

ROLL NUMBER				
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SET	1
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QP.Code:044/01/1



**INDIAN SCHOOL MUSCAT  
FIRST PRE-BOARD EXAMINATION 2023  
BIOLOGY(044)**



CLASS : XII  
DATE: 10/01/2023

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. The outer layer of pollen grain is called (A). This is made up of (B) which is absent on the (C).  
The correct option is 1

option	A	B	C
A	intine	cellulose	micropyle
B	exine	sporopollenin	germpores
C	intine	sporopollenin	germpores
D	exine	cellulose	micropyle

2. Which of the following statements regarding IUDs is correct? 1
  - A. It suppresses the process of gametogenesis.
  - B. They once inserted need not be replaced.

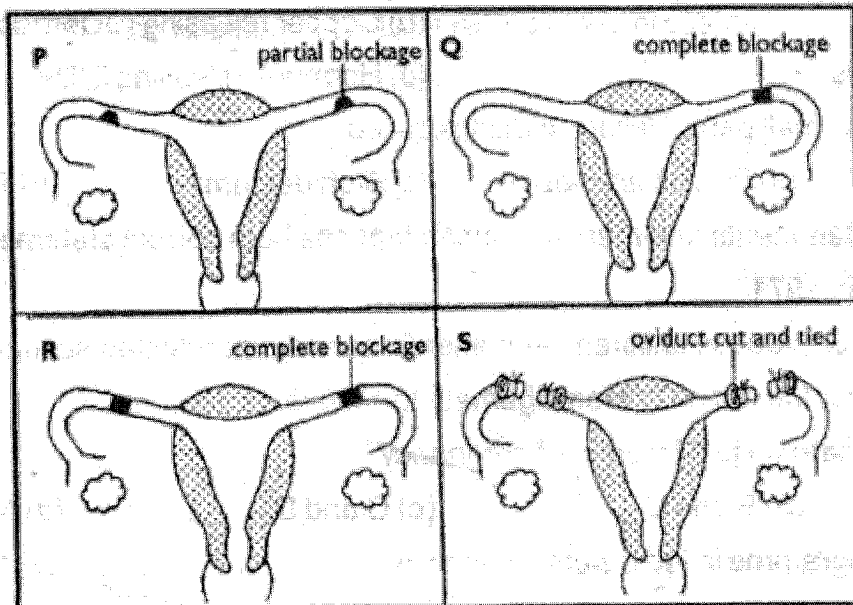
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C. They are generally inserted by the user itself.

D. It increases phagocytosis of sperms within the uterus.

3. The given diagram shows the uterine tubes of four women P, Q, R and S.

1



In which two women is fertilization impossible at present?

- A. P and Q  
B. Q and R  
C. R and S  
D. S and P
4. AB blood group is the classical example for codominance. Which of the following is best suited for codominance? 1
- A. Both are recessive  
B. One is recessive  
C. One is dominant  
D. Both are dominant
5. The human chromosome with the highest and least number of genes in them are respectively: 1
- A. Chromosome 21 and Y  
B. Chromosome 1 and X  
C. Chromosome 1 and Y  
D. Chromosome X and Y
6. Which of the following statement is correct? 1
- A. Injecting microbes during immunization induces passive immunity.  
B. Cell-mediated immune response is responsible for graft rejection.  
C. Colostrum during initial days of lactation provides active immunity to infant.  
D. None of the above

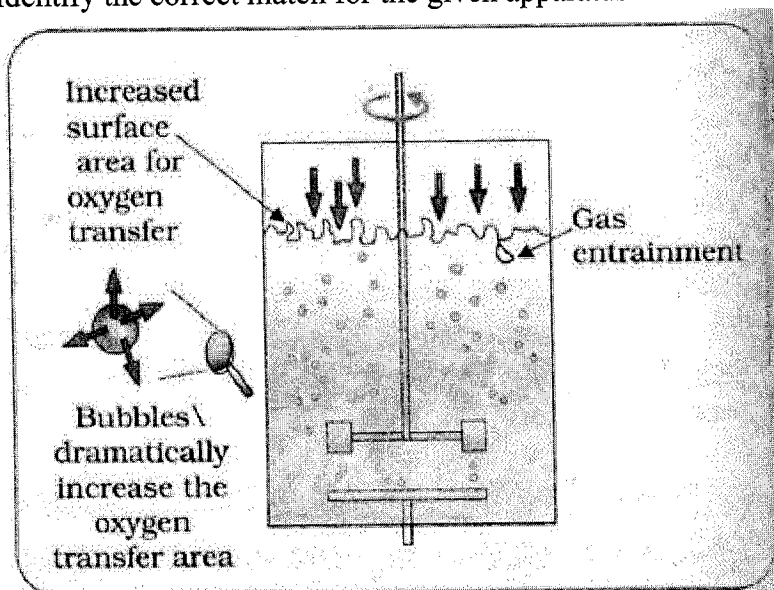
7. The free-living fungus *Trichoderma* can be used for:

1

- A. Killing insects
- B. Biological control of plant diseases
- C. Controlling butterfly caterpillars
- D. Producing antibiotics

8. Identify the correct match for the given apparatus

1



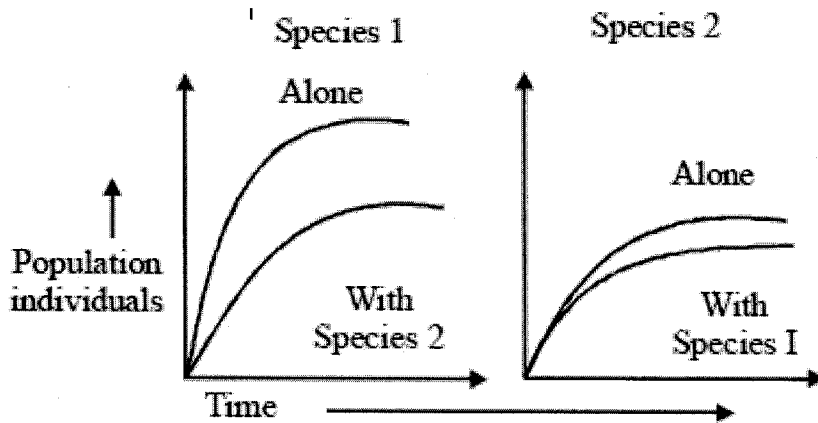
OPTIONS	Apparatus	Function
A.	Gene gun	Vectorless direct gene transfer
B.	Column chromatography	Separation of chlorophyll pigments
C.	Sparged stirred tank	Carry out fermentation bioreactor process
D.	Respirometer	Finding out rate of respiration

9. Which of the following would necessarily decrease the density of a population in a given habitat?

1

- A. Natality > mortality
- B. Immigration > emigration
- C. Mortality and emigration
- D. Natality and immigration

10. In laboratory experiments, two species of the protist *Paramecium* were grown alone and in the presence of the other species. The following graphs show growth of species 1 (left) and species 2 (right), both alone and when in mixed culture.



Interpretation of these graphs shows that

- A. competitive exclusion occurred in these experiments.
  - B. both species are affected by interspecific competition but species 1 is less affected.
  - C. both species are affected by interspecific competition but species 2 is less affected.
  - D. both species are affected equally by interspecific competition.
11. Which of the following cause of biodiversity loss is not included in evil quartet ?
- A. Coextinction
  - B. Pollution
  - C. Alien species invasion
  - D. Habitat loss and fragmentation
12. Energy flow in an ecosystem is
- A. unidirectional
  - B. bidirectional
  - C. multidirectional
  - D. all of these

**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 <sup>but</sup> 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: Drugs like Barbiturates and Benzodiazepines normally used as medicine to help the patients to cope up with mental illness.
- Reason: When these substances are taken for a purpose other than medical use, constitute the drug abuse.

14. Assertion: Genetically modified microbes help in crop protection. 1  
Reason: Transgenic bacteria control insects by producing endotoxins.
15. Assertion: Clown fish maintains a commensalistic relation with the sea anemone 1  
Reason: In this interaction, one species benefits and the other is neither benefitted nor harmed.
16. Assertion: Homologous organ represent divergent evolution. 1  
Reason: Homology indicate common ancestry.

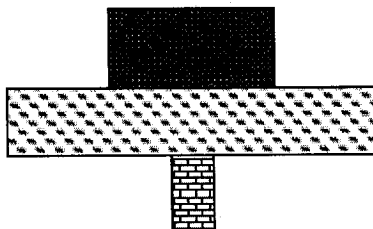
### SECTION – B

17. Where are fimbriae present in human female reproductive system? Give their function. 2

**OR**

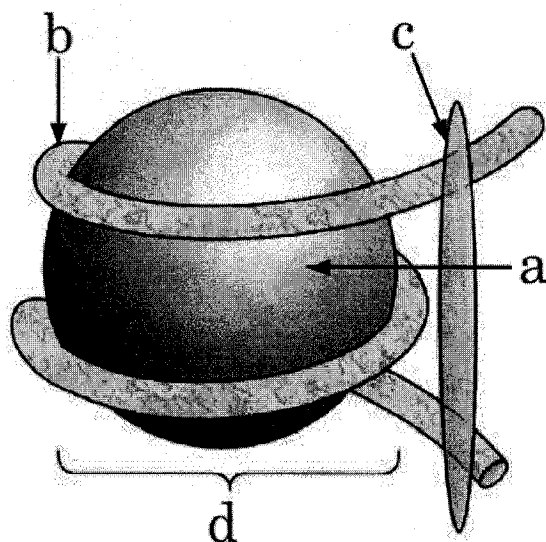
Male reproductive system will have different types of cells with different functions. Where are leydig cells present? What is their role in reproduction?

