Marking Scheme links are on each paper

# Pre-Board Sample Papers

# CBSE EXAM 2024 20 Sets

## Class : 12th

## Sub : Biology

### Disclaimer :

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# Sample Paper 1

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** If most individuals in a population are young, why is the population likely to grow rapidly in the future?

(a) Many individuals will begin to reproduce soon
(b) Death rates will be low
(c) Immigration and emigration can be ignored
(d) All of these

**2.** Primary endosperm nucleus (PEN) is formed by the fusion of

(a) 2 polar nuclei + 1 synergid cell nucleus
(b) 1 polar nucleus + 1 antipodal cell nucleus + 1 synergid cell nucleus
(c) 2 polar nuclei + 1 male gamete nucleus
(d) 2 antipodal cell nuclei + 1 male gamete nucleus.

**3.** Which enzyme helps in removing oil stains from clothes?

(a) Streptokinase
(b) Trypsin
(c) Lipase
(d) Amylase

**4.** Which of the following is a cause of transmission of HIV?

(a) Multiple sexual partners
(b) Transfusion of contaminated blood
(c) Sharing infected needles
(d) All of these

**5.** Hardy-Weinberg equilibrium is known to be essentially affected by factors like, gene flow, genetic drift, mutation, genetic recombination and

(a) evolution
(b) limiting factors
(c) saltation
(d) natural selection

**6.** Plasmid used to construct the first recombinant DNA was isolated from which bacterium species?

(a) Escherichia coli
(b) Salmonella typhimurium
(c) Agrobacterium tumefaciens
(d) Thermus aquaticus

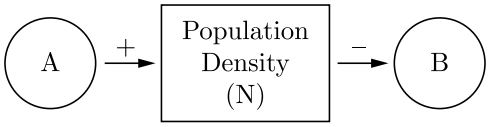
**7.** Microbes are used in
I. primary treatment of sewage
II. secondary treatment of sewage
III. anaerobic sludge digesters
IV. production of biogas.
Choose the correct option.

(a) I, II and III
(b) I, III and IV
(c) II, III and IV
(d) I, II, III and IV

**8.** If a double stranded DNA has 20% of cytosine, what will be the percentage of adenine in it?

(a) 20%
(b) 40%
(c) 30%
(d) 60%

**9.** The density of a population in a given habitat during a given period, fluctuates due to changes in certain basic processes. On this basis, fill up boxes A and B in the given flow chart with correct option.




(a) A-Natality, B-Mortality
(b) A-Immigration, B-Emigration
(c) A-Natality, B-Immigration
(d) Both (a) and (b)

**10.** The given Punnett's square represents the pattern of inheritance in a dihybrid cross where yellow (Y) and round (R) seed condition is dominant over white (y) and wrinkled (r) seed condition.

| | YR | Yr | yR | yr |
|---|---|---|---|---|
| YR | F | J | N | R |
| Yr | G | K | O | S |
| yR | H | L | P | T |
| yr | I | M | Q | U |

A plant of type 'H' will produce seeds with the genotype identical to seeds produced by the plants of

(a) type M
(b) type J
(c) type P
(d) type N

**11.** Match column I with column II and select the correct option from the given codes.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Recombinant DNA technology | (i) | Chilled ethanol |
| B. | Precipitation of DNA | (ii) | DNA staining |
| C. | PCR | (iii) | Gene amplification |
| D. | Ethidium bromide | (iv) | Genetic engineering |

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

**12.** The given table shows differences between spermatogenesis and spermiogenesis. Select the incorrect option.

| | **Spermatogenesis** | **Spermiogenesis** |
|---|---|---|
| (a) | Process of formation of spermatozoa. | Process of differentiation of spermatozoon from a spermatid. |
| (b) | It changes a haploid structure into another haploid structure. | It involves conversion of a diploid structure into haploid structure. |
| (c) | Growth and divisions occur. | Divisions and growth are absent. |
| (d) | A spermatogonium forms four spermatozoa. | A spermatid forms a single spermatozoon. |

**13.** **Assertion :** Elimination of a competitively inferior species in a closely related or otherwise similar group is known as competitive exclusion principle.
**Reason :** If two species compete for the same resource, they could avoid competition by choosing different times for feeding or different foraging patterns.

(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.

**14.** **Assertion :** Mouse is the most preferred mammal for studies on gene transfers.
**Reason :** Mouse possesses features like short oestrous cycle and gestation period, relatively short generation time, production of several offspring per pregnancy, etc.

(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.

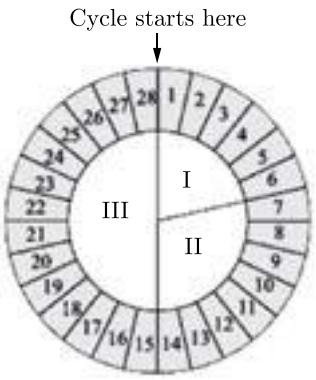
**15.** Given below is the diagram of a normal 28 day menstrual cycle in a human female. It depicts phase I, II and III. Study this diagram and comment upon the appropriateness of the Assertion and the Reason. **Assertion :** The hormone secreted in large amounts in phase III is also responsible for maintaining pregnancy in human females.
**Reason :** Corpus luteum secretes progesterone in phase I however it degenerates completely in phase III.

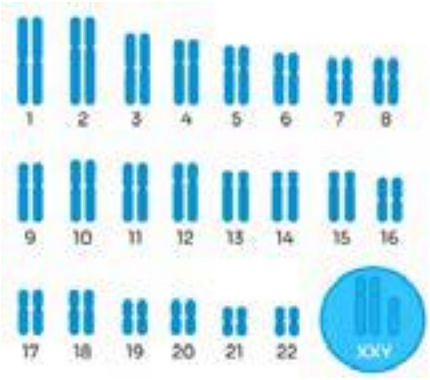
(a) Both A and R are true and R is the correct explanation of A.

(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.



**16.** **Assertion :** Emigration is outward movement of some individuals from local population.
**Reason :** Emigration is caused by occurrence of deficiencies and calamities.

(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.

# SECTION - B

**17.** Write the role of on and 'restriction' site in a cloning vector pBR322.

**18.** (a) It is generally observed that the children who had suffered from chicken-pox in their childhood may not contract the same disease in their adulthood. Explain giving reasons the basis of such an immunity in an individual. Name this kind of immunity.

(b) What are interferons? Mention their role.

**19.** Study the given diagram.


A is an embryonic stage that gets transformed into B, which in turn gets implanted in the endometrium in human females.

(a) Identify A, B and its parts C and D.

(b) State the fate of C and D in the course of embryonic development in humans.

**20.** Draw a pyramid of numbers considering a big banyan tree supporting a population of insects, small birds and their predators.

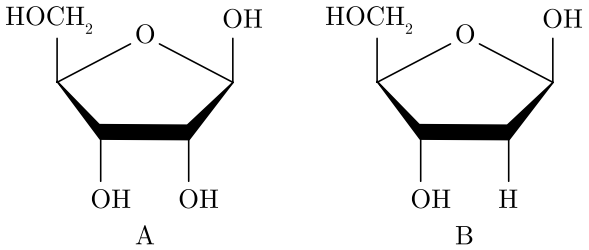
**OR**

Name the type of food chains responsible for the flow of larger fraction of energy in an aquatic and a terrestial ecosystem respectively. Mention one difference between the two food chains.

**21.** Two children one with blood group 'AB' and other with blood group '0' are born to parents where the father has blood group W and the mother has blood group 'B'. Work out a cross to show how is it possible?

# SECTION - C

**22.** Carefully examine structures A and B of pentose sugar given below. Which one of the two is more reactive? Give reasons.



**23.** Explain the role of pituitary and ovarian hormones in the menstrual cycle of human females.

**24.** Differentiate between autogamy, geitonogamy and xenogamy.

**25.** Convergent evolution and divergent evolution are the two concepts explaining organic evolution. Explain each one with the help of an example.

**26.** (i) Name the plant source of the drug commonly called 'smack. How does it affect the body of the abuser?
(ii) What is humoral immunity?

**OR**

(i) What is colostrum? Why are breast-fed babies likely to be healthy?
(ii) Malaria, typhoid, pneumonia and amoebiasis are some of the human infectious diseases. Which one of these are transmitted through mechanical carriers?

**27.** (a) Write the palindromic nucleotide for the following DNA segment : 5′-GAATTC-3′

(b) Name the restriction endonuclease that recognises this sequence.

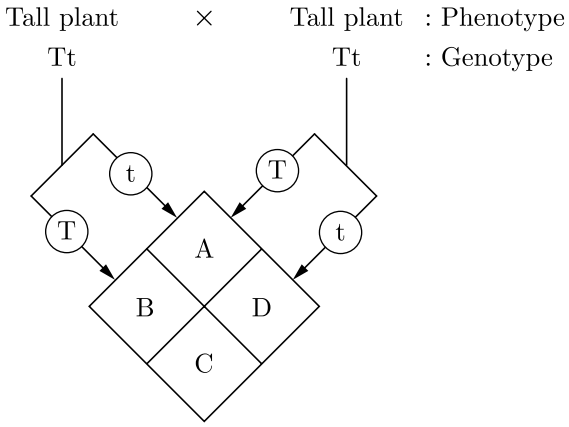
(c) How are 'sticky-ends' produced? Mention their role.

**28.** A particular species of wild cat is endangered. In order to save them from extinction, which is a desirable in situ or ex situ? Justify your answer and explain the difference between the two approaches.

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** Look at the diagram and answer the following questions.




(a) Write the genotypes of A, B, C, D.

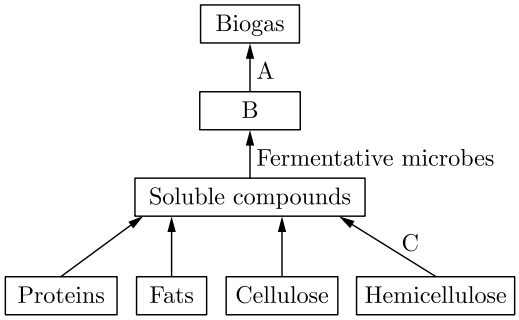
(b) Write the phenotypes of A, B, C, D.

(c) Write phenotypic and genotypic ratio of progeny.

**OR**

(c) Write the conclusions Mendel arrived at on dominance of traits on the basis of monohybrid crosses that he carried out in pea plants.

**30.** Villagers in a place near Chambur started planning to make power supply for agricultural purposes from cow dung. They have started a biogas plant for the purpose. Study the flow chart for biogas production given below and answer the following questions.




(a) Mention the major component of biogas.

(b) Identify 'B' in the flow chart?

(c) What does A depicts in the given flow chart?

**OR**

(c) What are advantages of biogas?

# SECTION - E

**31.** (a) Describe the events of oogenesis with the help of schematic representation.

(b) Write two differences between oogenesis and spermatogenesis.

**OR**

(a) When a seed of an orange is squeezed, many embryos, instead of one are observed. Explain how it is possible.

(b) Are these embryos genetically similar or different? Comment.

**32.** (a) Describe the process of synthesis of fully functional *m*RNA in a eukaryotic cell.

(b) How is the process of *m*RNA synthesis different from that in prokaryotes?

**OR**

(a) The given flow chart highlighting the steps in DNA fingerprinting technique. Identify a, b, c, d, e and 1

Isolation of DNA from blood cells
↓
Cutting of DNA by 'a'
↓
Separation of DNA framents by electrophoresis using 'b'
↓
Transfer (blotting) of fragments to 'c' gel
↓
DNA splits into single strand
↓
Introduction of lanelled 'd' probe
↓
'e' of single strands with 'd'
↓
Detection of hybridised DNA fragments by 'f'

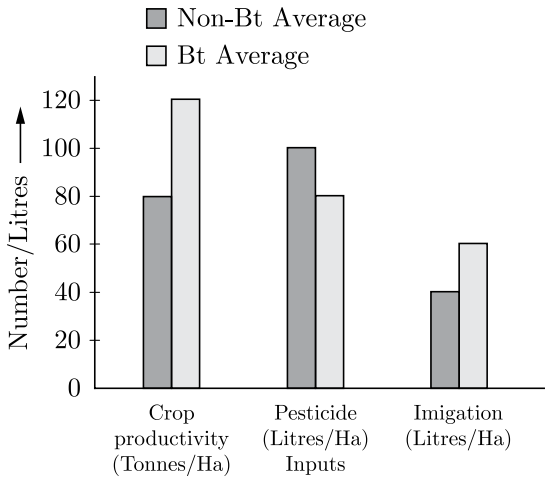
(b) List any two applications of DNA fingerprinting technique.

**33.** (a) Explain how to find whether an *E. coli* bacterium has transformed or not when a recombinant DNA bearing ampicillin resistant gene is transferred into it.

(b) What does the ampicillin resistant gene act as in the above case?

**OR**

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




Answer the following questions:

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

(ii) Which one of the crops would you like to cultivate in your farm and why?

(iii) Which one out of these two crops would a farmer from West Bengal like to cultivate and why?



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# Sample Paper 2

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** The structure in chromatin seen as 'beads-on string' when viewed under electron microscope are called

(a) nucleotides (b) nucleosides

(c) histone octamer (d) nucleosomes

**2.** For which of the following cases, population density can be easily determined by not utilising biological-entities directly?

(a) Fish density (b) Density of bacteria in bacterial culture

(c) Siberian cranes at Bharatpur wetlands (d) Tiger census

**3.** Identify the palindromic sequence in the following.

(a) $\frac{\text{GAATTC}}{\text{CTTUUG}}$ (b) $\frac{\text{GGATCC}}{\text{CCTAGG}}$

(c) $\frac{\text{CCTGG}}{\text{GGACC}}$ (d) $\frac{\text{CGATA}}{\text{GCTAA}}$

**4.** Identify the incorrect pair from the following with respect to angiosperms.

(a) Primary endosperm nucleus-3n (b) Antipodals-2n

(c) Cells of nucellus of ovule-2n (d) Vegetative cell of male gametophyte-n

**5.** Biochemical oxygen demand (BOD) in a river water

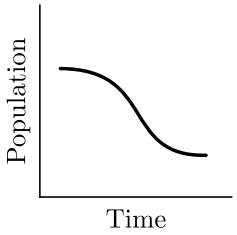
(a) has no relationship with concentration of oxygen in the water

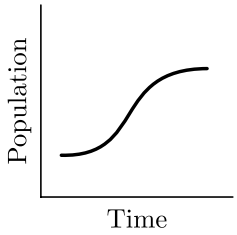
(b) gives a measure of Salmonella in the water

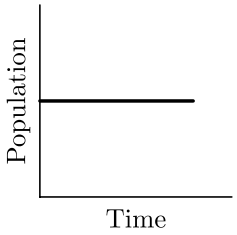
(c) increases when sewage added to river water

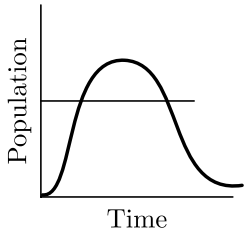
(d) remains unchanged when algal bloom occurs

**6.** In a given population of 2000 individuals, 80 births and 125 deaths were reported over a given period of time. Which of the following graphs will correspond to it?

