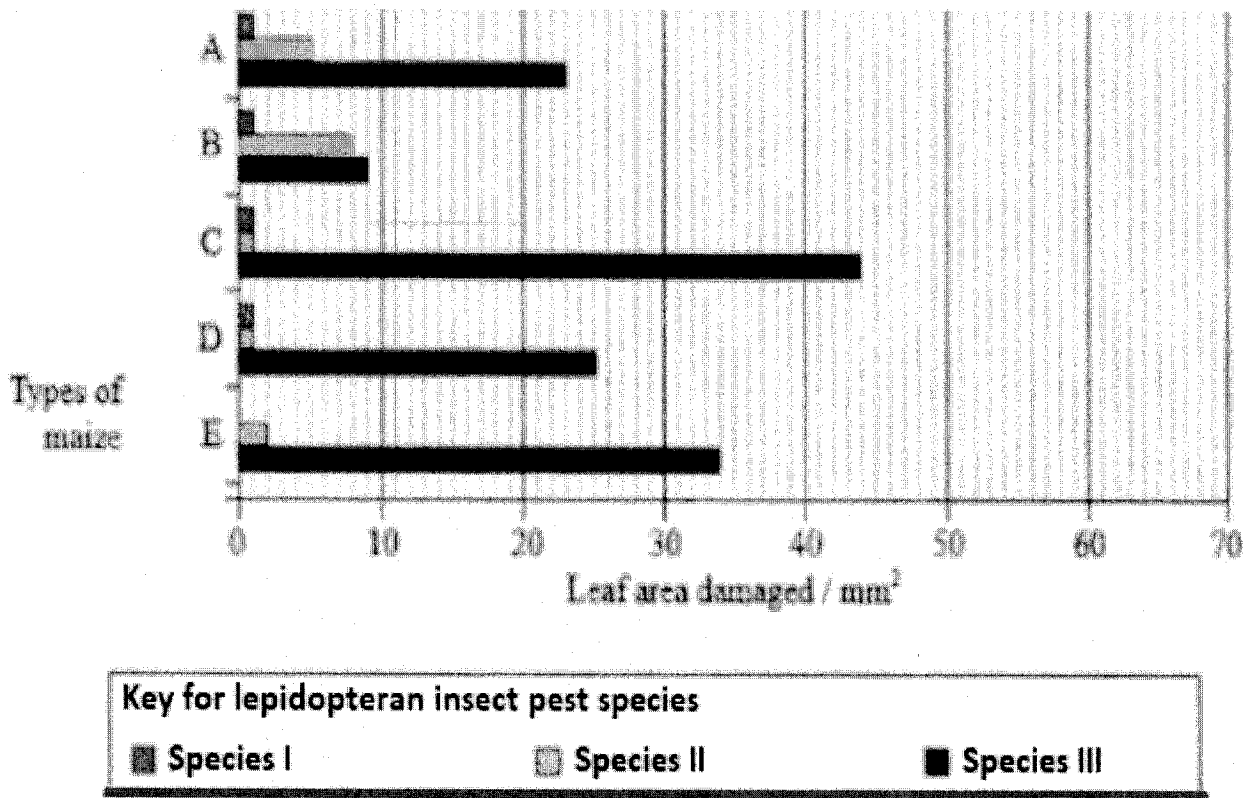
- How does cigarette smoking result in lung cancer and emphysema?



**SECTION – E**

- 31 Insects in the Lepidopteran group lay eggs on maize crops. The larvae on hatching feed on maize leaf and tender cob. In order to arrest the spread of three such Lepidopteran pests, Bt maize crops were introduced in an experimental field. A study was carried out to see which of the three species of lepidopteran pests was most susceptible to Bt genes and its product. The lepidopteran pests were allowed to feed on the same Bt-maize crops grown on 5 fields (A-E). The graph below shows the leaf area damaged by these three pests after feeding on maize leaves for five days. Insect gut pH was recorded as 10, 8 and 6 respectively for Species I, II and III respectively.
- Evaluate the efficacy of the Bt crop on the feeding habits of the three species of stem borer and suggest which species is least susceptible to Bt toxin.
  - Which species is most susceptible to Bt-maize, explain why?
  - Using the given information, suggest why similar effect was not seen in the three insect species?