18. Write the types of sex-determination mechanisms the following crosses show. Give an example of each type. 2  
(a) Female XX with male XO  
(b) Female ZW with male ZZ.
19. Write the scientific names of causal organism of elephantiasis and ring worm in humans. Mention the body parts affected by them. 2
20. (a) Name the deficiency for which first clinical gene therapy was given. 2  
(b) Mention the cause of and one cure for this deficiency.
21. Identify the type of given ecological pyramid and give one example each of pyramid of number and pyramid of biomass in such cases. 2



### SECTION – C

22. (a) What do 'Y' and 'B' stand for in 'YAC' and 'BAC' used in Human Genome Project (HGP). 3  
Mention their role in the project.
- (b) Write the percentage of the total human genome that codes for proteins and the percentage of discovered genes whose functions are known as observed during HGP.
- (c) Expand 'SNPs' identified by scientists in HGP.
23. Name the two end products of double fertilization in angiosperms. How are they formed? Write their 3  
fate during the development of seed.
24. (i) What is the given diagram representing? 3  
(ii) Name the parts a, b, c and d.  
(iii) In the eukaryotes the DNA molecules are organized within the nucleus. How is the DNA molecule organized in a bacterial cell in absence of a nucleus?



25. a) Rearrange the following in an ascending order of evolutionary tree: 3  
reptiles, salamander, lobefins, frogs.
- b) Name two reproductive characters that probably make reptiles more successful than amphibians.

26. A person suffering from AIDS dies of opportunistic infections (ARC) i.e., infections that could have been otherwise overcome. 3

- (i) State one reason as to why an 'HIV' patient dies of 'opportunistic infections'.
- (ii) Give the scientific name of one bacterium and one parasite which mainly attack a person.
- (iii) Write the full form of the name of the widely used diagnostic test for AIDS.

**OR**

A patient complains of suffering from constipation, stomach ache, stool with blood clots and excess mucous. The physician diagnosed it as amoebiasis, after stool test.

- (a) Write the scientific name of the microbe identified in the stool sample.
- (b) How do you think, the patient must have contracted it?
- (c) Write your suggestions to the patient to avoid infection in future.

27. Name two naturally occurring sources, one that transfers pathogenic genes into a plant cells and the other into an animal cell respectively, for their benefit. Write how have these naturally occurring sources been used for the benefit of human race by the biotechnologists. 3

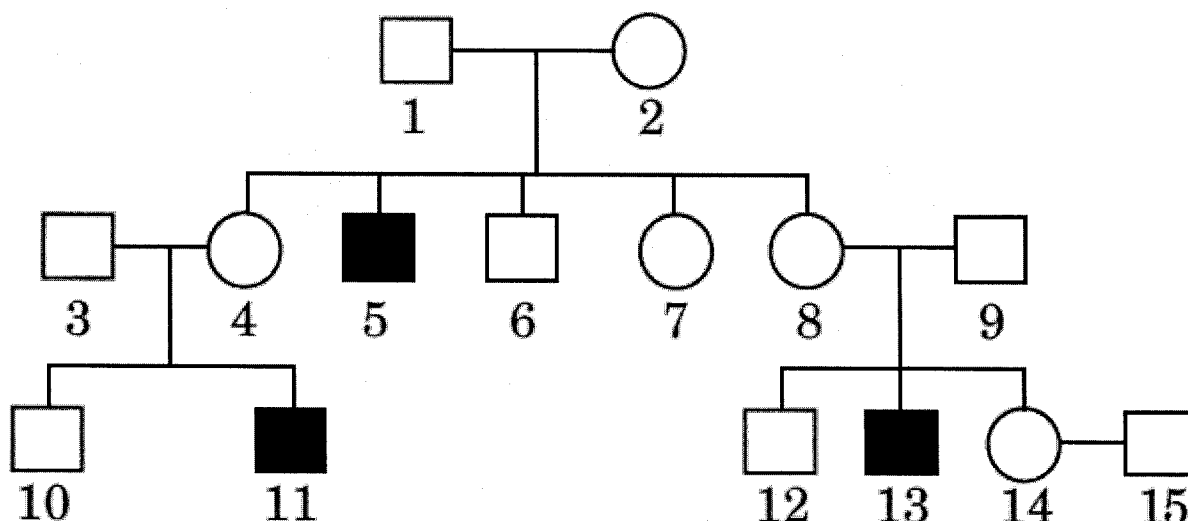
28. Bio-diversification of life started to occur almost 3 billion years ago. Since then new species have been evolving and then disappearing in masse from Earth. 3

- (a) How many episodes of mass extinctions of species have already taken place and which one is in progress in the current era?
- (b) How is current episode in progress different from the previous episodes and why? Explain.

### **SECTION – D**

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

29. Haemophilia is a genetic disorder of humans. The pedigree chart given below shows the inheritance of Haemophilia in one family. Study the pattern of inheritance and answer the questions given. 4



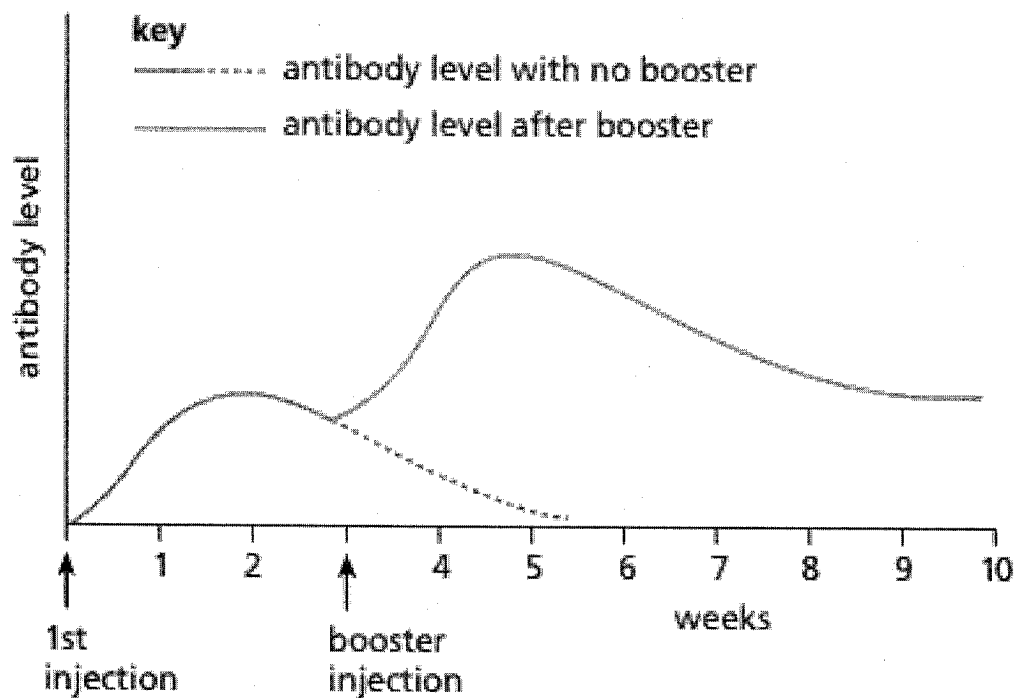
- What is the most likely mode of inheritance for this pedigree?
- Give all the possible genotypes of the members 4, 5 and 6 in the pedigree chart.
- 'A blood test shows that the individual 14 is a carrier of Haemophilia. The member numbered 15 has recently married the member numbered 14. What is the probability that their first child will be a haemophiliac male? How will you characterize this disorder?

**OR**

- Why is Haemophilia generally observed in human males? Explain the conditions under which a human female can be haemophiliac.

30. When bacteria get through the mechanical and chemical barriers, the body has two more lines of defence – white blood cells and antibodies, produced by white blood cells. One type of white blood cells fights infection by engulfing bacteria (a process called phagocytosis) and digesting them. The body's defences can be enhanced by vaccination. The presence of the pathogen triggers white blood cells to make specific antibodies to combat possible infection. If the person is exposed to the disease later, defences are already in place to prevent it developing (the person is immune to that disease). The figure shows the changes in the levels of antibody in response to an inoculation of a vaccine, followed by a booster injection 3 weeks later.





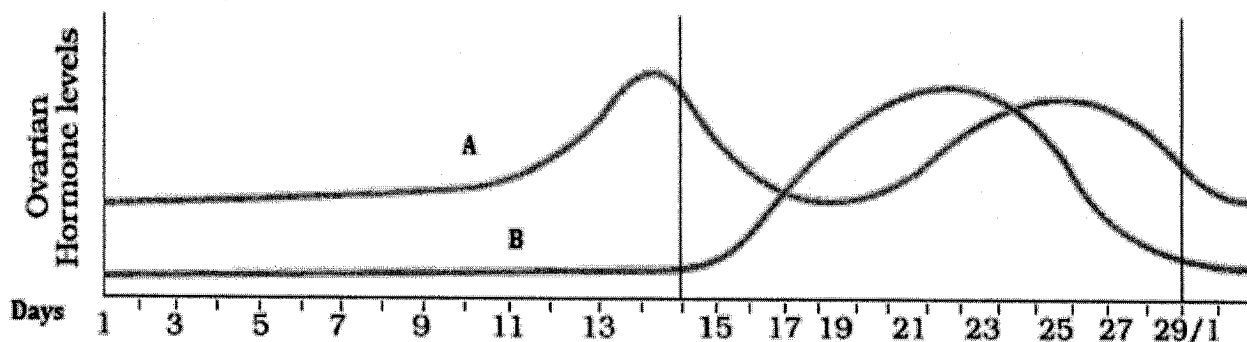
- What is vaccination?
- Name any two diseases against which vaccination is done.
- Where do you find antibodies in the blood? How does antibodies level increase after vaccination in the body?