(a) 


(b) 


(c) 


(d) 


**7.** A plant native to South America, which produces cocaine is

(a) Erythroxylum coca (b) Atropa belladonna

(c) Datura stramonium (d) Papaver somniferum

**8.** Match column I with column II.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Fimbriae | (i) | Oviduct |
| B. | Fallopian tube | (ii) | Capture ova released into coelom |
| C. | Infundibulum | (iii) | Site of fertilization |
| D. | Ampulla | (iv) | Part of oviduct closer to ovary |

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

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

**9.** Replacement of the lighter-coloured variety of peppered moth (Biston betularia) to its darker variety (Biston carbonaria) in England is the example of

(a) natural selection (b) regeneration

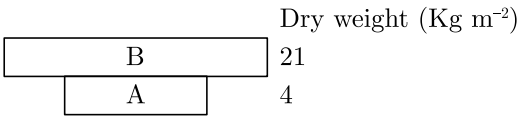
(c) genetic isolation (d) temporal isolation

**10.** The inoculum is added to the fresh milk in order to convert milk into curd, the term 'inoculum' here refers to

(a) a starter rich in vitamin $B_{12}$ (b) a starter rich in proteins

(c) a starter containing millions of LAB (d) an aerobic digester

**11.** Given figure represents a pyramid of biomass in an aquatic ecosystem.

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Identify A and B and select the correct answer.
(i) A is the crop which supports and B is the crop which is supported.
(ii) A is the crop which is supported and B is the crop which supports.
(iii) A is phytoplanktons and B is zooplanktons.
(iv) A is zooplanktons and B is phytoplanktons.

(a) (i) and (iv) (b) (ii) and (iii)
(c) (i) and (iii) (d) (ii) and (iv)

**12.** During insertional inactivation, the presence of a chromogenic substrate gives blue coloured colonies if the plasmid in the bacteria does not have an insert. The blue colour is produced by the enzyme

(a) $\alpha$-glucosidase (b) restriction endonuclease
(c) $\beta$-galactosidase (d) Taq polymerase

**13.** **Assertion :** The plant biomass which serves as the food of herbivores and decomposers is said to result from the net primary productivity.
**Reason :** Gross primary productivity is the rate of total production of organic material (biomass) during photosynthesis.

(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.

**14.** **Assertion :** In a monohybrid cross, $F_1$ generations indicate dominant characters.
**Reason :** Dominance occurs only in heterozygous state.

(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.

**15.** **Assertion :** Many endemic species are seen to flourish in sacred forests.
**Reason :** Sacred forests are undisturbed forest patches and biodiversity rich areas.

(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.

**16.** **Assertion :** The primary productivity of different ecosystems can be easily compared.
**Reason :** The magnitude of primary productivity depends on the photosynthetic capacity of producers and the prevailing environmental conditions.

(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.

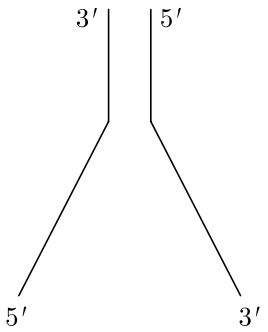
Continue on next page.....

# SECTION - B

**17.** What could be the possible treatments for a patient exhibiting ADA deficiency?

**18.** Where is sporopollenin present in plants? State its significance with reference to its chemical nature.

**19.** Refer to the given below figure.

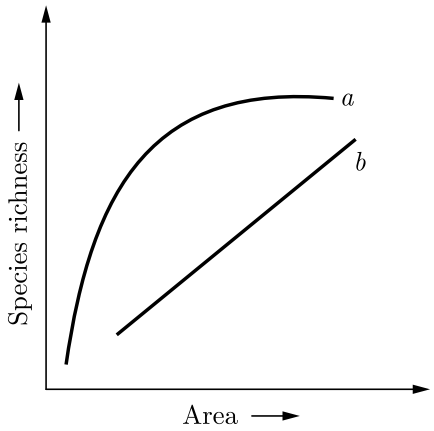



(a) Redraw the structure as a replicating fork and label the parts.

(b) Write the source of energy for this replication.

**20.** Name the genus of baculovirus that acts as a biological control agent in spite of being a pathogen. Justify by giving three reasons that make it an excellent candidate for the job.

**21.**




The above graph show species-area relationship. Write the equation of the curve 'a' and explain it.

**OR**

How does over-exploitation of beneficial species affect biodiversity? Explain with the help of one example.

# SECTION - C

**22.** Although a prokaryotic cell has no defined nucleus, yet DNA is not scattered throughout the cell. Explain.

**23.** A cross was carried out between two pea plants showing the contrasting traits of height of the plants. The result of the cross showed 50% parental characters.

(a) Work out the cross with the help of a Punnett square.

(b) Name the type of the cross carried out.

**24.** Prior to a sports event, blood and urine samples of sports persons are collected for drug tests.

(a) Why is there a need to conduct such tests?

(b) Name the drugs the authorities usually look for.

(c) Write the generic names of two plants from which these drugs are obtained.

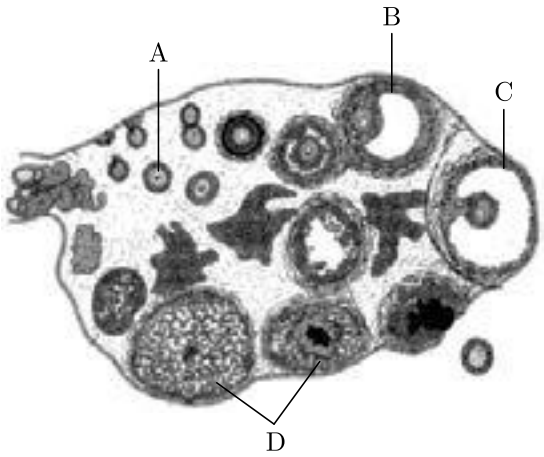
**25.** Why is predation required in a community of different organisms?

**OR**

(a) Explain "birth rate" in a population by taking a suitable example.

(b) Write the other two characterstics which only a population shows but an individual cannot.

**26.** Study the transverse section of human ovary given below and answer the questions that follow.




(a) Name the hormone that helps in growth of $A \rightarrow B \rightarrow C$

(b) Name the hormone secreted by A and B.

(c) State the role of hormone produced by D.

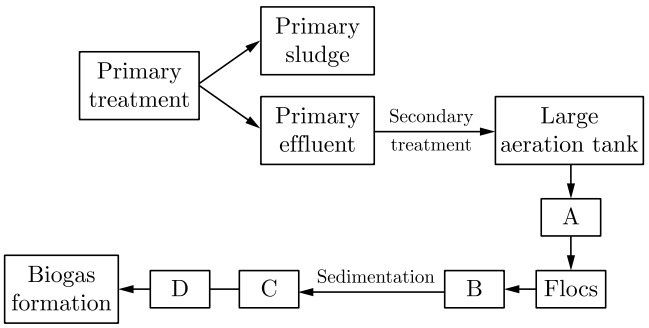
**27.** 'Plasmid is a boon to biotechnology'. Justify this statement quoting the production of human insulin as an example.

**28.** When does a geneticist need to carry a test cross? How is it carried?

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** Refer to the given below flow chart that shows the sewage treatment.




(a) With reference to the above flow chart explain the role of step A in the given process.

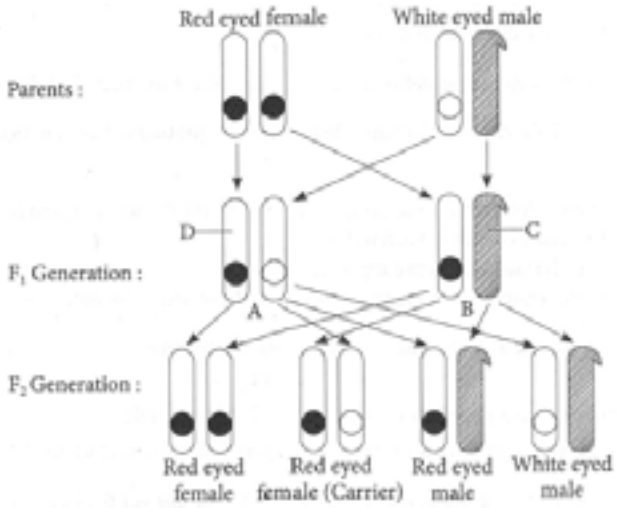
(b) Identify A, B, C and D in the given process.

(c) Explain the process at step D.

**OR**

(c) What is the significance of low B in the given process and how does it forms C?

**30.** Study the given figure and answer the following questions.




(a) Identify A, B, C and D from the given figure.

(b) What kind of inheritance is shown in the given the figure?

(c) State the significance of this inheritance in the above mentioned cross.

**OR**

(c) What would happen in the given cross if the parents phenotype be reversed i.e., white eyed female and red eyed male respectively?

# SECTION - E

**31.** An experiment 'X' provided evidence in support of 'Y'. In this experiment, four gases were circulated 'A', 'B', 'C, and 'D' in an air tight apparatus and electrical discharge from electrodes was passed at 800°C. The mixture of gases were passed through a condenser. After a week, the chemical composition of the liquid inside the apparatus was analysed. The results provided evidence through which 'Y' was more or less accepted.

(i) Identify gases A, B, C, D.
(ii) Which theory of origin of life is supported by the above experiment?
(iii) Draw a diagrammatic representation of experiment X.
(iv) What does A, B, C and D together produced in the experiment X?

**OR**

Explain three different ways in which natural selection can affect the frequency of a heritable trait in a population.

**32.** Give reasons why:

(a) DNA cannot pass into a host cell through the cell membrane.

(b) Proteases are added during isolation of DNA for genetic engineering.

(c) Single recognition site is preferred in a vector.

(d) Maintainance of sterile conditions in biotechnological processes.

(e) Genes encoding resistance to antibiotics considered as useful selectable markers for E.coli cloning vector.

**OR**

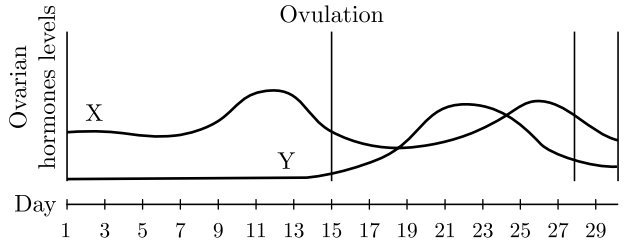
Causative agents of HIV-AIDS and COVID-19 belong to the same group of viruses. To diagnose and amplify the genetic material for further study of COVID-19 virus, 'RT-PCR' test is carried out.

(a) What does 'RT-PCR' stand for?

(b) Explain the various steps of PCR technique.

**33.** Study the graph given below related with menstrual cycle in females:

(a) Identify ovarian hormones X and Y mentioned in the graph and specify their source.

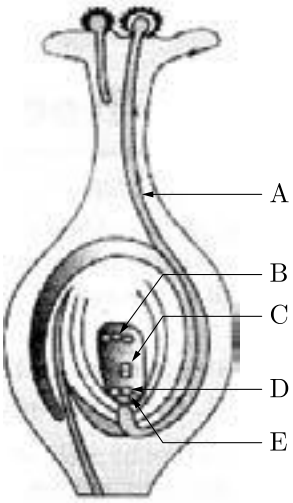



(b) Correlate and describe the uterine events that take place according to the ovarian hormone levels X and Y mentioned in the graph on -

(i) 6 - 15 days
(ii) 16 - 25 days
(iii) 26 - 28 days (when ovum is not fertilised)

**OR**

Refer the given below figure and answer the questions that follows:




(i) What phenomenon is represented in the above given figure ?
(ii) What is the path of entry of pollen tube ?
(iii) Label the parts marked as A to E.
(iv) What will happen after entering of pollen into one of the synergids?

# Sample Paper 3

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** Level of which hormones get elevated by the intake of nicotine?

(a) FSH, LH
(b) Thyroxine, progesterone
(c) Oxytocin, prolactin
(d) Adrenaline, nor-adrenaline

**2.** From bacteria to human nearly universal code for phenylalanine is

(a) UUU
(b) UUA
(c) UUG
(d) CUU

**3.** In a population of 500 zebras, average natality is 25, average mortality is 20, immigration is 30 and emigration is 35. What will be the population at the end of 10 years?

(a) 550
(b) 600
(c) 650
(d) 500

**4.** An urn shaped population age pyramid represents

(a) growing population
(b) static population
(c) declining population
(d) extinct population

**5.** Select the option that correctly identifies A, B and C in the given table.

| **Organism** | **Trophic level** | **Food chain** |
|---|---|---|
| Eagle | A | Grazing |
| Earthworm | Primary consumer | B |
| Frog | C | Grazing |

(a) A-Top carnivore, B-Detritus, C-Secondary consumer
(b) A-Top carnivore, B-Detritus, C-Primary consumer
(c) A-Secondary consumer, B-Grazing, C-Secondary consumer
(d) A-Scavanger, B-Grazing, C-Producer

**6.** The main reason why antibiotics could not always treat the bacteria-mediated diseases is

(a) insensitivity of the individual following prolonged exposure to antibiotics

(b) inactivation of antibiotics by bacterial enzymes

(c) decreased efficiency of immune system

(d) the development of mutant bacterial strains resistant to antibiotics.

**7.** Match column I with column II and select the correct option from the given codes.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Methanogens | (i) | BOD |
| B. | Fermentors | (ii) | Methane rich fuel gas |
| C. | Organic waste in water | (iii) | Production of methane |
| D. | Biogas | (iv) | Large vessels for growing microbes |

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

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

**8.** Having become an expert on gel electrophoresis, you are asked to examine a gel. Where would you find the smallest segments of DNA?

(a) Near the positive electrode, farthest away from the wells

(b) Near the negative electrode, close to the wells

(c) Near the negative electrode, farthest away from the wells

(d) Near the middle, they tend to slow down after the first few minutes

**9.** Which among the following birth control measures is considered to be highly effective?

(a) The rhythm method (b) The use of physical barriers

(c) Contraceptive pills (d) Sterilisation techniques

**10.** Hugo de Vries gave his mutation theory on organic evolution while working on

(a) Pisum sativum (b) Drosophila melanogaster

(c) Oenothera lamarckiana (d) Althea rosea

**11.** The most important human activity, leading to the extinction of wildlife, is

(a) pollution of air and water (b) hunting for valuable wildlife products

(c) introduction of alien species (d) alteration and destruction of the natural habitats.