OR

- Explain the process of isolation of DNA from a plant cell.
- Write the vectorless transfer of gene of interest into plant cell and animal cell.
- How can we make use of *Agrobacterium tumifaciens* as a cloning vector in plants?

32.
  - Name the wall layers of anther.
  - Absence of which layer will prevent the formation of mature pollen grains?
  - Describe the process of microsporogenesis.

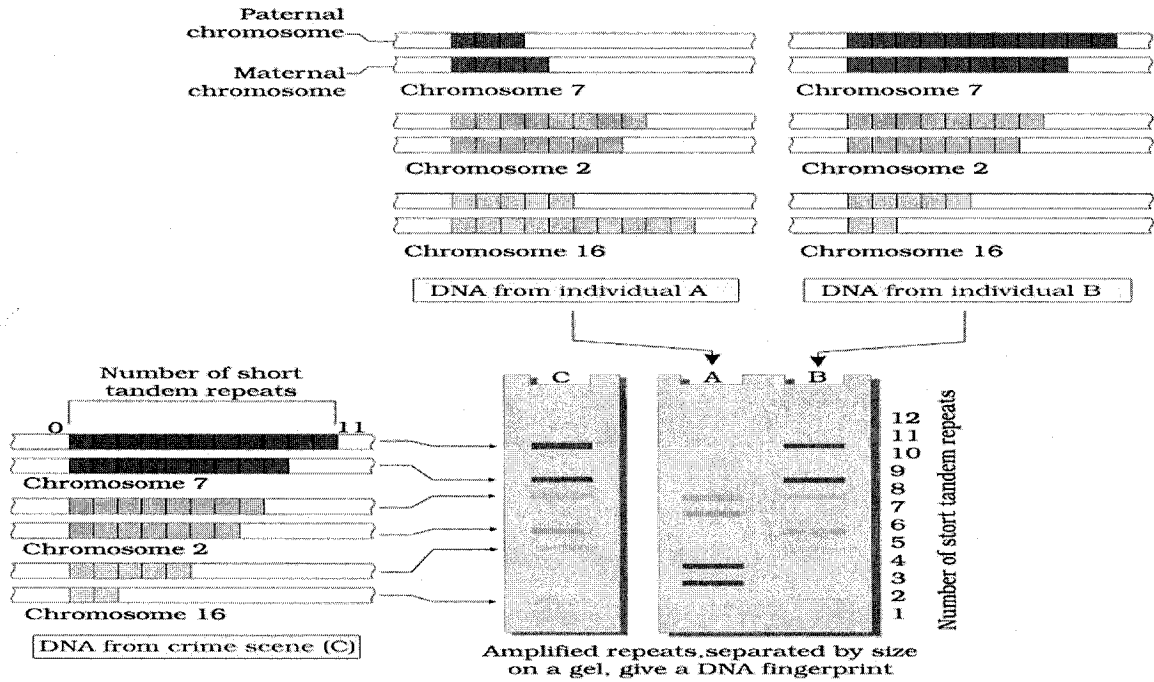
5

OR

- Define parturition.
- Which hormone is involved in induction of parturition?
- Describe the process of parturition.

33.

5



The diagram depicts the process of DNA fingerprinting. Based on the difference in the copy numbers of VNTR we can determine identity. List the steps involved in DNA fingerprinting.

OR

What are the post transcriptional modifications required for eukaryotic hnRNA before undergoing translation. Explain why they are required and how it happen.

\*\*\*\*END OF THE QUESTION PAPER\*\*\*\*