**OR**

- What is the importance of booster injection? Name one disease against which booster injection is suggested.

### SECTION – E

- The graph given below shows the variation in the levels of ovarian hormones during various phases of menstrual cycle: 5



- Identify 'A' and 'B'.
- Specify the source of the hormone marked in the diagram.

(c) Reason out why A peaks before B.

(d) Compare the role of A and B.

(e) Under which condition will the level of B continue to remain high on the 28<sup>th</sup> day?

OR

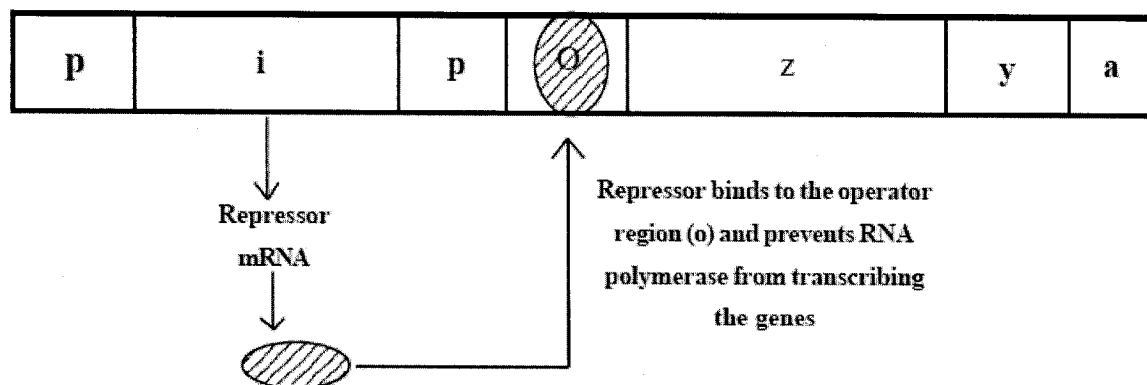
(a) Draw the embryo sac of a flowering plant and label (i) central cell (ii) Chalazal end of the embryo sac (iii) synergids.

(b) Name the cell that develops into the embryo sac and explain how this cell leads to the formation of Embryo sac . Also mention the role played by the various cells of the embryo sac.

32. (a) Describe the experiment conducted by Alfred Hershey and Martha Chase for identification of 5 genetic material.

(b) Why is it considered path breaking in the field of Molecular Biology?

OR



Look at the figure above depicting lac operon of *E.coli*

(a) What could be the series of events when an inducer is present in the medium in which *E.coli* is growing?

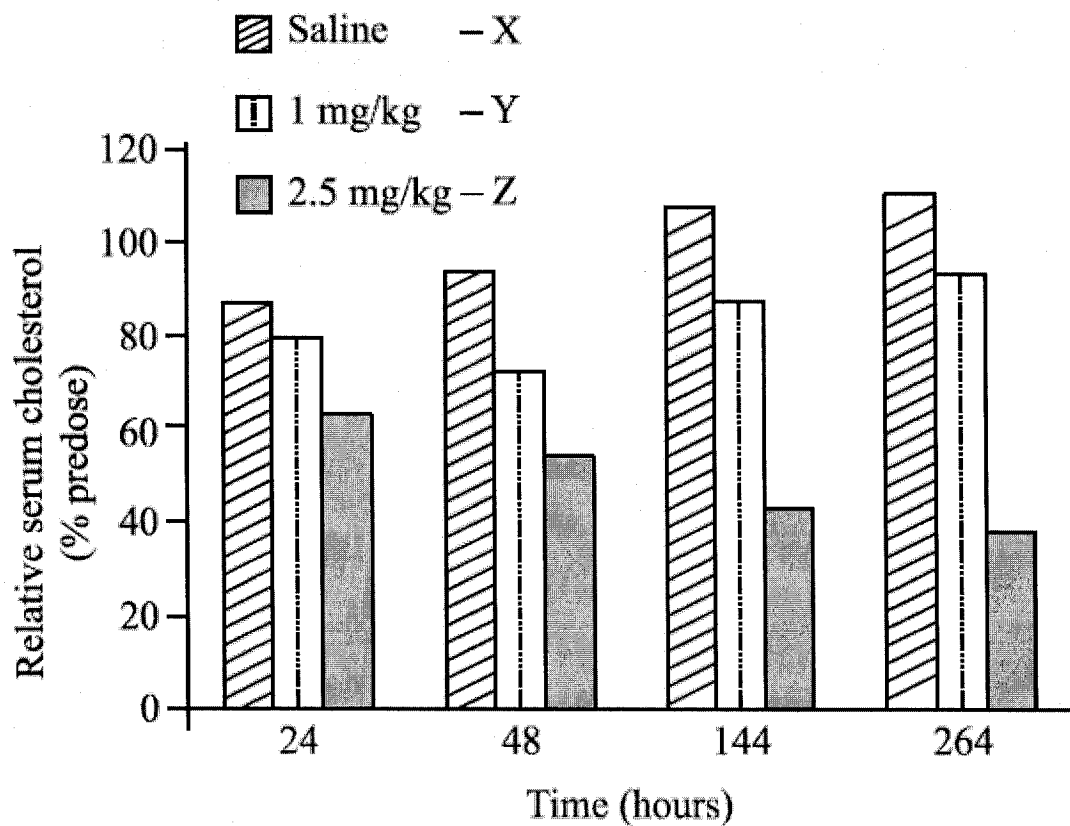
(b) Name the Inducer.

33. RNA interference (RNAi) holds great potential as a therapeutic agent for the treatment of human 5 diseases and as biocontrol agents in controlling pests in the field of agriculture. An experiment was carried to study the use of 'RNAi' for the potential treatment of disorders of cholesterol metabolism. Some people possess genetic mutations with elevated levels of ApoB gene which predisposes them to coronary artery diseases. Lowering the amount of ApoB can reduce the number of lipoproteins and lower the blood cholesterol.

Tracy Zimmerman and her colleagues used RNAi in 2006 to reduce the level of ApoB in non human primates *Cynomolgus* monkeys.

One group of monkeys were given RNAi treatment (small interfering RNAs, SiRNAs) (doses 1 mg/kg SiRNAs), second group of monkeys were given RNAi treatment (doses 2.5 mg/kg SiRNAs) and third group of monkeys were injected with saline.

The results of the study are depicted in the graph below :



- (i) How does the treatment with 2.5 mg/kg brings an effect on cholesterol metabolism when compared from 24 hours and 144 hours.
- (ii) Write any two natural sources from where dsRNA molecule could be obtained for silencing the specific mRNA.
- (iii) How is RNAi used in controlling the infection on the roots of tobacco plants by the nematode *Meloidogyne incognita*.

**OR**

A gene was identified in a fungus by a research worker in a lab which was considered to be of a great importance in the field of agriculture. As a student of biotechnology, write the steps you would suggest to

- (i) Isolate this gene of interest from the fungus
- (ii) Amplify this gene for further experimentation and research.

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



ROLL NUMBER				
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SET	2
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QP.Code:044/01/2



**INDIAN SCHOOL MUSCAT  
FIRST PRE-BOARD EXAMINATION 2023  
BIOLOGY(044)**



CLASS : XII  
DATE: 10/01/2023

TIME ALLOTTED : 3 HRS.  
MAXIMUM MARKS:70

**GENERAL INSTRUCTIONS:**

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- (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**

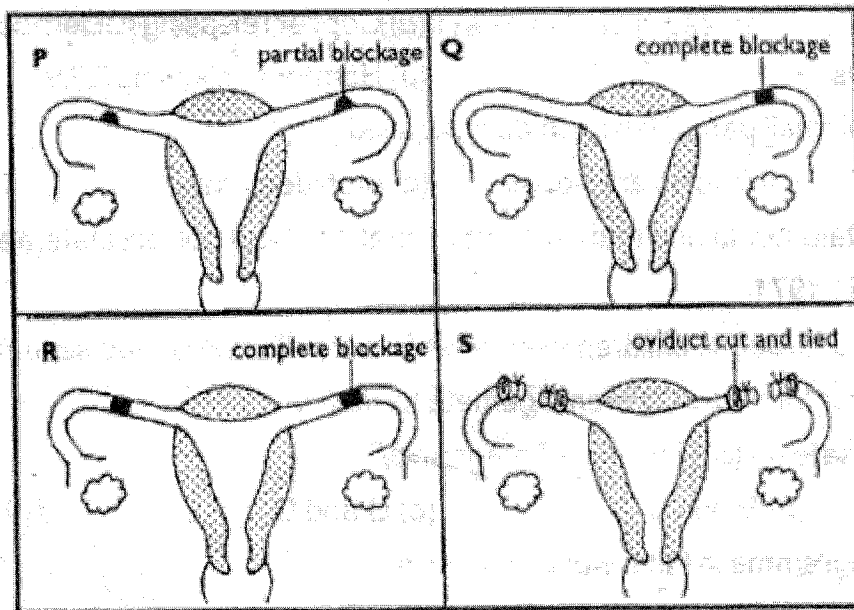
1. Which one of the following statement describe the function of the promoter in a transcription unit? 1  
 A. signals the termination of polypeptide chain.  
 B. serves a sequence where transcription will initiate.  
 C. serves as DNA template for transcription to take place.  
 D. determines the first nucleotide to be transcribed into RNA.
2. Which of the following statements regarding IUDs is correct? 1  
 A. It suppresses the process of gametogenesis.  
 B. They once inserted need not be replaced.  
 C. They are generally inserted by the user itself.  
 D. It increases phagocytosis of sperms within the uterus.
3. Which of the following statement is correct? 1