**12.** Match column I with column II and select the correct option from the codes given below.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Hyaluronidase | (i) | Acrosomal reaction |
| B. | Corpus luteum | (ii) | Embryonic development |
| C. | Gastrulation | (iii) | Progesterone |
| D. | Colostrum | (iv) | Mammary gland |

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

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

**13.** **Assertion :** Infundibulum is a funnel-shaped part closer to ovary.
**Reason :** The edges of infundibulum helps in collection of the ovum after ovulation.

(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.

**14.** **Assertion :** Agrobacterium tumefaciens is called natural genetic engineer.
**Reason :** Agrobacterium tumefaciens infects all broad-leaved agricultural crops but does not infect cereal crops.

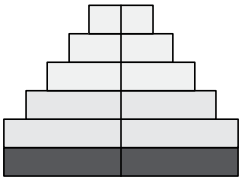
(a) Both A and R are true and R is the correct explanation of A.

(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.

**15.** Age sex structure of a population can be depicted in the form of a pyramid by plotting the percentage of population of each sex in each age class. Study this pyramid and comment upon the appropriateness of the Assertion and the Reason.



**Assertion :** It is a bell-shaped age pyramid.
**Reason :** In a stable population, proportion of individuals in reproductive age group is higher than the individuals in pre-reproductive age group.

(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.

**16.** **Assertion :** In eukaryotes, replication and transcription occur in the nucleus but translation occurs in the cytoplasm.
**Reason :** *m*RNA is transferred from the nucleus to the cytoplasm where ribosomes and amino acids are available for protein synthesis.

(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.

# SECTION - B

**17.** A student on a school trip started sneezing and wheezing soon after reaching the hill station for no explained reasons. But, on return to the plains, the symptoms disappeared. What is such a response called? How does the body produce it?

**18.** Study the given diagram.


A is an embryonic stage that gets transformed into B, which in turn gets implanted in the endometrium in human females.

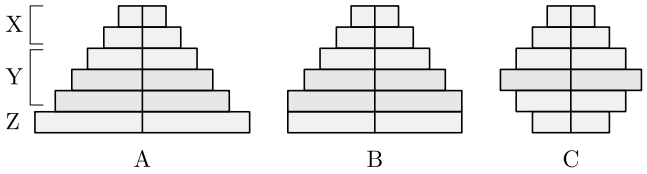
(a) Identify A, B and its parts C and D.

(b) State the fate of C and D in the course of embryonic development in humans.

**19.** In a typical monohybrid cross the $F_2$ population ratio is written as 3 : 1 for phenotype but expressed as 1 : 2 : 1 for genotype. Discuss with the help of an example.

**20.** Draw the vector DNA and a foreign DNA showing the sites where *Eco*RI has acted to form the sticky ends.

**21.** The given figure shows the different types of age pyramids for human population.




(a) What does the parts 'X, 'Y' and 'Z' represent?

(b) Which type of population is represented by pyramids A, B and C? Explain.

**OR**

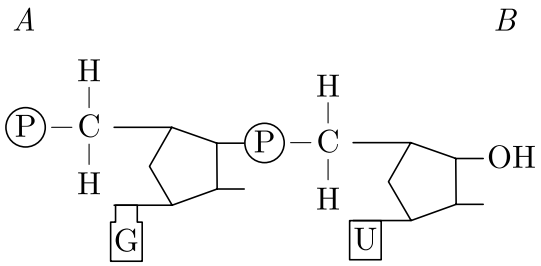
Why the pyramid of energy is always upright? Explain.

# SECTION - C

**22.** The sacred groves of Aravalli Hills and Ooty botanical garden both aim at biodiversity conservation. How do they differ in their approaches? Explain.

**23.** Write the mode of pollination in Vallisneria and water lily. Explain the mechanism of pollination in Vallisneria.

**24.** Answer the following based on the dinucleotide shown below.



(a) Name the type of sugar to which guanine base is attached.

(b) Name the linkage connecting the two nucleotides.

(c) Identify the 3′ end of the dinucleotide. Give a reason for your answer.

**25.** Briefly explain the implantation in an adult human female.

**26.** Refer to the given figure showing the variety of beaks of finches that Darwin found in Galapagos Island. Refer this figure and answer the following questions.

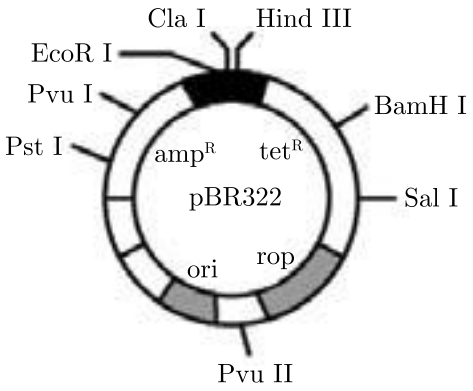
(a) What does the above figure depict?

(b) How did Darwin explain the existence of different varieties of finches on Galapagos Islands?

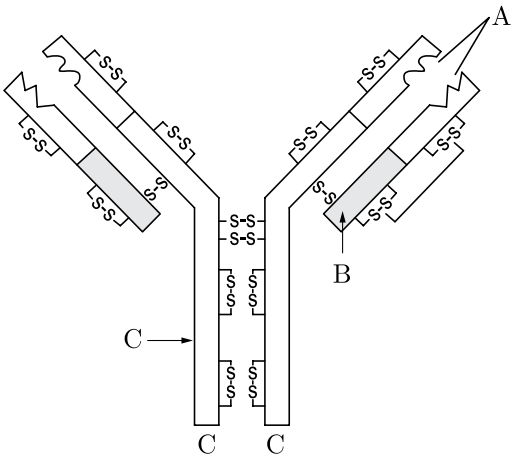
**27.** (a) Name the organism in which the vector shown is inserted to get the copies of the desired gene.

(b) Mention the area labelled in the vector responsible for controlling the copy number of the inserted gene.

(c) Name and explain the role of a selectable marker in the vector shown.




**28.** Identify A, B and C in the schematic diagram of an antibody given above and answer the questions.




Identify A, B and C in the schematic diagram of an antibody given above and answer the questions.

(a) Write the chemical nature of an antibody.

(b) Name the cells that produce antibodies in humans.

(c) Mention the type of immune response provided by an antibody.

**OR**

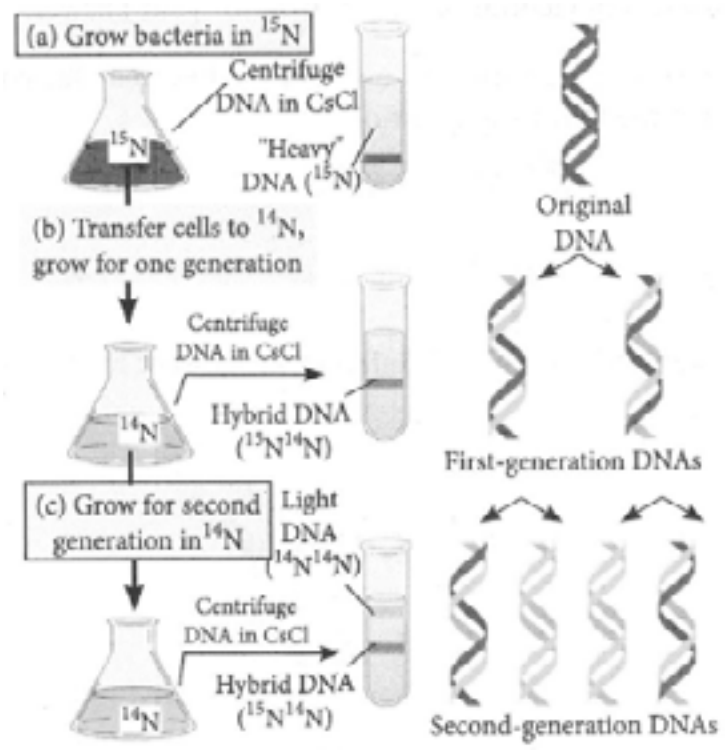
(a) Why do the symptoms of malaria not appear immediately after the entry of sporozoites into the human body when bitten by female Anopheles? Explain.

(b) Give the scientific name of the malarial parasite that causes malignant malaria in humans.

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** In 1958, Matthew Meselson and Franklin Stahl provided a strong experimental evidence to prove the template mechanism of DNA replication given by Watson and Crick. They used heavy ($^{15}N$) and light ($^{14}N$) isotopes of nitrogen to differentiate between parental and newly synthesised DNA strands. The experiment and results are diagrammatically shown below.




(a) What does the given experiment show?

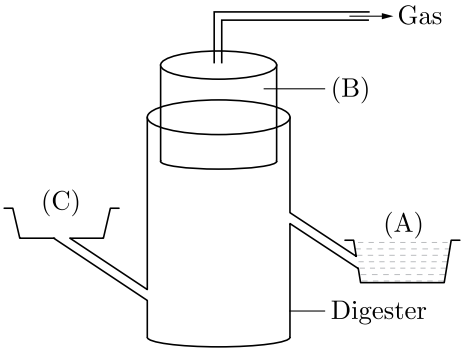
(b) Which bacteria are used in the above experiment?

(c) What would be the ratio of $^{15}N$ : $^{14}N$ DNA strands in *E.coli* extracted DNA after generation '2'?

**OR**

(d) If *E. coli* is allowed to grow in $N^{15}$ medium for 20 minutes and in $N^{14}$ medium for next 40 minutes, then what will be the number of hybrid and light double stranded DNA molecules respectively?

**30.** Biogas generation is done on a large scale in rural India. The given diagram shows a typical biogas plant.




(a) Identify A, B and C.

(b) Name the bacteria involved in the production of biogas.

(c) Name the animals in which methanogens occur and the role they play there.

**OR**

(d) How biogas is generated from activated sludge?

# SECTION - E

**31.** If a desired gene is identified in an organism for some experiments, explain the process of the following :

(a) Cutting of desired gene at specific locations.

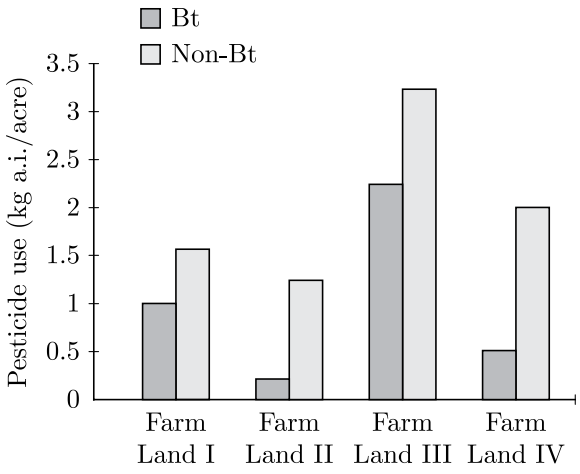
(b) Synthesis of multiple copies of the desired gene.

**OR**

GM crops especially Bt crops are known to have higher resistance to pest attacks. To substantiate this an experimental study was conducted in 4 different farmlands growing Bt and non Bt-Cotton crops. The farm lands had the same dimensions, fertility and were under similar climatic conditions. The histogram below shows the usage of pesticides on Bt crops and non-Bt crops in these farm lands.

(a) Which of the above 4 farm lands has successfully applied the concepts of biotechnology to show better management practices and use of agrochemicals? If you had to cultivate, which crop would you prefer (Bt or Non- Bt) and why?

(b) Cotton bollworms were introduced in another experimental study on the above farm lands wherein no pesticide was used. Explain what effect would a Bt and Non-Bt crop have on the pest.



**32.** Describe the post-zygotic events leading to implantation and placenta formation in humans. Mention any two functions of placenta.

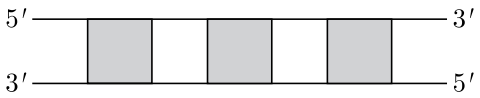
**OR**

(a) Draw a diagram of an enlarged view of T.S. of one microsporangium of an angiosperm and label the following parts:
(i) Tapetum
(ii) Middle layer
(iii) Endothecium
(iv) Microspore mother cells

(b) Mention the function of tapetum.

(c) Explain the following by giving reasons:
(i) Pollen grains are well preserved as fossils.
(ii) Pollen tablets are in use by people these days.

**33.** Illustrated below is a DNA segment, which constitute a gene




(i) Will the whole gene be transcribed into RNA primarily? State 'Yes' or 'No'.
(ii) Name the shaded and unshaded parts of the gene.
(iii) Explain how these genes are expressed.
(iv) How is this gene different from prokaryotic gene in its expression?

**OR**

Study the schematic representation of the genes involved in the lac operon given below and answer the questions that follow:

| | | | | | | |
|---|---|---|---|---|---|---|
| $p$ | $i$ | $p$ | $o$ | $z$ | $y$ | $a$ |

(a) Identify and name the regulatory gene in this operon. Explain its role in 'switching off' the operon.

(b) Why is the lac operon's regulation referred to as negative regulation?

(c) Name the inducer molecule and the products of the genes '$z$' and '$y$' of the operon. Write the functions of these gene products.

□□□□□□□

# Sample Paper 4

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** Connel's field experiment showed that on the rockysea coasts of Scotland, larger barnacle Balanus dominates the intertidal area and removes the smaller barnade Chathamalus. This happened due to

(a) parasitism (b) predation

(c) mutualism (d) competition

**2.** Pyramid of biomass for a grazing food chain represents

(a) gradual decrease in biomass from apex to base

(b) gradual decrease in biomass from producers to the tertiary consumers

(c) gradual increase of the biomass from producers to the tertiary consumers

(d) no change in biomass

**3.** In assisted reproductive technology, IVF involves transfer of

(a) ovum into the fallopian tube

(b) zygote into the fallopian tube

(c) zygote into the uterus

(d) embryo with 16 blastomeres into the fallopian tube.

**4.** During the purification process for recombinant DNA technology, addition of chilled ethanol precipitates out

(a) polysaccharides (b) RNA

(c) DNA (d) histones

**5.** In a dihybrid cross, if you get 9:3:3:1 ratio it denotes that

(a) the alleles of two genes are interacting with each other

(b) it is a multigenic inheritance

(c) it is a case of multiple allelism

(d) the alleles of two genes are segregating independently.