- A. Injecting microbes during immunization induces passive immunity.
- B. Cell-mediated immune response is responsible for graft rejection.
- C. Colostrum during initial days of lactation provides active immunity to infant.
- D. None of the above

4. Which of the following cause of biodiversity loss is not included in evil quartet ? 1

- A. Coextinction
- B. Pollution
- C. Alien species invasion
- D. Habitat loss and fragmentation

5. The given diagram shows the uterine tubes of four women P, Q, R and S. 1



In which two women is fertilization impossible at present?

- A. P and Q
- B. Q and R
- C. R and S
- D. S and P

6. Match Column-I with Column-II and select the correct option. 1

Column-I	Column-II
(a) Fragmentation	(i) Break down of detritus into smaller particles
(b) Leaching	(ii) Precipitation of water soluble nutrients as unavailable salt
(c) Catabolism	(iii) Degradation of detritus by bacterial and fungal enzymes

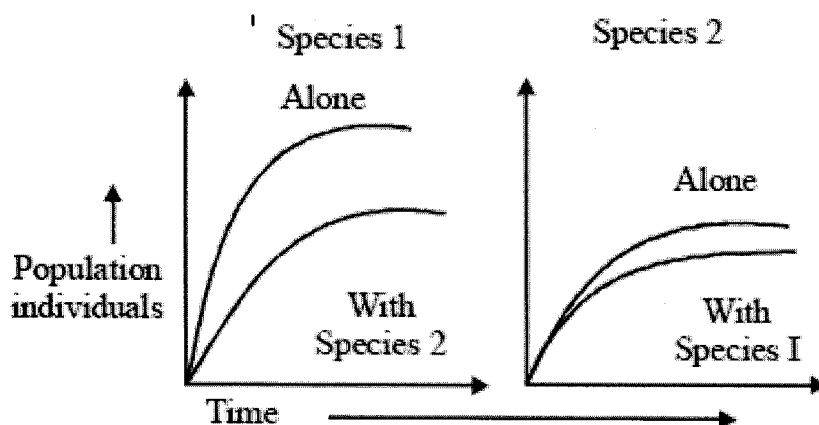
A. (a) - (i); (b) - (ii); (c) - (iii)

B. (a)- (ii); (b) - (iii); (c) - (i)

C. (a) - (iii); (b) - (ii); (c) - (i)

D. (a) - (iii); (b) - (i); (C) - (ii)

7. In laboratory experiments, two species of the protist Paramecium were grown alone and in the presence of the other species. The following graphs show growth of species 1 (left) and species 2 (right), both alone and when in mixed culture.



Interpretation of these graphs shows that

A. competitive exclusion occurred in these experiments.

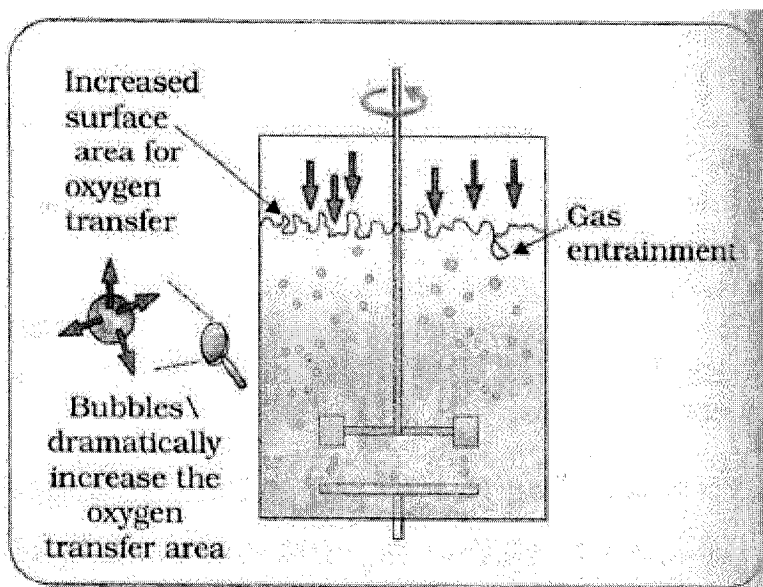
B. both species are affected by interspecific competition but species 1 is less affected.

C. both species are affected by interspecific competition but species 2 is less affected.

D. both species are affected equally by interspecific competition.

8. Identify the correct match for the given apparatus

1



OPTIONS	Apparatus	Function
A.	Gene gun	Vectorless direct gene transfer
B.	Column chromatography	Separation of chlorophyll pigments
C.	Sparged stirred tank	Carry out fermentation bioreactor process
D.	Respirometer	Finding out rate of respiration

9. Exine of pollen is

1

- Hard outer layer of pollen grain
- Most resistant organic matter known
- Layer made up of sporopollenin
- Layer which can withstand high temperature, strong acids and alkali
- Layer which cannot be degraded by any known enzyme.

- (i) and (ii)
- All except (v)
- All of these
- (i),(iii) and (v)

10. Energy flow in an ecosystem is

1

- unidirectional
- bidirectional
- multidirectional
- all of these



11. AB blood group is the classical example for codominance. Which of the following is best suited for codominance? 1
- A. Both are recessive  
B. One is recessive  
C. One is dominant  
D. Both are dominant
12. \_\_\_\_\_ are pathogens that attack insects and other arthropods. The majority of these used as biological control agents belong to \_\_\_\_\_ 1
- A. *Agrobacterium tumefaciens*; Archaeobacteria  
B. Methanogens; Eubacteria  
C. *Trichoderma polysporum*; Deutromycetes  
D. Baculoviruses; Nucleopolyhedrovirus

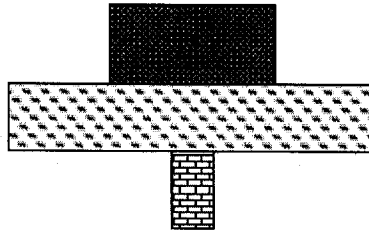
**Question No. 13 to 16 consist of two** statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- 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.  
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- Reason: In this interaction, one species benefits and the other is neither benefitted nor harmed.
16. Assertion: Homologous organ represent divergent evolution. 1
- Reason: Homology indicate common ancestry.

### SECTION – B

17. (a) Name the deficiency for which first clinical gene therapy was given. 2
- (b) Mention the cause of and one cure for this deficiency.

18. Acquired immunity is memory based seen in higher vertebrates. A set of diseases where this property is lost by the immune system. Name such group of diseases and how these diseases are characterized. State one example of this disease. 2
19. Identify the type of given ecological pyramid and give one example each of pyramid of number and pyramid of biomass in such cases. 2



20. The male fruit fly and female fowl are heterogametic while the female fruit fly and the male fowl are homogametic. Why are they called so? 2
21. Where are fimbriae present in human female reproductive system? Give their function. 2

**OR**

Where are leydig cells present? What is their role in reproduction?

### SECTION – C

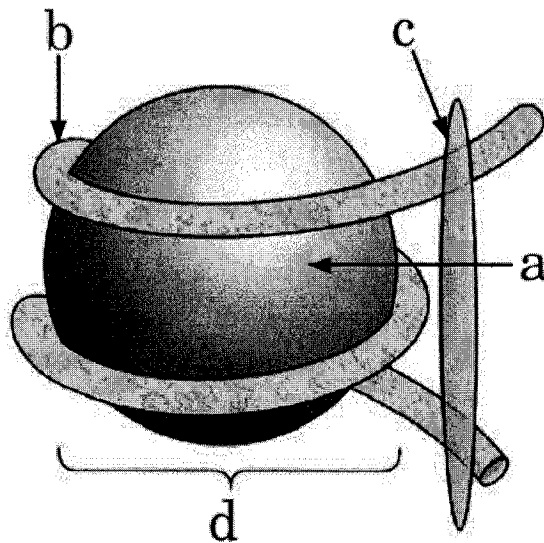
22. What are cry-proteins? With the help of a suitable example, explain how it acts as a biological pesticide. 3
23. Most of the angiospermic plants reproduce by seeds. What are the advantages of seeds for angiosperms? 3
24. If origin of life is in progress in any other planet, what would be condition there? 3
25. Bio-diversification of life started to occur almost 3 billion years ago. Since then new species have been evolving and then disappearing in masse from Earth. 3
- (a) How many episodes of mass extinctions of species have already taken place and which one is in progress in the current era?
- (b)How is current episode in progress different from the previous episodes and why? Explain.