**6.** The annual net primary productivity of the whole biosphere is approximately

(a) 150 billion tons (b) 160 billion tons

(c) 170 billion tons (d) 180 billion tons

**7.** Which of the following is a non-symbiotic biofertiliser?

(a) Nostoc (b) Azotobacter

(c) Anabaena (d) Rhizobium

**8.** Match column I with column II and select the correct option from the given codes.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Glomus | (i) | Mosquitoes |
| B. | Bacillus thuringiensis | (ii) | Phosphorus nutrition |
| C. | Root nodules | (iii) | Leghaemoglobin |
| D. | Ladybird | (iv) | Bioinsecticide |

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

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

**9.** Maximum species diversity is seen in latitudinal range of

(a) 23.5° N to 66.5° N (b) 23.5° N to 23.5° S

(c) 23.5° S to 66.5° S (d) 66.5° N to 90° N

**10.** Organic farming includes

(a) use of fertilisers and pesticides of biological origin (b) IPM (Integrated Pest Management)

(c) use of green manures (d) all of these

**11.** What is the criterion for movement of DNA fragments on agarose gel during gel electrophoresis?

(a) The smaller the fragment size, the farther it moves. (b) Positively charged fragments move to farther end.

(c) Negatively charged fragments do not move. (d) The larger the fragment size, the farther it moves.

**12.** Match column I with column II and select the correct option from the given codes.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Sigma factor | (i) | 5′ - 3′ |
| B. | Capping | (ii) | Initiation |
| C. | Tailing | (iii) | Termination |
| D. | Coding strand | (iv) | 5′ end |
| | | (v) | 3′ end |

(a) A-(iii), B-(v), C-(iv), D-(ii) (b) A-(ii), B-(iv), C-(v), D-(i)

(c) A-(ii), B- (iv), C-(v), D-(iii) (d) A-(iii), B-(v), C-(iv), D-(i)

**13.** **Assertion :** In barrier methods, ovum and sperms are prevented from physical meeting.
**Reason :** Barrier methods are used during coitus, to prevent the entry of ejaculated semen into the female reproductive tract.

(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.

**14.** **Assertion :** If the species-area relationships are analysed among very large areas like the entire continents, the value of Z i.e., slope of line lies in the range of D.1 to 0.2.
**Reason :** The value of Z for frugivorous birds and mammals in the tropical forests is found to be 1.15.

(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.

**15.** The given below figures show the different modification found in Bougainvillea and Cucurbita. Observe the figures carefully and comment upon the appropriateness of the Assertion and Reason.


Bougainvillea Cucurbita

**Assertion :** The given structures X and Y show convergent evolution.
**Reason :** Structures X and Y are modified stems that perform different functions.

(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.

**16.** **Assertion :** Ex-albuminous seeds do not possess any residual endosperm, as it is completely consumed during embryo development.
**Reason :** Wheat, castor, pea and groundnut all are examples of ex-albuminous seeds.

(a) Both A and R are true and R is the correct explanation of A.

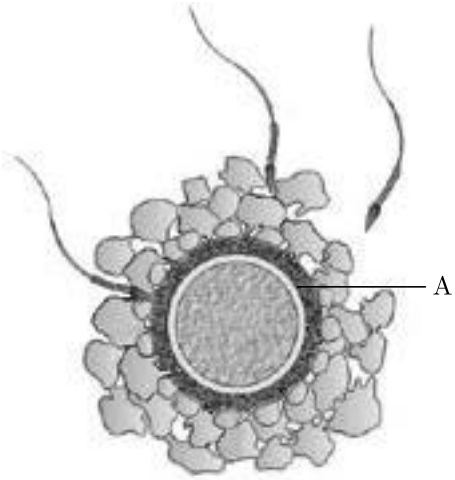
(b) Both A and R are true and R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

# SECTION - B

**17.** Refer to the given figure and answer the following questions:




(a) One of the sperms is observed to penetrate 'A' of the ovum, as shown in the above diagram. Name 'A'.

(b) Why only one sperm can penetrate and fertilise the ovum?

**18.** In snapdragon a cross between true-breeding red flowered (RR) plants and true-breeding white flowered (rr) plants showed a progeny of plants with all pink flowers.

(a) The appearance of pink flowers is not known as blending. Why?

(b) What is this phenomenon known as?

**19.** Mention one application for each of the following :

(a) Passive immunisation

(b) Antihistamine

(c) Colostrum

(d) Cytokinin-barrier

**20.** (a) How can we find whether an E. coli bacterium has transformed or not when a recombinant DNA bearing ampicillin resistant gene is transferred into it?

(b) What does the ampicillin resistant gene act as in the above case?

**21.** (a) How many primary producers do you think will be needed to support six tertiary consumers in a grassland ecosystem?

(b) Draw a grassland pyramid to substantiate your answer.

**OR**

Define the following terms :

(a) Productivity

(b) Humification

# SECTION - C

**22.** Explain the events in a normal woman during her menstrual cycle on the following days:

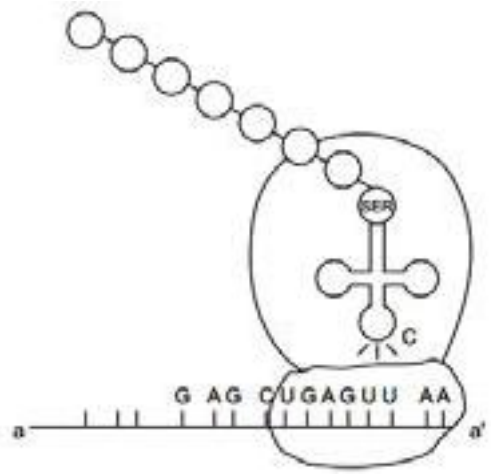
(a) Ovarian event from 13-15 days

(b) Ovarian hormones level from 16 to 23 days

(c) Uterine events from 24 to 29 days

**23.** Describe the characteristic features of wind pollinated flowers.

**24.**




(a) Identify the polarity from a to $a'$ in the above diagram and mention how many more amino acids are expected to be added to this polypeptide chain.

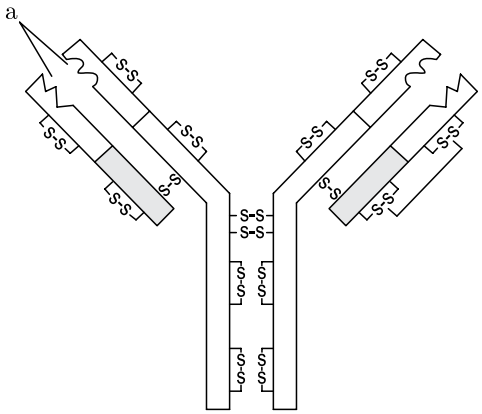
(b) Mention the DNA sequence coding for serine and the anticodon of $t$RNA for the same amino acid.

(c) Why are some untranslated sequence of bases seen in $m$RNA coding for a polypeptide? Where exactly are they present on $m$RNA?

**25.** (a) Describe Hardy-Weinberg equilibrium.

(b) List any four factors which affect genetic equilibrium.

**26.** (i) Identify the molecule shown and the site labelled 'A'.




Continue on next page.....

(ii) Why is this molecule referred to as $H_2L_2$? Explain.
(iii) Mention the chemical nature of given molecule and type of cells they are produced by?

**OR**

Give the scientific name of the parasite that causes malignant malaria in humans. At what stage does this parasite enter the human body? Trace its life cycle in human body.

**27.** A segment of foreign DNA and that of a vector DNA are cut with restriction endonuclease to form a recombinant DNA. Show with the help of schematic diagrams.

(a) The set of palindromic nucleotide sequence of base pairs the *Eco*RI will recognise in both the DNA segments. Mark the site at which *Eco*RI will act and cut both the segments.

(b) Sticky ends formed on both the segments where the two DNA segments will join later to form a recombinant DNA.

**28.** There are many animals that have become extinct in the wild but continue to be maintained in Zoological parks.

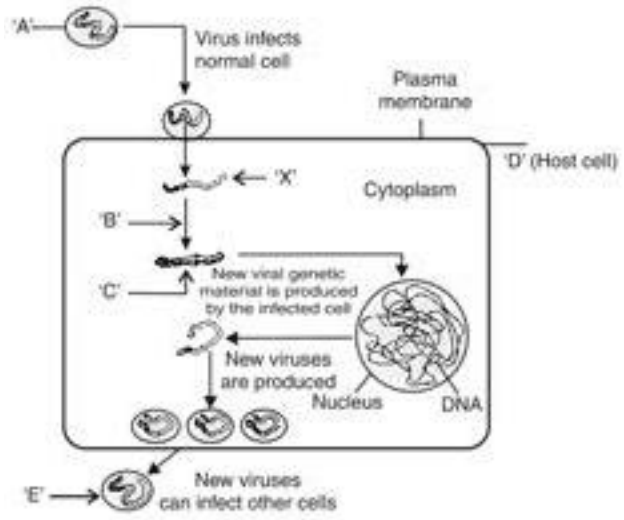
(a) What type of biodiversity conservation is observed in this case?

(b) Explain any other two ways which help in this type of conservation.

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** Study the diagram showing replication of HIV in humans and answer the following questions accordingly.




(a) Write the chemical nature of the coat 'A'.

(b) Name the enzyme 'B' acting on 'X' to produce molecule 'C'. Name 'C'.

(c) Mention the name of the host cell 'D' the HIV attacks first when it enters into the human body. How does HIV differ from a bacteriophage

**OR**

(c) Name the two different cells the new viruses 'E' subsequently attack. What are two ways of transmission of HIV infection in humans other than sexual contact.

**30.** Study the schematic representation of the genes involved in the lac operon given below and answer the questions that follow:

| | | | | | | |
|---|---|---|---|---|---|---|
| $p$ | $i$ | $p$ | $o$ | $z$ | $y$ | $a$ |

(a) Identify and name the regulatory gene in this operon.

(b) What is the role of inducer in the given figure?

(c) Why is the lac operon's regulation referred to as negative regulation?

**OR**

(c) Name the inducer molecule and the products of the genes '$z$' and '$y$' of the operon. Write the functions of these gene products.

# SECTION - E

**31.** Mention the site of fertilisation of a human female. List the events that follow in sequence until the implantation of the blastocyst.

**OR**

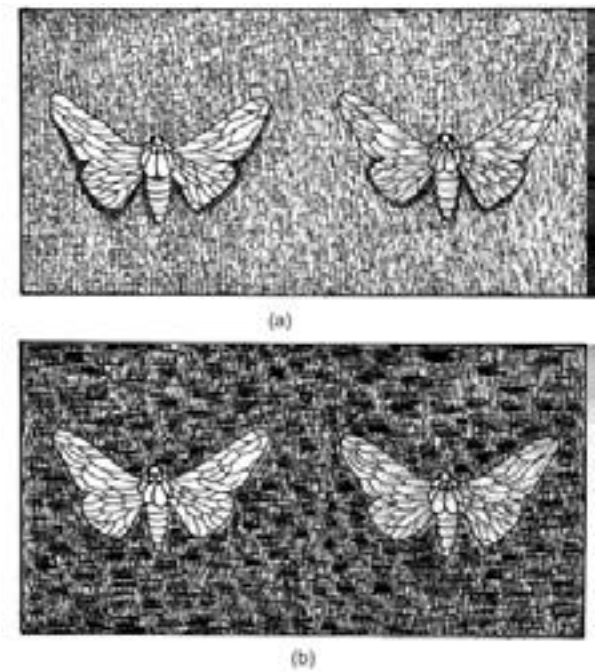
Write briefly the role of pollination in the growth and development in an angiosperm.

**32.**

(a) Write your observations on the variations seen in the Darwin's finches shown above.

(b) Explain what conclusions did he draw and how.

**OR**




(i) What do these pictures 'a' and 'b' illustrate with reference to evolution? Explain.

(ii) How does industrial melanism support Darwin's theory of natural selection? Explain.

**33.** Unless the vector and source DNA are cut, fragments separated and joined, the desired recombinant vector molecule cannot be created.

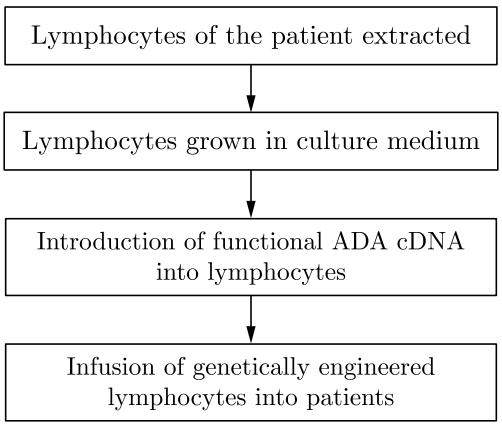
(a) How are the desirable DNA sequences cut?

(b) Explain the technique used to separate the cut fragments.

(c) How are the resultant fragments joined to the vector DNA molecule?

**OR**

The clinical gene therapy is given to a 4-years old patient for an enzyme which is crucial for the immune system to function. Observe the given flow chart of gene therapy and answer the following questions.




(a) Identify the disease to be cured with gene therapy.

(b) Why the above method is not a complete solution to the problem?

(c) Mention a possible permanent cure for this disease.

# Sample Paper 5

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** Swathi was growing a bacterial colony in a culture flask under ideal laboratory conditions where the resources are replenished. Which of the following equations will represent the growth in this case? (Where population size is $N$, birth rate is $b$, death rate is $d$, unit time period is $t$, and carrying capacity is $K$).

(a) dN/dt = KN

(b) dN/dt = r N

(c) dN/dt = r N(K-N/K)

(d) dN/dt = r N(K+N/K)

**2.** Which of the following food chains is the major conduit for energy flow in terrestrial and aquatic ecosystems respectively?

| | **Terrestrial ecosystem** | **Aquatic ecosystem** |
|---|---|---|
| (a) | Grazing | Grazing |
| (b) | Detritus | Detritus |
| (c) | Detritus | Grazing |
| (d) | Grazing | Detritus |

**3.** Interferons are most effective in making non-infected cells resistant against the spread of which of the following diseases in humans?

(a) Ascariasis

(b) Ringworm

(c) Amoebiasis

(d) AIDS

**4.** Which of the following water samples in the table given below, will have a higher concentration of organic matter?

| | Level of pollution | Value of BOD |
|---|---|---|
| (a) | High | High |
| (b) | Low | Low |
| (c) | Low | High |
| (d) | High | Low |

**5.** Sea anemone gets attached to the surface of the hermit crab. The kind of population interaction exhibited in this case is

(a) amensalism

(b) commensalism

(c) mutualism

(d) parasitism

**6.** Which of the following is an example of ex situ conservation?

(a) Sacred Groves (b) National Park

(c) Biosphere Reserve (d) Seed Bank

**7.** Evolutionary convergence is development of a

(a) common set of functions in groups of different ancestry

(b) dissimilar set of functions in closely related groups

(c) common set of structures in closely related groups

(d) dissimilar set of functions in unrelated groups.

**8.** Apis mellifera are killer bees possessing toxic bee venom. Identify the treatment and the type of immunity developed from the given table to treat a person against the venom of this bee.

| | Remedy | Immunity |
|---|---|---|
| (a) | Inactivated proteins | Active |
| (b) | Proteins of the venom | Passive |
| (c) | Preformed antibodies | Passive |
| (d) | Dead micro-organisms | Active |

**9.** An infertile couple was advised to undergo in vitro fertilisation by the doctor. Out of the options given below, select the correct stage for transfer to the fallopian tube for successful results?

(a) Zygote only (b) Zygote or early embryo upto 8 blastomeres

(c) Embryos with more than 8 blastomeres (d) Blastocyst Stage

**10.** Which of the following amino acid residues will constitute the histone core?

(a) Lysine and Arginine (b) Asparagine and Arginine

(c) Glutamine and Lysine (d) Asparagine and Glutamine

**11.** The given figure shows the structure of a plasmid.
A foreign DNA was ligated at BamH1. The transformants were then grown in a medium containing antibiotics tetracycline and ampicillin.
Choose the correct observation for the growth of bacterial colonies from the given table.

| | **Medium with tetracycline** | **Medium with ampicillin** |
|---|---|---|
| (a) | Growth | No growth |
| (b) | No growth | Growth |
| (c) | No growth | No growth |
| (d) | Growth | Growth |

**12.** Given below are four contraceptive methods and their modes of action. Select the correct match.

| | **Method** | | **Mode of action** |
|---|---|---|---|
| (A) | Condom | (i) | Ovum not able to reach fallopian tube |
| (B) | Vasectomy | (ii) | Prevents ovulation |
| (C) | Pill | (iii) | Prevents sperm reaching the cervix |
| (D) | Tubectomy | (iv) | Semen contains no sperms |

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

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

**13.** **Assertion :** When white eyed, yellow bodied Drosophila females were hybridised with red eyed, brown-bodied males; and $F_1$ progeny was intercrossed, $F_2$ ratio deviated from 9 : 3 : 3 : 1.
**Reason :** When two genes in a dihybrid are on the same chromosome, the proportion of parental gene combinations is much higher than the non-parental type.

(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.

**14.** **Assertion :** Apomictic embryos are genetically identical to the parent plant.
**Reason :** Apomixis is the production of seeds without fertilisation.

(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.

**15.** Given is the age pyramid of population in one of the states in India as per 2011 census. It depicts the male population on the left hand side, female population on the right hand side, newborns towards the base and gradually increasing age groups as we move from base to the top, with the oldest population at the top. Study this pyramid and comment upon the appropriateness of the Assertion and the Reason.

**Assertion :** It is a stable population.
**Reason :** The pre-reproductive and reproductive individuals are almost in equal numbers and the post-reproductive individuals are relatively fewer.

(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.

**16.** **Assertion :** Functional ADA cDNA genes must be inserted in the lymphocytes at the early embryonic stage.
**Reason :** Cells in the embryonic stage are mortal, differentiated and easy to manipulate.

(a) Both A and R are true and R is the correct explanation of A.

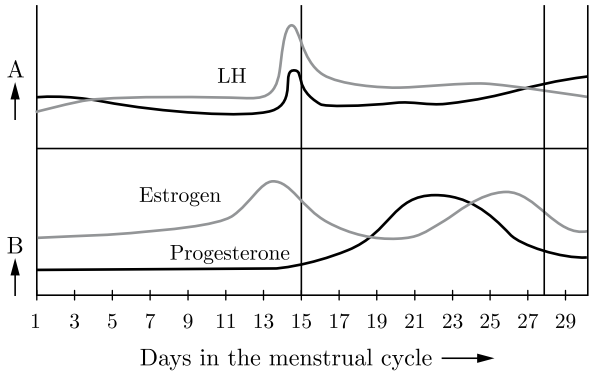
(b) Both A and R are true and R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

# SECTION - B

**17.** In the figure given below, parts A and B show the level of hormones which influence the menstrual cycle. Study the figure and answer the questions that follow:




(a) Name the organs which secrete the hormones represented in parts A and B.

(b) State the impact of the hormones in part B on the uterus of the human female during 6 to 15 days of menstrual cycle.

**18.** A true breeding pea plant, homozygous dominant for inflated green pods is crossed with another pea plant with constricted yellow pods (ffgg). With the help of Punnett square show the above cross and mention the results obtained phenotypically and genotypically in $F_1$ generation?

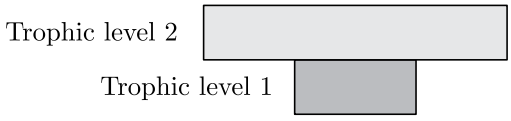
**19.** During a field trip, one of your friend in the group suddenly became unwell, she started sneezing and had trouble in breathing.
Name and explain the term associated with such sudden responses. What would the doctor recommend for relief?

**20.** CTTAAG
GAATTC

(a) What are such sequences called? Name the enzyme used that recognises such nucleotide sequences.

(b) What is their significance in biotechnology?

**21.** (a) Given below is a pyramid of biomass in an ecosystem where each bar represents the standing crop available in the trophic level. With the help of an example explain the conditions where this kind of pyramid is possible in nature.




(b) Will the pyramid of energy be also of the same shape in this situation? Give reason for your response.

**OR**

(a) Draw a pyramid of numbers where a large number of insects are feeding on the leaves of a tree. What is the shape of this pyramid?

(b) Will the pyramid of energy be also of the same shape in this situation? Give reason for your response.

# SECTION - C

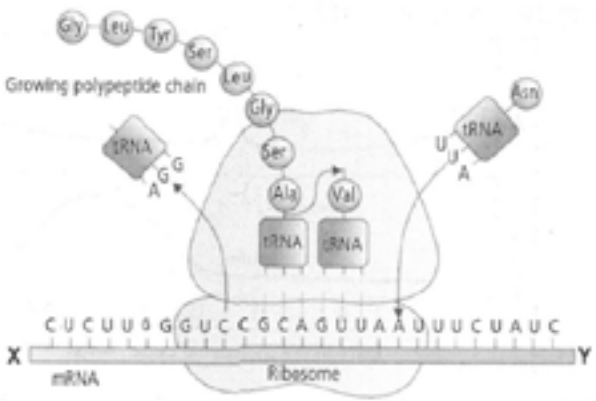
**22.** Explain the functions of the following structures in the human male reproductive system.

(a) Scrotum, (b) Leydig cells, (c) Male accessory glands

**23.** State the agent(s) which helps in pollinating the following plants. Explain the adaptations in these plants to ensure pollination :

(a) Corn, (b) Water hyacinth, (c) Vallisneria

**24.** (a) Identify the polarity of X to Y in the diagram below and mention how many more amino acids are expected to be added to this polypeptide chain.




(b) Mention the codon and anticodon for alanine.

(c) Why are some untranslated sequences of bases seen in *m*RNA coding for a polypeptide? Where exactly are they present on *m*RNA?

**25.** (a) How is Hardy-Weinberg's expression "$(p^2 + 2pq+q^2) = 1$"derived?

(b) List any two factors that can disturb the genetic equilibrium.

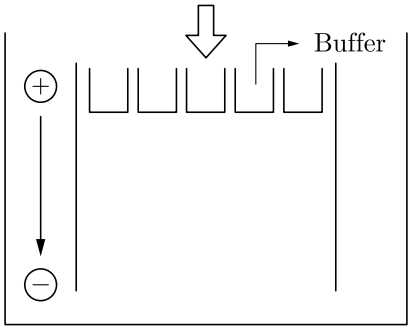
**26.** Highlight the structural importance of an antibody molecule with a diagram. Name the four types of antibodies found to give a humoral immune response, mentioning the functions of two of them you have studied.

**OR**

(a) Explain the life cycle of Plasmodium starting from its entry in the body of female Anopheles till the completion of its life cycle in humans.

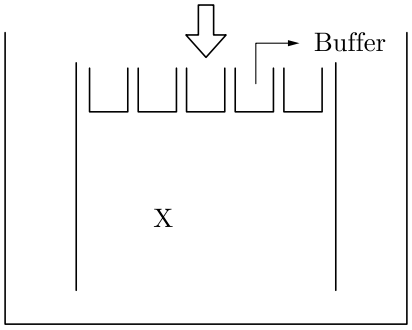
(b) Explain the cause of periodic recurrence of chill and high fever during malarial attack in humans.

**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.



(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?

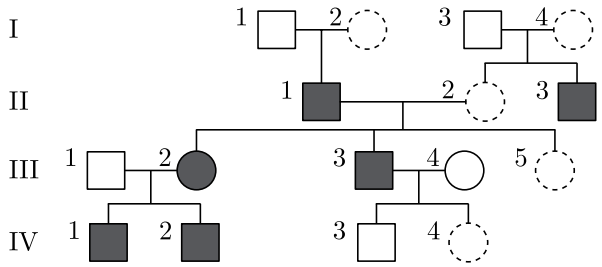
**28.** (a) There was loss of biodiversity in an ecosystem due to a new construction project in that area. What would be its impact on the ecosystem? State any three.

(b) List any three major causes of loss of biodiversity.

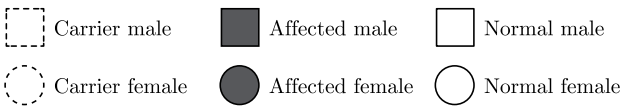
# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** Study the Pedigree chart given below and answer the questions that follow:




Symbols used in the given pedigree chart are as follows :




(a) On the basis of the inheritance pattern exhibited in this pedigree chart, what conclusion can you draw about the pattern of inheritance?

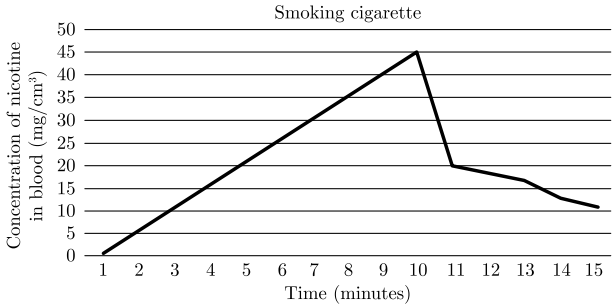
(b) If the female is homozygous for the affected trait in this pedigree chart, then what percentage of her sons will be affected ?

(c) Give the genotype of offsprings 1,2,3 and 4 in III generation.

**OR**

(c) In this type of inheritance pattern, out of male and female children which one has less probability of receiving the trait from the parents? Give a reason.

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




(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?

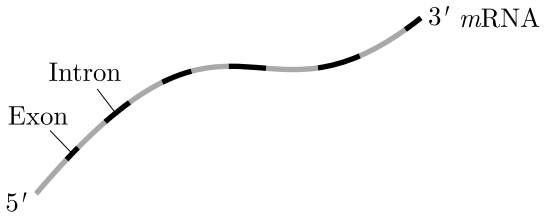
(c) How does cigarette smoking result in high blood pressure and increase in heart rate?

**OR**

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

# SECTION - E

**31.** Observe the segment of *m*RNA given below.




(a) Explain and illustrate the steps involved to make fully processed hnRNA.

(b) Gene encoding RNA Polymerase I and III have been affected by mutation in a cell. Explain its impact on the synthesis of polypeptide, stating reasons.

**OR**

Study the schematic representation of the genes involved in the lac operon given below and answer the questions that follow:

| | | | | | | |
|---|---|---|---|---|---|---|
| *p* | *i* | *p* | *o* | *z* | *y* | *a* |

(a) The active site of enzyme permease present in the cell membrane of a bacterium has been blocked by an inhibitor, how will it affect the lac operon?

(b) The protein produced by the i gene has become abnormal due to unknown reasons. Explain its impact on lactose metabolism stating the reason.

(c) If the nutrient medium for the bacteria contains only galactose; will operon be expressed? Justify your answer.

**32.** Oil spill is a major environmental issue. It has been found that different strains of Pseudomonas bacteria have genes to break down the four major groups of hydrocarbons in oil. Trials are underway to use different biotechnological tools to incorporate these genes and create a genetically engineered strain of Pseudomonas-a 'super-bug, to break down the four major groups of hydrocarbons in oil. Such bacteria might be sprayed onto surfaces polluted with oil to clean thin films of oil.

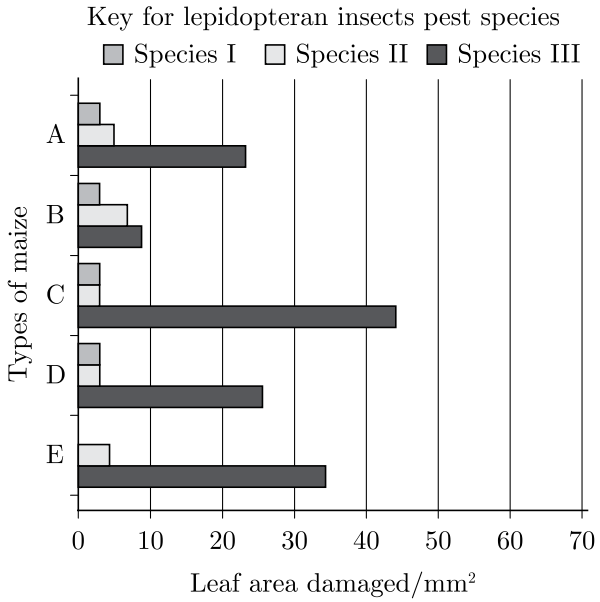
(a) List two advantages of using bacteria for such biotechnological studies.

(b) For amplification of the gene of interest PCR was carried out. The PCR was run with the help of polymerase which was functional only at a very low temperature. How will this impact the efficiency of the PCR? Justify.

(c) If such bacteria are sprayed on water bodies with oil spills, how will this have a positive or negative effect on the environment? Discuss.

**OR**

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.

(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?

**33.** Trace the events from copulation to zygote formation in a human female.

**OR**

Trace the development of a megaspore mother cell to the formation of mature embryo sac in a flowering plant.