26. A person suffering from AIDS dies of opportunistic infections (ARC) i.e., infections that could have been otherwise overcome. 3
- (i) State one reason as to why an 'HIV' patient dies of 'opportunistic infections'.
  - (ii) Give the scientific name of one bacterium and one parasite which mainly attack a person.
  - (iii) Write the full form of the name of the widely used diagnostic test for AIDS.

**OR**

A patient complains of suffering from constipation, stomach ache, stool with blood clots and excess mucous. The physician diagnosed it as amoebiasis, after stool test.

- (a) Write the scientific name of the microbe identified in the stool sample.
  - (b) How do you think, the patient must have contracted it?
  - (c) Write your suggestions to the patient to avoid infection in future.
27. (i) What is the given diagram representing? 3
- (ii) Name the parts a, b, c and d.
- (iii) In the eukaryotes the DNA molecules are organized within the nucleus. How is the DNA molecule organized in a bacterial cell in absence of a nucleus?



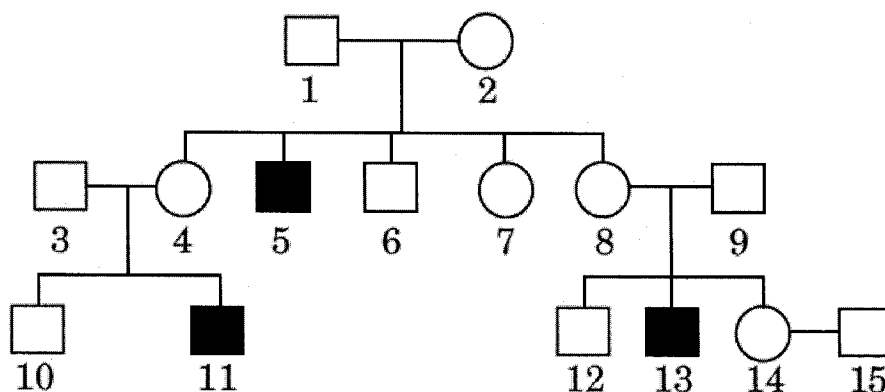
28. (a) What do 'Y' and 'B' stand for in 'YAC' and 'BAC' used in Human Genome Project (HGP). 3  
Mention their role in the project.
- (b) Write the percentage of the total human genome that codes for proteins and the percentage of discovered genes whose functions are known as observed during HGP.
- (c) Expand 'SNPs' identified by scientists in HGP.

## SECTION – D

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

29. Haemophilia is a genetic disorder of humans. The pedigree chart given below shows the inheritance of Haemophilia in one family. Study the pattern of inheritance and answer the questions given.

4

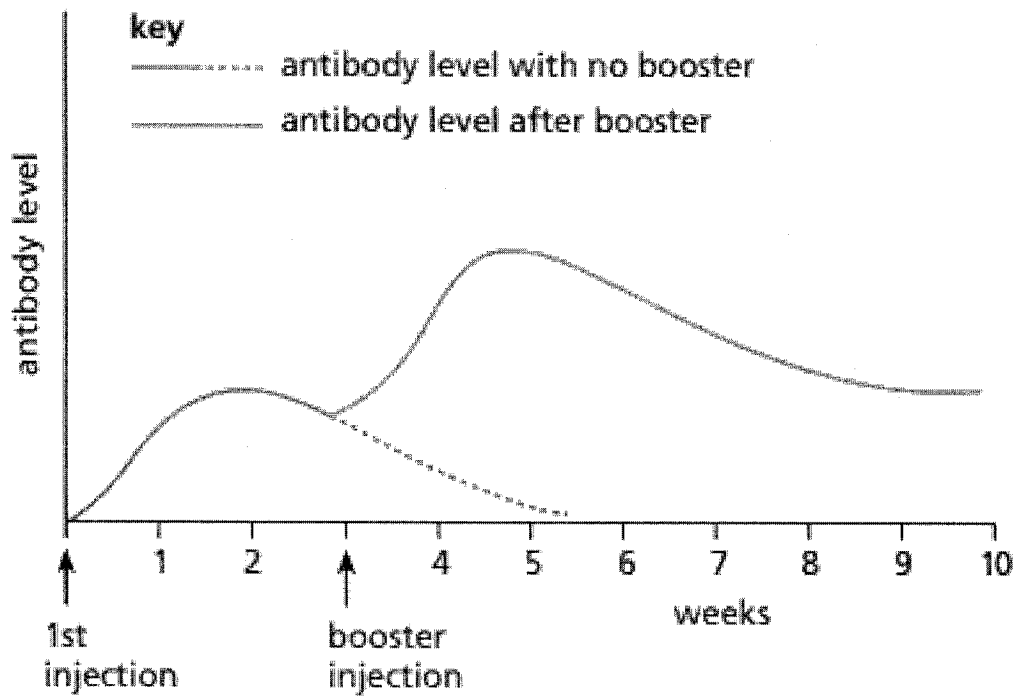


- What is the most likely mode of inheritance for this pedigree?
- Give all the possible genotypes of the members 4, 5 and 6 in the pedigree chart.
- 'A blood test shows that the individual 14 is a carrier of Haemophilia. The member numbered 15 has recently married the member numbered 14. What is the probability that their first child will be a haemophiliac male? How will you characterize this disorder?

OR

- Why is Haemophilia generally observed in human males? Explain the conditions under which a human female can be haemophiliac.

30. When bacteria get through the mechanical and chemical barriers, the body has two more lines of defence – white blood cells and antibodies, produced by white blood cells. One type of white blood cells fights infection by engulfing bacteria (a process called phagocytosis) and digesting them. The body's defences can be enhanced by vaccination. The presence of the pathogen triggers white blood cells to make specific antibodies to combat possible infection. If the person is exposed to the disease later, defences are already in place to prevent it developing (the person is immune to that disease). The figure shows the changes in the levels of antibody in response to an inoculation of a vaccine, followed by a booster injection 3 weeks later.



- What is vaccination?
- Name any two diseases against which vaccination is done.
- Where do you find antibodies in the blood? How does antibodies level increase after vaccination in the body?

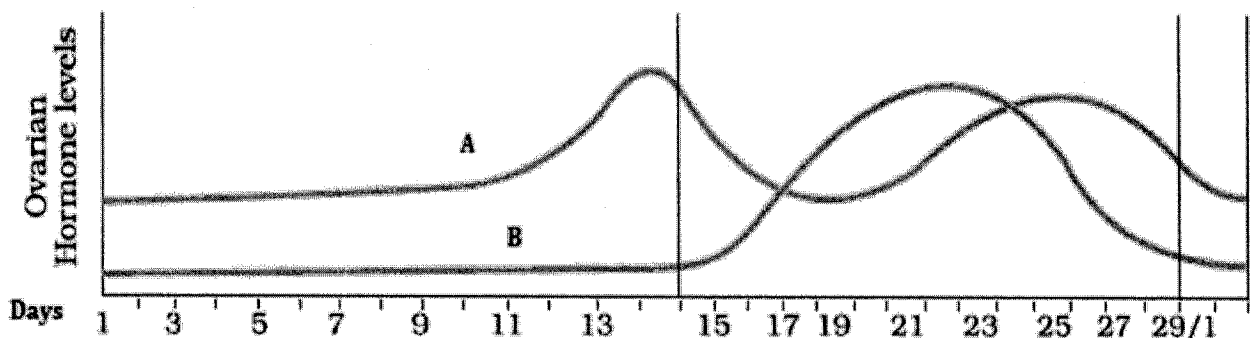
OR

- What is the importance of booster injection? Name one disease against which booster injection is suggested.

### SECTION – E

- The graph given below shows the variation in the levels of ovarian hormones during various phases of menstrual cycle:

5



- Identify 'A' and 'B'.
- Specify the source of the hormone marked in the diagram.

- (c) Reason out why A peaks before B.
- (d) Compare the role of A and B.
- (e) Under which condition will the level of B continue to remain high on the 28th day?

OR

- (a) Draw the embryo sac of a flowering plant and label (i) central cell (ii) Chalazal end of the embryo sac (iii) synergids.
- (b) Name the cell that develops into the embryo sac and explain how this cell leads to the formation of Embryo sac. Also mention the role played by the various cells of the embryo sac.

32. Answer the following questions based on Meselson and Stahl's experiment:

5

- (a) Why did the scientists use  $^{15}\text{NH}_4\text{Cl}$  and  $^{14}\text{NH}_4\text{Cl}$  as sources of nitrogen in the culture medium for growing *E. coli*?
- (b) Name the molecule(s) that  $^{15}\text{N}$  got incorporated into.
- (c) How did they distinguish between  $^{15}\text{N}$  labelled molecules from  $^{14}\text{N}$  ones?
- (d) Mention the significance of taking the *E. coli* samples at definite time intervals for observations.
- (e) Write the observations made by them from the samples taken at the end of 20 minutes and 40 minutes respectively.