□□□□□□□

# Sample Paper 6

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** Animal vectors are required for pollination in

(a) Vallisneria (b) Wheat

(c) Yucca (d) maize

**2.** During transcription, the site of DNA molecule at which RNA polymerase binds is called

(a) promoter (b) regulator

(c) receptor (d) enhancer

**3.** Match column I containing transgenic organisms with their specific characteristics in column II and select the correct option from the given codes.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Golden rice | (i) | Protein - enriched milk |
| B. | Bt cotton | (ii) | Increased shelf life |
| C. | Flavr Savr | (iii) | Enriched with vitamin A |
| D. | Rosie cow | (iv) | High yield and pest resistant |

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

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

**4.** Total number of individuals of a species per unit area and per unit time is called

(a) population size (b) population density

(c) demography (d) population dynamics

**5.** Gel electrophoresis is used for

(a) construction of recombinant DNA by joining with cloning vectors

(b) isolation of DNA molecules

(c) cutting of DNA into fragments

(d) separation of DNA fragments according to their size

**6.** Match column I with column II and select the correct option from the given codes.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Turner's syndrome | (i) | Trisomy |
| B. | Linkage | (ii) | AA + XO |
| C. | Y-chromosome | (iii) | Morgan |
| D. | Down's syndrome | (iv) | TDF |

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

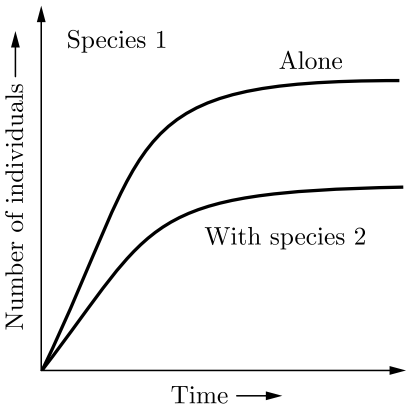
**7.** The primate which existed 15 mya was
(a) Homo habilis
(b) Australopithecus
(c) Ramapithecus
(d) Homo erectus

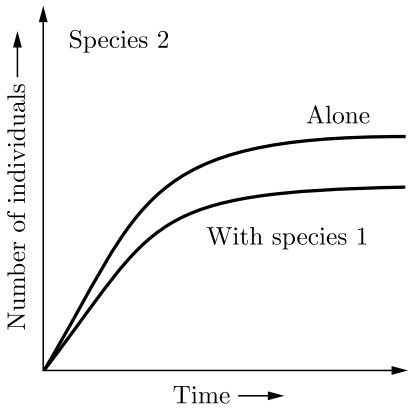
**8.** After an injury, usually ATS injection is given. It provides
(a) medication to kill tetanus bacteria
(b) passive immunity against bacteria.
(c) active immunity against tetanus bacteria
(d) none of these

**9.** How does vaccination work?
(a) The immune system produces antibodies which stay in the blood.
(b) Memory lymphocytes are produced. They remain in the body to fight off any future infection with the same pathogen.
(c) The dead pathogen stays in the body and constantly stimulates the immune system.
(d) All of these.

**10.** Which one of the following can be used as biofertiliser?
(a) Anabaena
(b) Azotobacter
(c) Azospirillum
(d) All of these

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



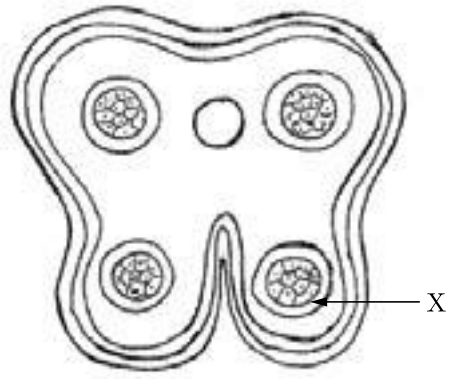

Which of the following conclusions can be drawn from the graphs?
(a) Competitive exclusion occurred in these experiments.
(b) Both species are affected by interspecific competition but species 1 is affected less.
(c) Both species are affected by interspecific competition but species 2 is affected less.
(d) Both species are affected equally by interspecific competition.

**12.** Match column I (terms) with column II (definitions) and select the correct option from the codes given below.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Parturition | (i) | Attachment of embryo to endometrium |
| B. | Gestation | (ii) | Release of egg from Graafian follicle |
| C. | Ovulation | (iii) | Delivery of baby from uterus |
| D. | Implantation | (iv) | Duration between pregnancy and birth |
| E. | Menopause | (v) | Formation of zygote by fusion of the egg and sperm. |
| | | (vi) | Stoppage of menstruation |

(a) A-(ii), B-(iv), C-(i), D-(v), E-(vi)
(b) A-(iv), B-(iii), C-(i), D-(v), E-(ii)
(c) A-(v), B-(vi), C-(ii), D-(iii), E-(iv)
(d) A-(iii), B-(iv), C-(ii), D-(i), E-(vi)

**13.** Given below is the figure of a transverse section of a young anther. It depicts a bilobed, tetragonal structure consisting of four microsporangia located at the corners; two in each lobe. Study this figure and comment upon the appropriateness of the Assertion and the Reason.




**Assertion :** 'X' represents innermost wall layer tapetum.
**Reason :** 'X' performs the function of protection only.

(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.

**14.** **Assertion :** Lion and jackal both feed on other animals.
**Reason :** Lion is a predator and jackal is a scavanger.

(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.

**15.** **Assertion :** The amount of energy decreases at successive trophic levels.
**Reason :** Energy does not remain trapped permanently in any organism, it is either passed on to higher trophic level or becomes available to detritivores and decomposers after the organism dies.

(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.

**16.** **Assertion :** The primary productivity of different ecosystems can be easily compared.
**Reason :** The magnitude of primary productivity depends on the photosynthetic capacity of producers and the prevailing environmental conditions.

(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.

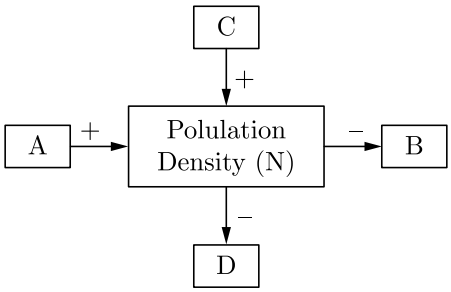
# SECTION - B

**17.** Suggest a technique to a researcher who needs to separate fragments of DNA.

**18.** Ringworm is one of the most common infectious fungal disease in humans. Name any two genera of fungi which cause ringworm and state any of its two symptoms.

**19.** Explain the processes of emasculation and bagging of flowers. State their importance in breeding experiments.

**20.** Study the schematic representation given below and answer the following questions.

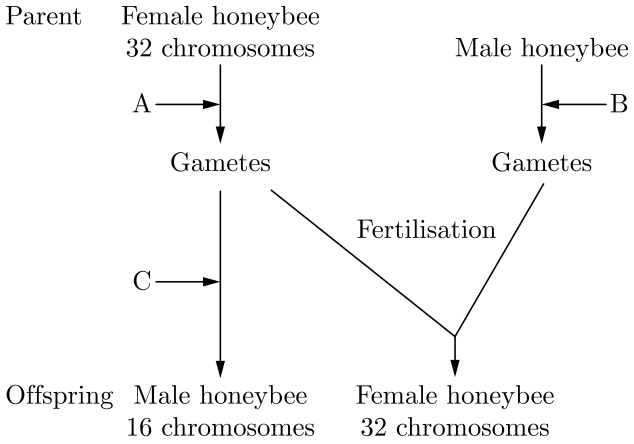



(a) Identify A in it.
(b) When population density at time t is N as shown above, write the population density at time $t+1$ in the form of an equation using appropriate symbols.

**OR**

If 8 individuals in a population of 80 butterflies die in a week, calculate the death rate of population of butterflies during that period.

**21.** The cytological observations made in a number of insects led to the development of the concept of genetic/ chromosomal basis of sex-determination mechanism. Honeybee is an interesting example to study the mechanism of sex-determination. Study the schematic cross between the male and the female honeybees given below and answer the questions that follow:




Continue on next page.....

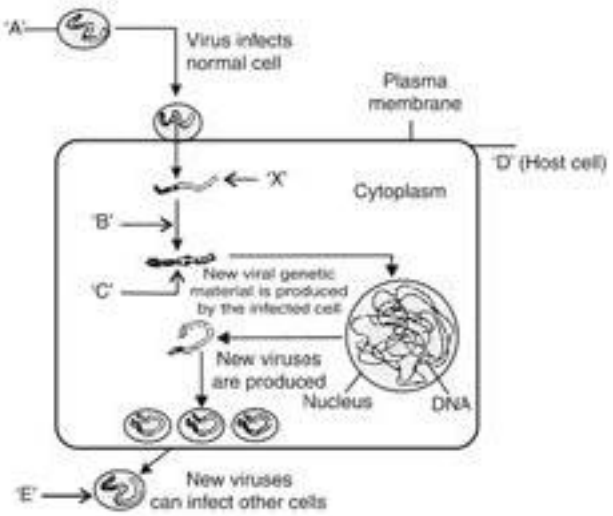
(a) Identify the cell divisions 'A' and 'B' that lead to gamete formation in female and male honeybees respectively.
(b) Name the process 'C' that leads to the development of male honeybee (drone).

# SECTION - C

**22.** Explain the significance of `palindromic nucleotide sequence' and restriction endonuclease in the formation of recombinant DNA.

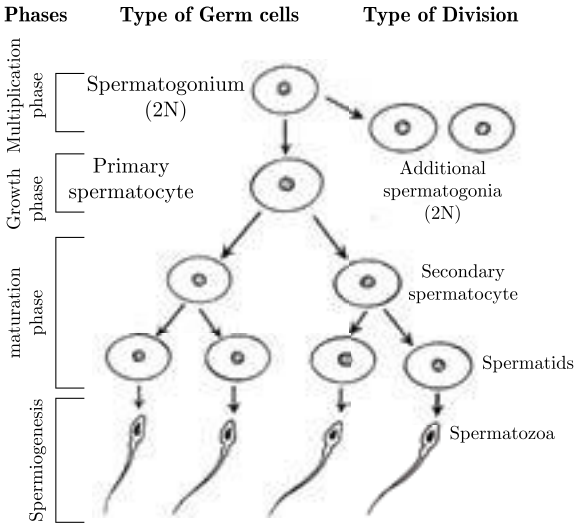
**23.** With the help of one example, explain the phenomena of co-dominance and multiple allelism in human population.

**24.** Study the diagram showing the entry of HIV into the human body and the process that follows.




(a) Name the human cells A, HIV enters into.
(b) Mention the genetic material (B) HIV releases into the cell.
(c) Identify enzyme C.

**25.** Study the schematic representation of spermatogenesis and answer the following questions.



(a) Which cell division occurs during multiplication phase?
(b) How many chromosomes are present in secondary spermatocyte and spermatid respectively?
(c) Which hormone acts on spermatogonia to stimulate sperm production?

**26.** Alien species are highly invasive and are a threat to indigenous species. Substantiate this statement with any three examples.

**OR**

What are the two types of desirable approaches to conserve biodiversity? Explain with examples bringing out the difference between the two types.

**27.** Name the disorder humans suffer from as a result of monosomy of the sex chromosome. Give the karyotype and write the symptoms.

**28.** Differentiate between :
(i) Vasa efferentia and vas deferens
(ii) Spermatogenesis and spermiogenesis

# SECTION - D

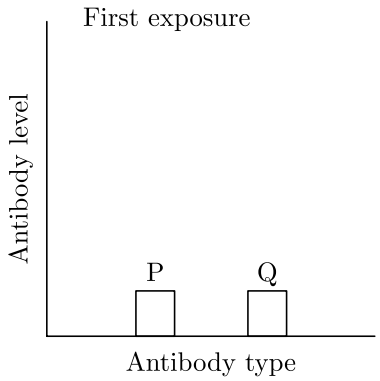
**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

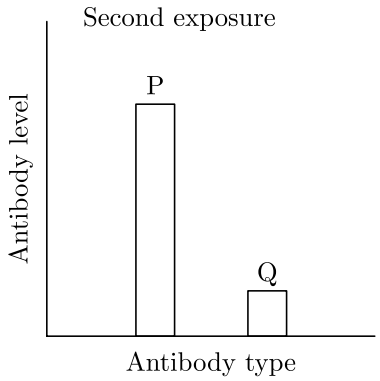
**29.** In a plant species that follows Mendelian inheritance yellow flower colour is dominant over white and round fruit shape is dominant over elongated. Crossing was performed between two purelines-one having yellow-flower and round fruit and another with white flower and elongated fruits. About 20 plants survived in $F_1$ progeny. Plants of $F_1$ were allowed to self fertilise and about 960 plants survived in $F_2$.
(a) How many plants would have yellow flower and round fruit in $F_1$ generation?
(b) How many plants would have yellow flower and round fruit in $F_2$ generation?
(c) Mention the genotypic and phenotypic ratio when plant heterozygous for yellow flower and round fruit is crossed with the double recessive parent.

**OR**

(d) If the plant heterozygous for yellow flower and round fruit are self crossed, then what will be the genotype of plant with yellow flower and elongated fruit?

**30.** In a study to test a new vaccine against a viral disease, mouse model testing is done. In this process, mice are vaccinated and their blood samples were tested. Mice developed mild disease symptoms. After few days those mice were again infected with the virus. This time they did not show any disease symptoms. Their blood samples were tested. Two graphs given show antibody concentration for the first and second infection in mice blood.






(a) Identify P and Q in the given graphs.

(b) Which form of pathogen is used in vaccination?

(c) Write the characteristics of P.

**OR**

(c) Why mice did not show any disease symptoms during second exposure to the pathogen virus?

# SECTION - E

**31.** Disease X is a chromosomal disorder occur due to autosomal aneuploidy. The children with this syndrome suffer from severe mental retardation, short statured with small round head, furrowed tongue and partially open mouth. Palm is broad with characteristic palm crease.

(a) Name the disease 'X' and state main cause of autosomal aneuploidy in it.

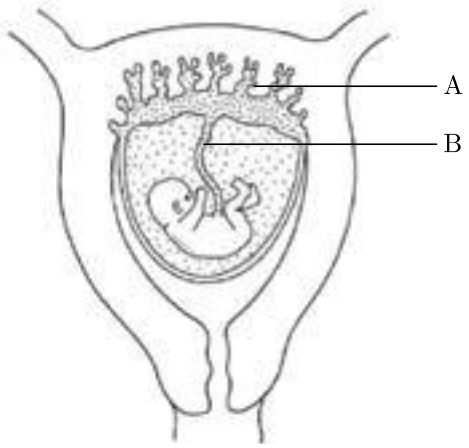
(b) How many number of chromosomes are present in the child suffering from this syndrome?

(c) What will be the sex chromosomal complement in males suffering from this disease?

**OR**

Write the scientific name of the organism Thomas Hunt Morgan and his colleagues worked on for their experiments. Why did they select that organism to study sex linked genes for lab experiments?