OR

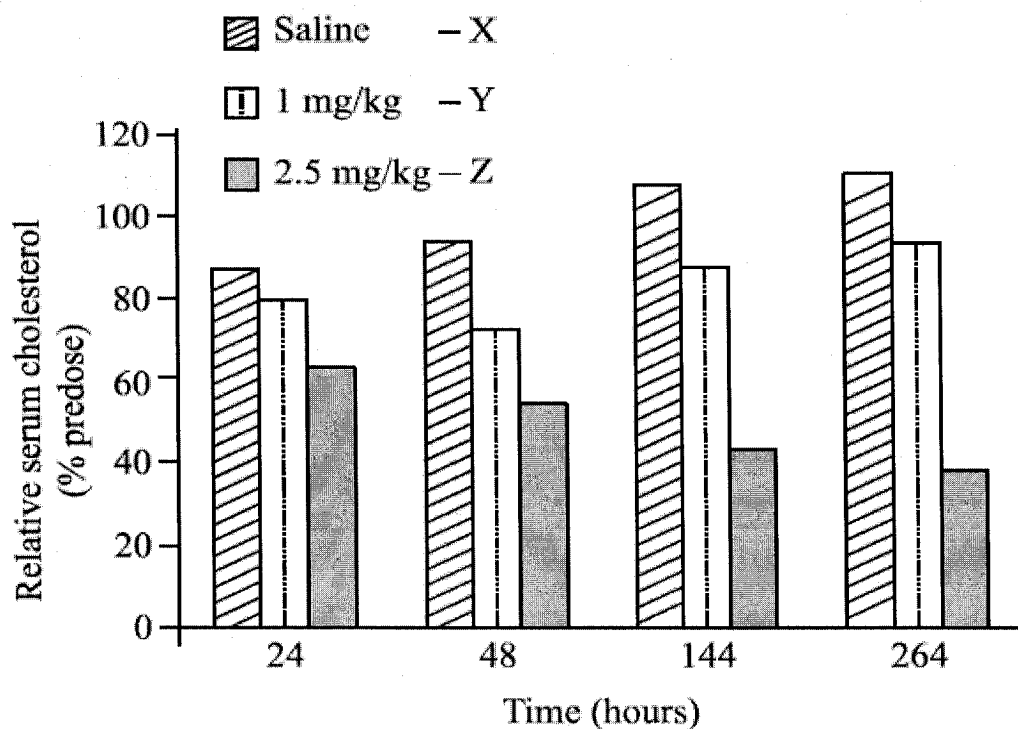
- (a) Write the scientific name of the organism Thomas Hunt Morgan and his colleagues worked with for their experiments. Explain the correlation between linkage and recombination with respect to genes as studied by them.
- (b) How did Sturtevant explain gene mapping while working with Morgan?

33. RNA interference (RNAi) holds great potential as a therapeutic agent for the treatment of human diseases and as biocontrol agents in controlling pests in the field of agriculture. An experiment was carried to study the use of 'RNAi' for the potential treatment of disorders of cholesterol metabolism. Some people possess genetic mutations with elevated levels of ApoB gene which predisposes them to coronary artery diseases. Lowering the amount of ApoB can reduce the number of lipoproteins and lower the blood cholesterol.

Tracy Zimmerman and her colleagues used RNAi in 2006 to reduce the level of ApoB in non human primates *Cynomolgus* monkeys.

One group of monkeys were given RNAi treatment (small interfering RNAs, SiRNAs) (doses 1 mg/kg SiRNAs), second group of monkeys were given RNAi treatment (doses 2.5 mg/kg SiRNAs) and third group of monkeys were injected with saline.

The results of the study are depicted in the graph below :



- How does the treatment with 2.5 mg/kg brings an effect on cholesterol metabolism when compared from 24 hours and 144 hours.
- Write any two natural sources from where dsRNA molecule could be obtained for silencing the specific mRNA.
- How is RNAi used in controlling the infection on the roots of tobacco plants by the nematode *Meloidogyne incognita*.

OR

A gene was identified in a fungus by a research worker in a lab which was considered to be of a great importance in the field of agriculture. As a student of biotechnology, write the steps you would suggest to

- isolate this gene of interest from the fungus
- amplify this gene for further experimentation and research.

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

ROLL NUMBER				
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SET	3
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QP.Code:044/01/3



**INDIAN SCHOOL MUSCAT  
FIRST PRE-BOARD EXAMINATION 2023  
BIOLOGY(044)**



CLASS : XII

DATE: 10/01/2023

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. Which one of the following technique is used in DNA fingerprinting for the detection of DNA? 1
  - A. Northern blotting
  - B. Western blotting
  - C. Southern blotting
  - D. In-situ hybridization
  
2. Which of the following statements regarding IUDs is correct? 1
  - A. It suppresses the process of gametogenesis.
  - B. They once inserted need not be replaced.
  - C. They are generally inserted by the user itself.
  - D. It increases phagocytosis of sperms within the uterus.
  
3. Which of the following statement is correct? 1

*JS*



- A. Injecting microbes during immunization induces passive immunity.
- B. Cell-mediated immune response is responsible for graft rejection.
- C. Colostrum during initial days of lactation provides active immunity to infant.
- D. None of the above

4. Which of the following is best suited for codominance?

1

- A. Both are recessive
- B. One is recessive
- C. One is dominant
- D. Both are dominant

5. Which of the following cause of biodiversity loss is not included in evil quartet ?

1

- A. Coextinction
- B. Pollution
- C. Alien species invasion
- D. Habitat loss and fragmentation

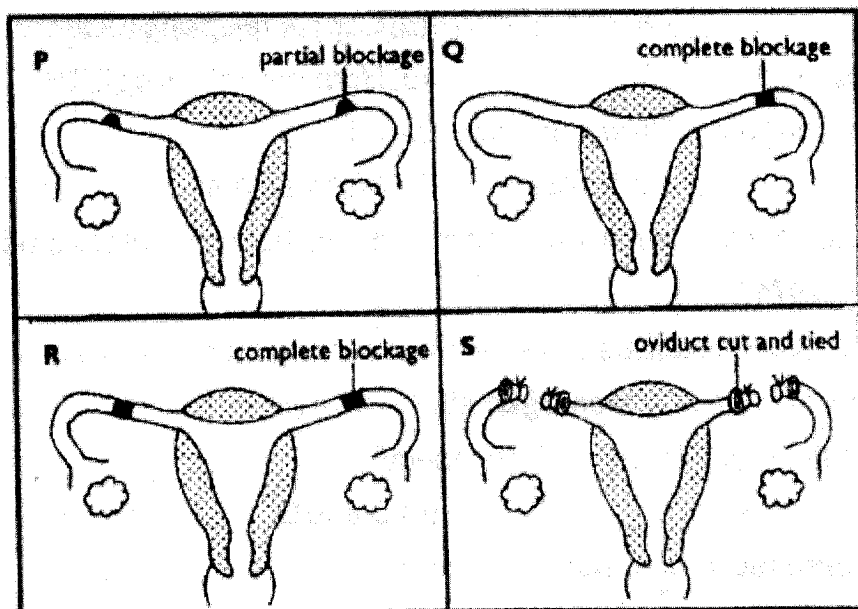
6. The second trophic level in a lake is

1

- A. Phytoplankton
- B. Zooplankton
- C. Benthos
- D. Fishes

7. The given diagram shows the uterine tubes of four women P, Q, R and S.

1



In which two women is fertilization impossible at present?

- A. P and Q
- B. Q and R
- C. R and S
- D. S and P

8. The bacterium 'Propionibacterium sharmanii' is used in the production of:

1

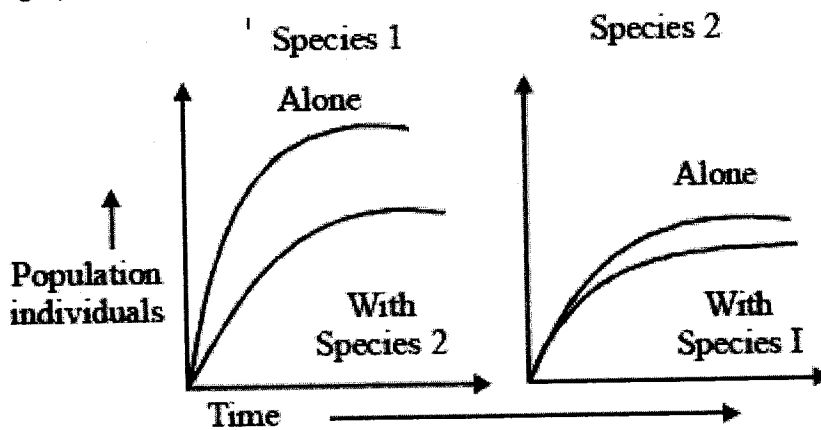
- A. Toddy
- B. Swiss cheese
- C. Roquefort cheese
- D. Dough for bread

9. Seeds of an orange when taken out and squeezed, show many embryos of different sizes and shapes. 1

The reason for this is as many embryos have developed from :

- A. Egg cells fusing with different male gametes forming embryos.
- B. PEN fusing with different male gametes forming embryos.
- C. Nucellar cells dividing and developing into embryos.
- D. Synergids dividing and developing into embryos.

10. In laboratory experiments, two species of the protest Paramecium were grown alone and in the presence of the other species. The following graphs show growth of species 1 (left) and species 2 (right), both alone and when in mixed culture.



Interpretation of these graphs shows that

- A. competitive exclusion occurred in these experiments.
- B. both species are affected by interspecific competition but species 1 is less affected.
- C. both species are affected by interspecific competition but species 2 is less affected.
- D. both species are affected equally by interspecific competition.

11. Identify the correct match for the given apparatus



15. Assertion: Clown fish maintains a commensalistic relation with the sea anemone 1  
Reason: In this interaction, one species benefits and the other is neither benefitted nor harmed.
16. Assertion: Homologous organ represent divergent evolution. 1  
Reason: Homology indicate common ancestry.

**SECTION – B**

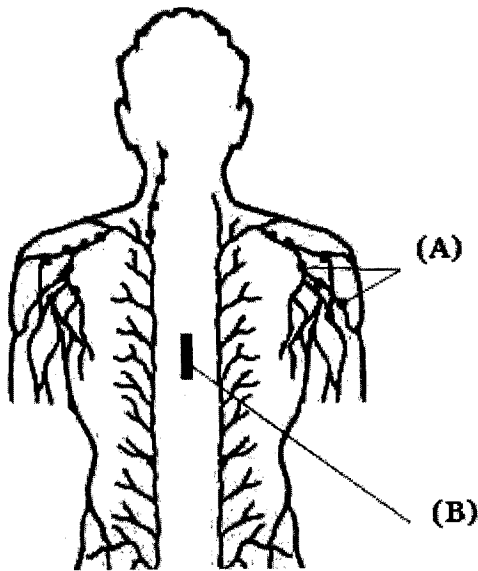
17. Where are fimbriae present in human female reproductive system? Give their function. 2

**OR**

Where are leydig cells present? What is their role in reproduction?

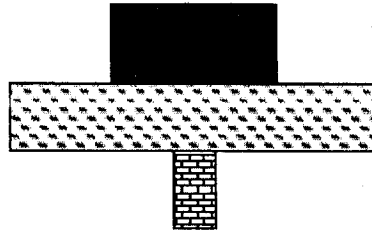
18. In a typical monohybrid cross the F<sub>2</sub> population ratio is written as 3 : 1 for phenotype but expressed as 1 : 2 : 1 for genotype. Explain with the help of an example. 2

19. 2



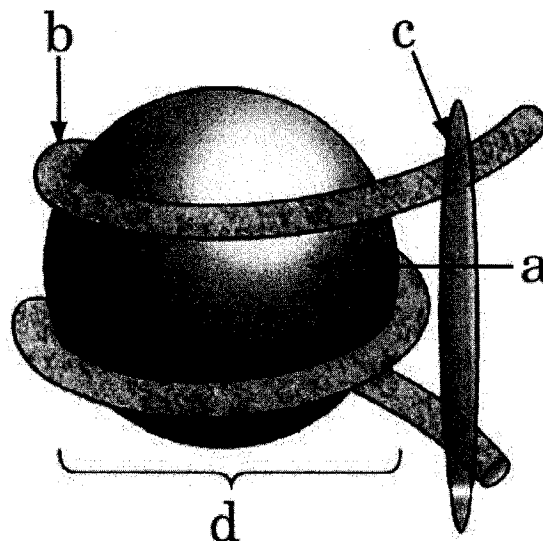
The diagram above shows a part of human immune system. Identify the parts (A) and (B). How do they differ in their function?

20. (a) Name the deficiency for which first clinical gene therapy was given. 2  
(b) Mention the cause of and one cure for this deficiency.
21. Identify the type of given ecological pyramid and give one example each of pyramid of number and pyramid of biomass in such cases. 2



### SECTION – C

22. (a) What do 'Y' and 'B' stand for in 'YAC' and 'BAC' used in Human Genome Project (HGP).? 3  
Mention their role in the project.
- (b) Write the percentage of the total human genome that codes for proteins and the percentage of discovered genes whose functions are known as observed during HGP.
- (c) Expand 'SNPs' identified by scientists in HGP.
23. (a) List any four characteristic features of wheat flowers that make it a good example of wind 3  
pollination.
- (b) It is observed that plant breeders carrying out wheat hybridization often take pollen grains from the 'pollen banks'. Do you agree? Give one reason in support of your answer.
24. (i) What is the given diagram representing? 3
- (ii) Name the parts a, b, c and d.
- (iii) In the eukaryotes the DNA molecules are organized within the nucleus. How is the DNA molecule organized in a bacterial cell in absence of a nucleus?



25. Which law states that the sum of allelic frequencies in a population is constant? Write its mathematical formula used to derive allelic frequency. List the two factors that influence the law. 3
26. A person suffering from AIDS dies of opportunistic infections (ARC) i.e., infections that could have been otherwise overcome. 3
- (i) State one reason as to why an 'HIV' patient dies of 'opportunistic infections'.
  - (ii) Give the scientific name of one bacterium and one parasite which mainly attack a person.
  - (iii) Write the full form of the name of the widely used diagnostic test for AIDS.

**OR**

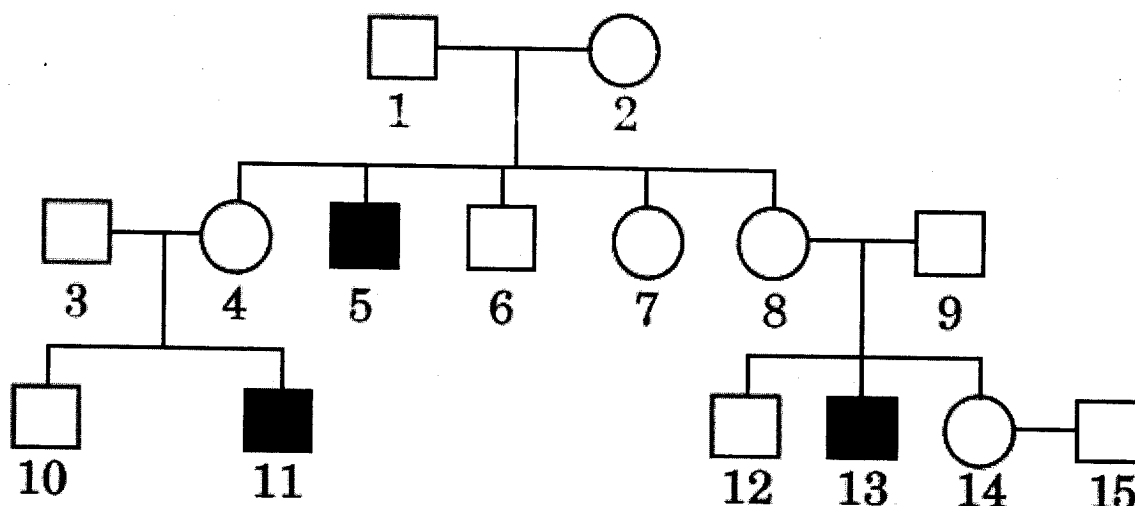
A patient complains of suffering from constipation, stomach ache, stool with blood clots and excess mucous. The physician diagnosed it as amoebiasis, after stool test.

- (a) Write the scientific name of the microbe identified in the stool sample.
  - (b) How do you think, the patient must have contracted it?
  - (c) Write your suggestions to the patient to avoid infection in future.
27. (a) Name the technique used for separation of DNA fragments. 3
- (b) Write the type of matrix used in this technique.
  - (c) How is separated DNA visualized and extracted for use in recombinant technology?
28. Bio-diversification of life started to occur almost 3 billion years ago. Since then new species have been evolving and then disappearing in masse from Earth. 3
- (a) How many episodes of mass extinctions of species have already taken place and which one is in progress in the current era?
  - (b) How is current episode in progress different from the previous episodes and why? Explain.

### SECTION – D

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

29. Haemophilia is a genetic disorder of humans. The pedigree chart given below shows the inheritance of Haemophilia in one family. Study the pattern of inheritance and answer the questions given. 4

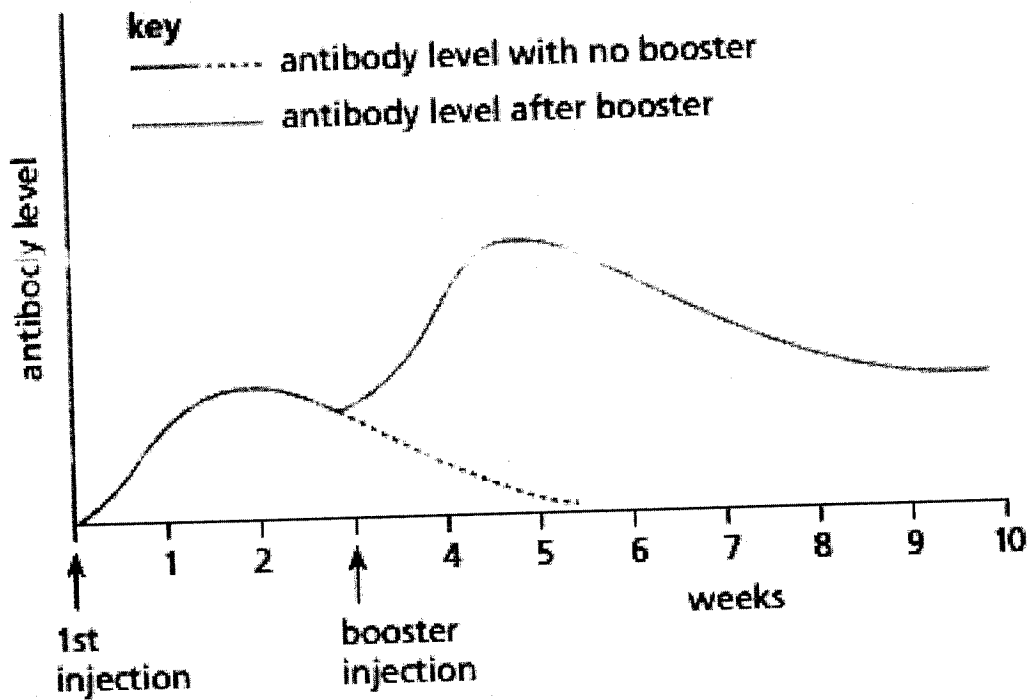


- (a) What is the most likely mode of inheritance for this pedigree?
- (b) Give all the possible genotypes of the members 4, 5 and 6 in the pedigree chart.
- (c) 'A blood test shows that the individual 14 is a carrier of Haemophilia. The member numbered 15 has recently married the member numbered 14. What is the probability that their first child will be a haemophiliac male? How will you characterize this disorder?