**32.** The given figure shows a fetus within the uterus. On the basis of the given figure, answer the questions that follow:



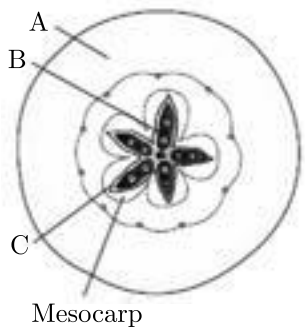

(a) Mention the role of B in the development of the embryo.

(b) Name the fluid surrounding the developing embryo. How is it misused for sex-determination?

(c) Give a short note on 'A'

**OR**

(a) Given below is a T.S. of an apple. Identify A, B and C.




(b) Why is an apple categorised as a false fruit?

(c) Mention the ploidy levels of the cells of different parts of a maize seed.

**33.** (a) Describe the different steps in one complete cycle of PCR.

(b) Write the applications of PCR.

**OR**

Explain the process by which a bacterial cell can be made 'competent'. Why is it essential to make bacterial cells 'competent' in recombinant DNA technology?

# Sample Paper 7

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** What type of ecological pyramid would be obtained with the following data?
Secondary consumer : 120 g
Primary consumer : 60 g
Primary producer : 10 g

(a) Inverted pyramid of biomass
(b) Pyramid of energy
(c) Upright pyramid of numbers
(d) Upright pyramid of biomass

**2.** The terminator/stop codons UGA, UAG and UAA

(a) initiate translation
(b) do not code for any amino acids
(c) code for only one amino acid
(d) code for more than one amino acid

**3.** One of the ex situ conservation methods for endangered species is

(a) wildlife sanctuaries
(b) biosphere reserves
(c) cryopreservation
(d) national parks.

**4.** According to Oparin, which one of the following was not present in the primitive atmosphere of the earth ?

(a) Methane
(b) Oxygen
(c) Hydrogen
(d) Water vapour

**5.** Select the hormone-releasing intra-uterine devices.

(a) Lippe's loop, Multiload 375
(b) Vault, LNG-20
(c) Multiload 375, Progestasert
(d) Progestasert, LNG-20

**6.** Mycorrhizae are the example of

(a) amensalism
(b) antibiosis
(c) mutualism
(d) fungistasis

**7.** When does the growth rate of a population following the logistic model equal zero? The logistic model is given as dN/dt = rN(1—N/K).

(a) When N/K equals zero

(b) When death rate is greater than birth rate

(c) When N/K is exactly one

(d) When N nears the carrying capacity of the habitat

**8.** Match column I with column II and select the correct answer from the given codes.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Ganga action plan | (i) | $N_2$ fixing cyanobacterium |
| B. | Bt-cotton | (ii) | Ministry of environment and forests |
| C. | Rhizobium | (iii) | Insect resistant plant |
| D. | Nostoc | (iv) | $N_2$ fixing bacterium |

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

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

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

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

**9.** Transplantation of tissues/organs to save certain patients often fails due to rejection of such tissues/organs by the patient. Which type of immune response is responsible for such rejections?

(a) Auto-immune response

(b) Humoral immune response

(c) Physiological immune response

(d) Cell-mediated immune response

**10.** The substance given to cancer patients in order to activate their immune system and destroy the tumor is

(a) histamine

(b) interleukin

(c) $\alpha$-interferon

(d) morphine

**11.** Match the following sexually transmitted diseases (column I) with their causative agent (column II) and select the correct option.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Gonorrhoea | (i) | HIV |
| B. | Syphilis | (ii) | Neisseria |
| C. | Genital warts | (iii) | Treponema |
| D. | AIDS | (iv) | Human papilloma virus |

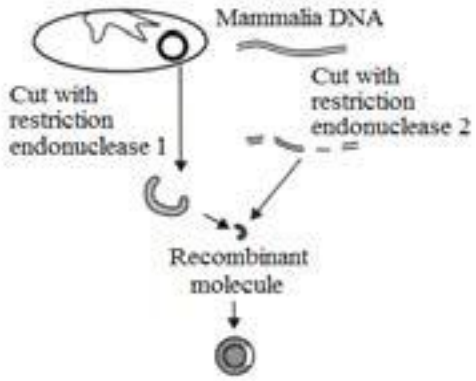
(a) A-(iv), B-(i), C-(ii), D(iii)

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

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

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

**12.** The basic procedure involved in the synthesis of recombinant DNA molecule is depicted below. The mistake in the procedure is




(a) enzyme polymerase is not included
(b) the mammalian DNA is shown double stranded
(c) two different restriction enzymes are used
(d) only one fragment is inserted

**13.** **Assertion :** Plant-animal interactions do not generally involve co-evolution of the mutualist organisms.
**Reason :** Evolution of the plants and animals go side by side.

(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.

**14.** **Assertion :** In Cocos nucifera, coconut water represents the cellular endosperm and the surrounding white kernel represents the free-nuclear endosperm.
**Reason :** Endosperm persist in some mature seeds.

(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.

**15.** **Assertion :** The first clinical gene for ADA therapy was given to cure SCID.
**Reason :** The normal gene was delivered into the patient's cells using retroviral vector.

(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.

**16.** **Assertion :** A geneticist crossed two plants and got 50% tall and 50% dwarf progenies.
**Reason :** This cross follows Mendelian law as one of the parent plant might be heterozygous.

(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.

# SECTION - B

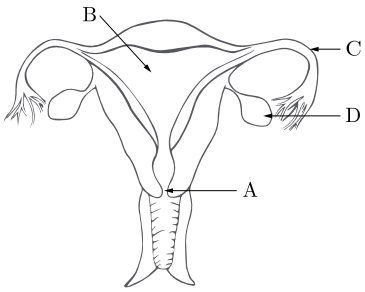
**17.** How are the desirable DNA sequences cut?

**18.** A student on a school picnic to a park on a windy day started sneezing and having difficulty in breathing on reaching the park. The teacher enquired whether the student was allergic to something.

(a) What is an allergy?

(b) Write the two unique characteristics of the system involved in the response observed in the student.

**19.** Refer to the given figure of human female reproductive system and answer the following questions.




(a) Write the function of part labelled as C?

(b) What is ovulation? Which of the labelled part is involved in this process?

**20.** Identify the type of the given ecological pyramid and give one example of each pyramid of number and pyramid of biomass showing such type.

**OR**

(a) Draw a pyramid of numbers considering a big banyan tree supporting a population of insects, small birds and their predators.

(b) Construct an ideal pyramid of energy when 1,000,000 joules of sunlight is available. Label all its trophic levels.

**21.** A cross was carried out between two pea plants showing the contrasting traits of height of the plants. The result of the cross showed 50% parental characters.

(a) Work out the cross with the help of a Punnett square.

(b) Name the type of the cross carried out.

# SECTION - C

**22.** Explain three different modes of pollination that can occur in a chasmogamous flower.

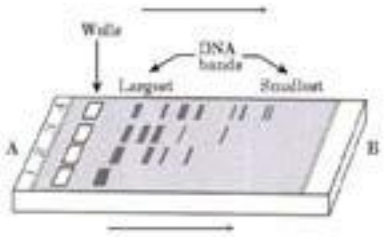
**23.** Since the origin of life on earth, there were five episodes of mass extinction of species.

(a) How is the 'Sixth extinction, presently in progress, different from the previous episodes?

(b) Who is mainly responsible for the 'Sixth extinction'?

(c) List any four points that can help to overcome this disaster.

**24.** Given below is the diagram representing the observations made for separating DNA fragments by gel electrophoresis technique. Observe the illustration and answer the questions that follow.




(a) Why are the DNA fragments seen to be moving in the direction $A \rightarrow B$?

(b) Write the medium used in which DNA fragments separate.

(c) Mention how the separated DNA fragments can be visualised for further technical use.

**25.** Construct and label a transcription unit from which the RNA segment given below has been transcribed. Write the complete name of the enzyme that transcribed this RNA.


**26.** Name and explain the role of the inner and middle walls of the human uterus.

**27.** As we know that evolution occurs, when the genetic equilibrium is upset,

(a) List any four factors which affect genetic equilibrium.

(b) Describe Founder's effect.

(c) What kind of evolution is shown by vertebrate brains?

**28.** What is the functional difference between B-cells and T-cells?

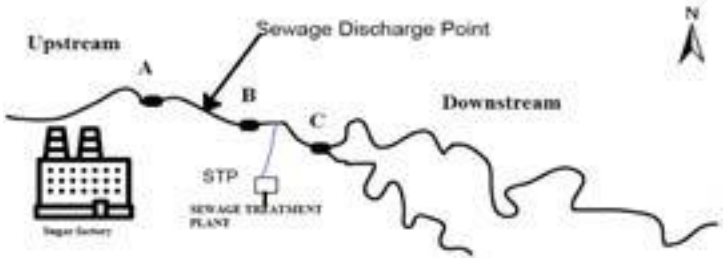
**OR**

Mention any two human diseases caused by roundworms alongwith their causative agents and their mode of transmission into the human body.

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** Water samples were collected at points A, B and C in a segment of a river near a sugar factory and tested for BOD level. The BOD levels of samples A, B and C were 400 mg/L, 480 mg/L and 8 mg/L respectively.




(a) What is high level of BOD at A and B indicative of?

(b) Explain why the BOD level gets reduced considerably at the collection point C.

(c) It was observed that fish mortality was high near point B. Give a suitable reason for this.

**OR**

(c) Which part of river is fit for drinking and why?

**30.** Read the given passage and answer the questions that follow:
In a dihybrid cross white eyed, yellow bodied female Drosophila is crossed with red eyed, brown bodied male Drosophila. 1.3% recombinants and 98.7% progeny with parental type combinations were produced in $F_2$ generation. This observation deviated from Mendelian $F_2$ phenotypic dihybrid ratio.

(a) What could be the most probable reason for the deviation of the cross from Mendelian ratio?

(b) Who first conducted the given cross?

(c) How the physical distance between two genes work in such type of crosses?

**OR**

(c) If number of offspring obtained in the above case is 847, then what will be the number of recombinants?

# SECTION - E

**31.** (a) Study the following chart. Name the hormones involved at each stage. Explain their functions.

Hypothalamus
↓
Pituitary
↓
Testes
↓
Sperms

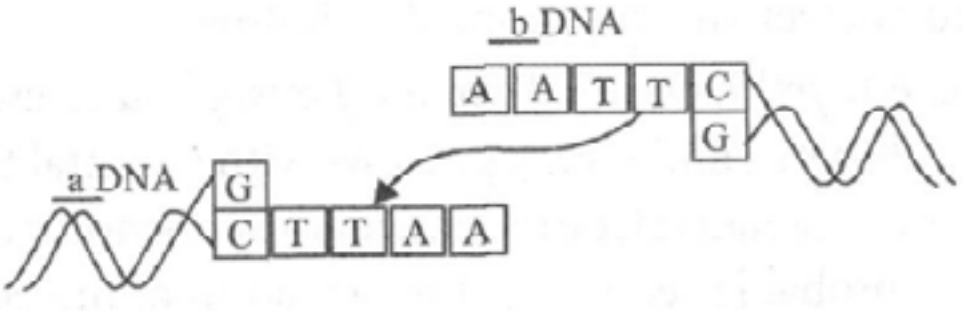
(b) Explain with the help of schematic representation the process of formation of mature gamete in a human female.

(c) How is spermatogenesis different from the process mentioned above? Explain.

**OR**

Why is the process of fertilisation in a flowering plant referred to as double fertilisation?

**32.** (a) Study the linking of DNA fragments shown.




(i) Name 'a' DNA and 'b' DNA.

(ii) Name the restriction enzyme that recognises this palindrome.

(iii) Name the enzyme that can link these two DNA fragments.

(b) Why has a bacterium to first become 'competent' to be able to take up DNA? Explain how it become 'competent' and takes in the recombinant DNA.

**OR**

Read the following base sequence of a certain DNA strand and answer the questions that follow:

| | | | | | |
|---|---|---|---|---|---|
| G | A | A | T | T | C |
| C | T | T | A | A | G |

(a) What is a 'alindromic sequence' in a DNA ?

(b) State the significance of enzymes that identify palindromic nucleotide sequences.

(c) How the enzyme that recognises the given palindromic nucleotide sequence named so?

**33.** During course of evolution why DNA was chosen over RNA as genetic material? Give reasons by first discussing the desired criteria in a molecule that can act as genetic material and in the light of biochemical differences between DNA and RNA.

**OR**

Refer to the given double stranded DNA molecule.
3′ - ATGCATGCATGCATGCATGCATGC - 5′
5′ - TACGTACGTACGTACGTACGTACG - 3′

(a) What would be the template DNA strand, coding DNA strand and transcribed *m*RNA sequence from this strand?

(b) How is *m*RNA made from DNA? Which enzyme catalyses this reaction?

# Sample Paper 8

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION-A

**1.** The polymerase enzyme used in PCR is

(a) DNA polymerase I
(b) restriction endonuclease
(c) reverse transcriptase
(d) Taq polymerase

**2.** Which one of the following pair is a purine pair?

(a) Adenine, Guanine
(b) Cytosine, Thymine
(c) Uracil, Guanine
(d) Adenine, Thymine

**3.** The law of segregation of characters postulated by Mendel can be related to

(a) the presence of two genes for each character in a somatic cell.
(b) presence of both genes on the same chromosome.
(c) a gamete receiving only one of the two homologous chromosomes during gamete formation.
(d) None of the above

**4.** Methanogenic bacteria are present in

(a) anaerobic sludge
(b) rumen (a part of stomach) of cattle
(c) Both (a) and (b)
(d) None of these

**5.** Atmosphere of earth just before the origin of life consisted of:

(a) $CH_4$, $NH_3$, $H_2$ and water vapours.
(b) $CO_2$, $NH_3$, and $CH_2$
(c) water vapours, $CH_4$, $NH_3$ and oxygen.
(d) $CH_4$, $O_3$, $O_2$ and water vapours.

**6.** The trigger for activation of toxin of Bacillus thuringiensis is

(a) alkaline pH of gut

(b) high temperature

(c) acidic pH of stomach

(d) mechanical action in the insect gut

**7.** The term 'precipitation' includes

(a) rain (b) snow

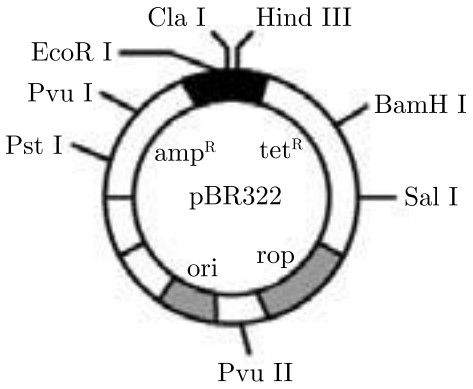
(c) Both (a) and (b) (d) None of them

**8.** Who proposed that the first form of life come from pre-existing non- living molecules?

(a) Darwin and Lamarck (b) de Vries and Sturtevant

(c) Oparin and Haldane (d) Louis Pasteur and Miller

**9.** The figure below is the diagrammatic representation of the E.Coli vector pBR 322. Which one of the given options correctly identifies its certain component (s)?