OR

- (d) Why is Haemophilia generally observed in human males? Explain the conditions under which a human female can be haemophiliac.

30. When bacteria get through the mechanical and chemical barriers, the body has two more lines of defence – white blood cells and antibodies, produced by white blood cells. One type of white blood cells fights infection by engulfing bacteria (a process called phagocytosis) and digesting them. The body's defences can be enhanced by vaccination. The presence of the pathogen triggers white blood cells to make specific antibodies to combat possible infection. If the person is exposed to the disease later, defences are already in place to prevent it developing (the person is immune to that disease). The figure shows the changes in the levels of antibody in response to an inoculation of a vaccine, followed by a booster injection 3 weeks later.



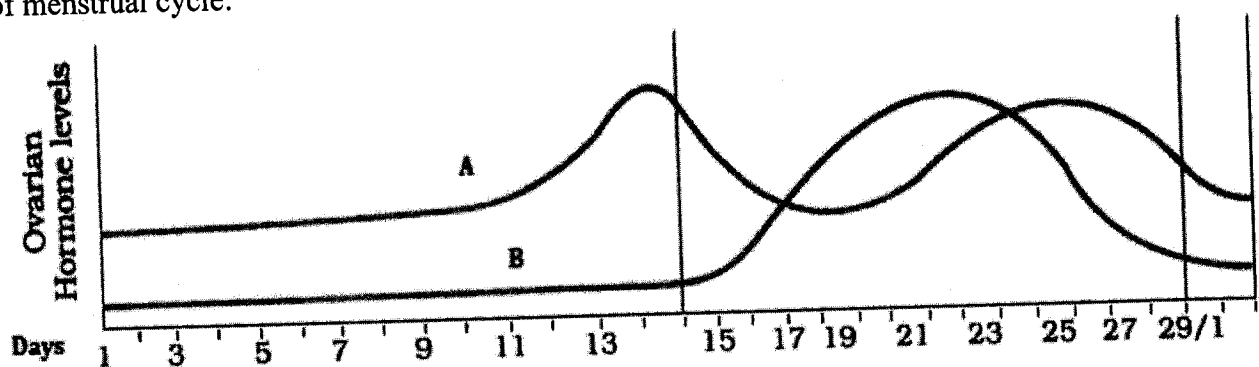
- What is vaccination?
- Name any two diseases against which vaccination is done.
- Where do you find antibodies in the blood? How does antibodies level increase after vaccination in the body?

OR

- What is the importance of booster injection? Name one disease against which booster injection is suggested.

### SECTION – E

31. The graph given below shows the variation in the levels of ovarian hormones during various phases of menstrual cycle: 5



- Identify 'A' and 'B'.
- Specify the source of the hormone marked in the diagram.



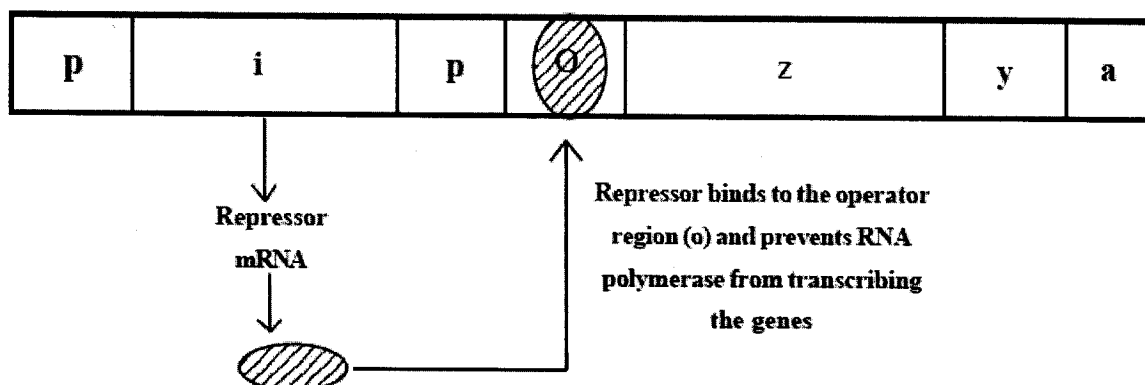
- (c) Reason out why A peaks before B.
- (d) Compare the role of A and B.
- (e) Under which condition will the level of B continue to remain high on the 28th day?

OR

- (a) Draw the embryo sac of a flowering plant and label (i) central cell (ii) Chalazal end of the embryo sac (iii) synergids.
- (b) Name the cell that develops into the embryo sac and explain how this cell leads to the formation of Embryo sac. Also mention the role played by the various cells of the embryo sac.

32. (a) Describe the experiment conducted by Alfred Hershey and Martha Chase for identification of genetic material.
- (b) Why is it considered path breaking in the field of Molecular Biology?

OR



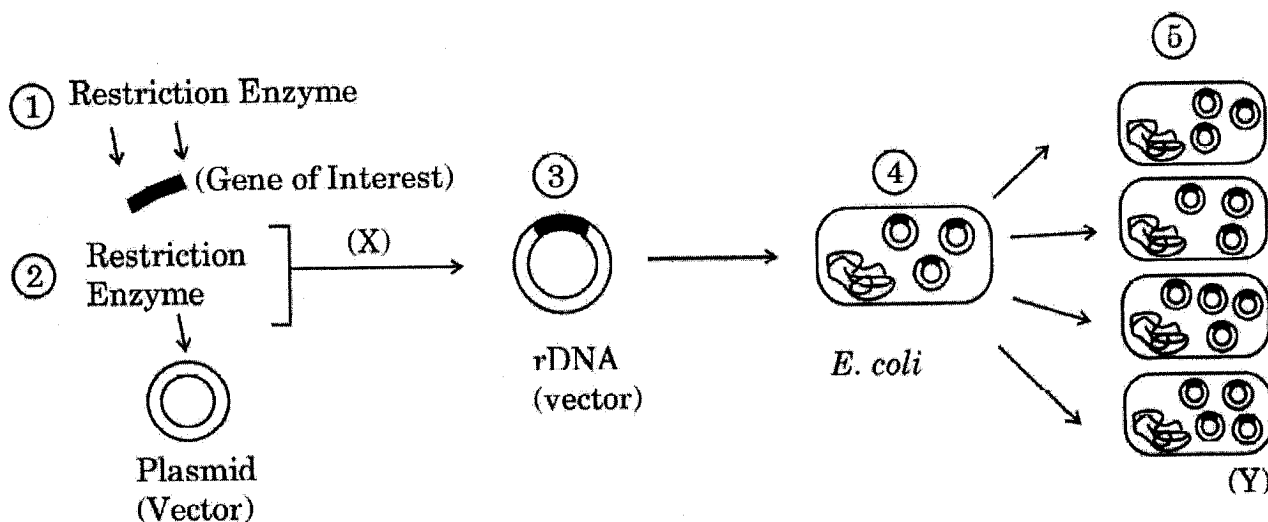
Look at the figure above depicting lac operon of *E.coli*

- (a) What could be the series of events when an inducer is present in the medium in which *E.coli* is growing?
- (b) Name the Inducer.
33. Read the paragraph given below and answer the questions that follow :
- Enzyme *Taq polymerase*, is extracted from a eubacterial microorganism *Thermus aquaticus* from Yellowstone National Park in Montana, USA and isolated by Chien et al. (1976). *Taq polymerase* successfully replaced the DNA polymerase from *E.coli* that was being used in PCR earlier and this shift revolutionized the PCR technique.
- (i) *Taq polymerase* after its discovery replaced *E.coli* DNA polymerase in PCR technique. Explain giving reasons why was the need felt for the change?

- (ii) What is a primer and its importance in PCR?
- (iii) Write the importance of PCR as a diagnostic tool.

OR

Development of recombinant DNA technology has opened gates to many breakthroughs in the fields of medicine and agriculture. This has enabled scientists to isolate, sequence and manipulate individual genes obtained from diverse living or dead cells. Given below is a diagram showing the basic steps involved in genetically modifying an organism. Study the given diagram and answer the questions that follow :



- (i) Are two different types of restriction endonucleases used, one to cut the vector DNA and another to cut the desired DNA to be cloned? Support your answer, giving reason.
- (ii) Which enzyme is used at step (X) to integrate the foreign DNA with the vector DNA?
- (iii) What is the term used for step (Y) showing multiple copies of the foreign DNA being formed in transformed *E. coli*?
- (iv) Draw a diagram of *E. coli* cloning vector pBR322 to show the following :
  - (I) Any one restriction endonuclease site in tetracycline resistance gene
  - (II) Any one restriction endonuclease site in ampicillin resistance gene
  - (III) "ori" site
- (v) What does rop code for in plasmid pBR322?

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

Q  
alms