(a) ori - original restriction enzyme

(b) ampR, tetR - antibiotic resistance genes

(c) Hind III, EcoRI - selectable markers

(d) rop-reduced osmotic pressure

**10.** Asexual reproduction is common among

(a) single celled organisms only.

(b) single celled animals, plants and animals with simple organizations.

(c) animals with simple organization.

(d) plants only.

**11.** C-peptide of human insulin is

(a) removed during maturation of pro-insulin to insulin

(b) responsible for the formation of disulphide bridge

(c) a part of mature insulin molecule

(d) responsible for its biological activity

**12.** Which of the following statement confirm the law of dominance

(a) Alleles do not show any blending and both characters recovered as such in $F_2$ generation

(b) It is the conclusion of a dihybrid cross

(c) 3:1 ratio in $F_2$ generation

(d) Alleles of a pair segregate from each other such that gamete receives only one of the two factors

**13.** **Assertion:** Phagocyte cells digest microbes and debris

**Reason:** Natural killer cells destroy virus-infected cells and tumor cells.

(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.

**14.** **Assertion:** Hybrid is formed by cross between two organisms that are different in one or more traits.

**Reason:** Mendel crossed two plants differing in one trust to obtain F1 plants in monohybrid cross.

(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.

**15.** **Assertion:** An antibody is a protein molecule made by the lymphocytes.

**Reason:** An antibody binds to a specific antigen and neutralizes its odd effects.

(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.

**16.** **Assertion:** Replication and transcription occur in the nucleus but translation takes place in the cytoplasm.

**Reason:** mRNA is transferred from the nucleus into cytoplasm where ribosomes and amino acids are available for protein synthesis.

(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.

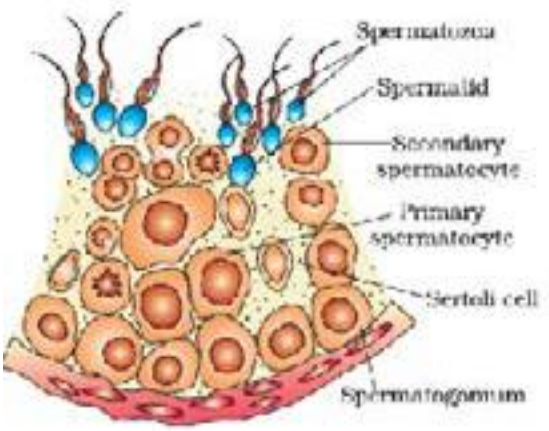
# SECTION-B

**17.** State the role of 'biolistic gun' in biotechnology experiments. Microparticles of which elements are used in this technique?

**18.** A region of a coding DNA strand has the following nucleotide sequence: -ATGC-

What shall be the nucleotide sequence in the following?
(i) Sister DNA segment it replicates.
(ii) m-RNA polynucleotide it transcribes.

**19.** Refer the figure of a part of seminiferous tubule showing different stages of sperm formation and answer the questions.




(a) Describe the process of spermatogenesis up to the formation of spermatozoa.

(b) Trace the path of spermatozoa from the testes up to the ejaculatory duct only.

**20.** Define the term 'health'. Mention any two ways of maintaining it.

**or**

Microbes play a dual role when used for sewage treatment as they not only help to retrieve usable water but also generate fuel. Write in points how this happens?

**21.** Cucurbits and papaya plants bear staminate and pistillate flowers. Mention the categories they are put under separately on the basis of the type of flowers they bear.

# SECTION-C

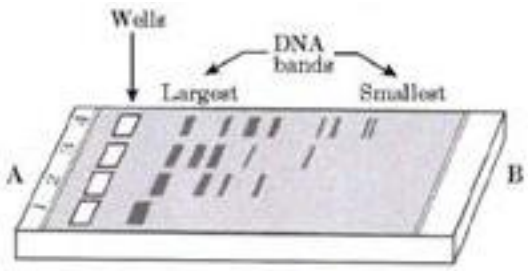
**22.** A large number of married couples in the world are childless. It is shocking to know that in India the female partner is often blamed for the couple being childless.

(a) State any two reasons responsible for the cause of infertility in case of male and female.
(b) Suggest a technique that can help the couple to have a child where the problem is with male.

**23.** Name the organic materials exine and intine of an angiosperm pollen grains are made up of. Explain the role of exine.

**24.** Explain stirring type bioreactors.

**25.** Study the diagram given below and answer the following questions.




(i) Why have DNA fragments in band D moved far away in comparison to those in band C?
(ii) Identify the anode end in the diagram.
(iii) How are these DNA fragments visualised.

**26.** Scientists have succeeded in recovering healthy sugarcane plants from a diseased one.

(i) Name the part of the plant used as explant by scientists.
(ii) Describe the procedure the scientists followed by recover the healthy parts.
(iii) Name the technology used for crop improvement.

**27.** (a) State the cause and symptoms of Down's syndrome. Name and explain the event responsible for causing this syndrome.

(b) Haemophilia and Thalassemia are both examples of Mendelian disorder, but show difference in their inheritance pattern. Explain how.

**28.** Name the ancestors of man based on the features given below:

(i) Human like, meat-eater with 900 cc brain, lived in Java.
(ii) More human with brain size 1400 cc, lived in central Asia, used hides and buried their dead.
(iii) Human like, vegetarian, with brain capacity between 650 cc and 800 cc.

# SECTION-D

**29.** Read the following and answer any four questions from 29(i) to 29(iv) given below:

**Ex-Situ Conservation:**
In this approach, threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care. Zoological parks, botanical gardens and wildlife safari parks serve this purpose. There are many animals that have become extinct in the wild but continue to be maintained in zoological parks. In recent years ex situ conservation has advanced beyond keeping threatened species in enclosures.
Now gametes of threatened species can be preserved in viable and fertile condition for long periods using cryopreservation techniques, eggs can be fertilised in vitro, and plants can be propagated using tissue culture methods. Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks.
Biodiversity knows no political boundaries and its conservation is therefore a collective responsibility of all nations. The historic Convention on Biological Diversity ('The Earth Summit') held in Rio de Janeiro in 1992, called upon all nations to take appropriate measures for conservation of biodiversity and sustainable utilisation of its benefits.

Continue on next page.....

In a follow-up, the World Summit on Sustainable Development held in 2002 in Johannesburg, South Africa, 190 countries pledged their commitment to achieve by 2010, a significant reduction in the current rate of biodiversity loss at global, regional and local levels.

(i) What was the outcome of the 1992 Earth Summit in Rio de Janeiro?

(ii) For endangered species, Ex-situ conservation is a method that is?

(iii) Which one of the following is related to ex-situ conservation of threatened animals and plants?

(iv) World summit on sustainable development of 2002 was held in?

**30.** Read the following and answer any four questions from 30(i) to 30(iv) given below:

**Microbes in commercial production of Chemicals, enzymes and Bioactive molecule:**

Microbes are also used for commercial and industrial production of certain chemicals like organic acids, alcohols and enzymes. Examples of acid producers are Aspergillus niger (a fungus) of citric acid, Acetobacter aceti (a bacterium) of acetic acid; Clostridium butylicum (a bacterium) of butyric acid and Lactobacillus (a bacterium) of lactic acid. Yeast (Saccharomyces cerevisiae) is used for commercial production of ethanol. Microbes are also used for production of enzymes.

Lipases are used in detergent formulations and are helpful in removing oily stains from the laundry. You must have noticed that bottled fruit juices bought from the market are clearer as compared to those made at home. This is because the bottled juices are clarified by the use of pectinases and proteases.

Streptokinase produced by the bacterium Streptococcus and modified by genetic engineering is used as a 'clot buster' for removing clots from the blood vessels of patients who have undergone myocardial infraction leading to heart attack. Another bioactive molecule, cyclosporin A, that is used as an immunosuppressive agent in organ-transplant patients, is produced by the fungus Trichoderma polysporum. Statins produced by the yeast Monascus purpureus have been commercialised as blood-cholesterol lowering agents. It acts by competitively inhibiting the enzyme responsible for synthesis of cholesterol.

(i) Which organisms has been Commercialised as blood cholesterol lowering agent?

(ii) Why bottled fruit juices bought from the market are clearer as compared to those made at home?

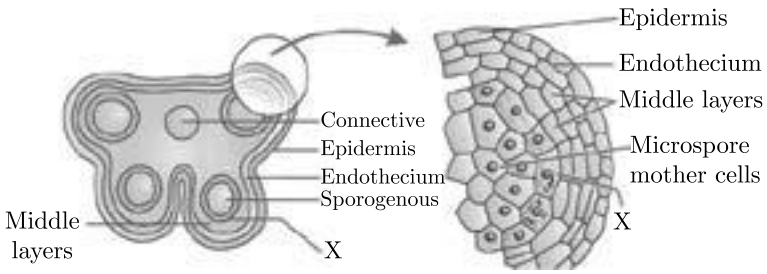
(iii) Identify a, b, c, d, e and fin the given table below

| | **Organism** | **Bioactive Molecule** | **Use** |
|---|---|---|---|
| 1. | Monascus purpureus | a | b |
| 2. | c | d | Antibiotic |
| 3. | e | Cyclosporin A | f |

(iv) Name the enzyme produced by the bacterium Streptococcus?

# SECTION-E

**31.** (a) "X" part in the given diagram plays an important role in the formation of pollen grain wall. Identify "X" and explain its role in the formation of pollen grain wall.

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(b) Describe the characteristics of flowers that are pollinated by wind.
(c) Identify and explain the stage (given below) involved in post-fertilisation event of flowering plants.
(i) Transfer of pollen grains
(ii) Embryo development
(iii) Formation of flower
(iv) Formation of pollen grains

**or**

(a) Explain the menstrual phase in a human female. State the levels of ovarian and pituitary homones during this phase.
(b) Why is follicular phase in the menstrual cycle also referred as proliferative phase? Explain.
(c) Explain the events that occur in a graafian folicle at the time of ovulation and thereafter.

**32.** (a) Why are thalassemia and haemophilia categorized as Mendelian disorders ? Write the symptoms of these diseases. Explain their pattern of inheritance in humans.

(b) Write the genotypes of the normal parents producing a haemophilic son.

**or**

Describe the experiment that helped demonstrate the semi-conservative mode of DNA replication.

**33.** How is biodiversity at all levels generally conserved ?

**or**

What kind of threat to biodiversity may lead to its loss ?

□□□□□□□

# Sample Paper 9

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** Which of the following is incorrect regarding vasectomy?

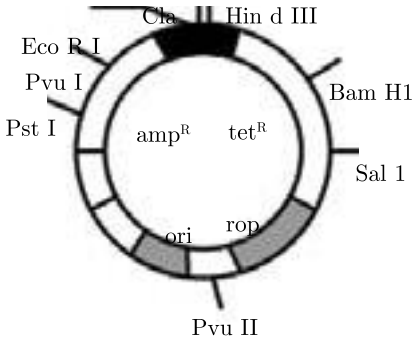
(a) No sperm occurs in seminal fluid.
(b) No sperm occurs in epididymis.
(c) Vasa deferentia is cut and tied.
(d) Irreversible sterility

**2.** Match the following columns and select the correct option.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Contraceptive pill | (i) | Prevents sperms reaching the female reproductive tract |
| B. | Condom | (ii) | Inhibits ovulation and implantation |
| C. | Vasectomy | (iii) | Increases phagocytosis of sperms |
| D. | Copper T | (iv) | Blocks gamete transport |

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

**3.** The given figure is the diagrammatic representation of the E. coli vector pBR322. Which one of the given options correctly identifies its certain component(s)?




(a) ori-original restriction enzyme
(b) rop-reduced osmotic pressure
(c) HindIII, EcoRI - selectable markers
(d) amp$^R$, tet$^R$-antibiotic resistance genes

**4.** In the double-helical structure of DNA, the pitch of the helix is

(a) 3.4 nm (b) 0.34 nm
(c) 6.6 nm (d) 34 nm

**5.** Cuscuta is an example of

(a) ectoparasitism (b) brood parasitism
(c) predation (d) endoparasitism

**6.** Colostrum, the yellowish fluid, secreted by mother during the initial days of lactation is very essential to impart immunity to the new born infants because it contains

(a) immunoglobulin A (b) natural killer cells
(c) monocytes (d) macrophages

**7.** Which one of the following pairs is wrongly matched?

(a) Yeast - Ethanol (b) Streptomycetes - Antibiotic
(c) Coliform - Vinegar (d) Methanogens - Gobar gas

**8.** The main reason why antibiotics could not always treat the bacteria-mediated diseases is

(a) insensitivity of the individual following prolonged exposure to antibiotics
(b) inactivation of antibiotics by bacterial enzymes
(c) decreased efficiency of immune system
(d) the development of mutant bacterial strains resistant to antibiotics.

**9.** Which one of the following animals may occupy more than one trophic levels in the same ecosystem at the same time?

(a) Sparrow (b) Lion
(c) Goat (d) Frog

**10.** Replacement of the lighter-coloured variety of peppered moth (Biston betularia) to its darker variety (Biston carbonaria) in England is the example of

(a) natural selection (b) regeneration
(c) genetic isolation (d) temporal isolation

**11.** The birth and death rates of four countries are given below. Which one will have the least population growth rate?

| **Country** | **Birth rate/1000** | **Death rate/1000** |
|---|---|---|
| P | 20 | 5 |
| Q | 15 | 3 |
| R | 50 | 18 |
| S | 48 | 41 |

(a) P (b) Q
(c) R (d) S

**12.** Tiger is not a resident in which one of the following national parks?

(a) Sunderbans (b) Gir
(c) Jim Corbett (d) Ranthambore

**13.** **Assertion :** In plants, apomixis is a form of asexual reproduction that mimics sexual reproduction.

**Reason :** Apomixis involves the production of seeds without the fusion of gametes.

(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.

**14.** **Assertion :** GM plants are made tolerant to abiotic stress.

**Reason :** Golden rice is rich in n-carotene.

(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.

**15.** **Assertion :** In Mirabilis jalapa the pink coloured flowers appear in F1 generation.

**Reason :** Pink colour is observed due complete suppression of white colour alleles in one of parental flowers by red colour alleles.

(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.

**16.** **Assertion :** Tropical regions have got a long evolutionary time for species diversification as compared to temperate regions.

**Reason :** Temperate regions have undergone frequent glaciations in the past whereas tropical regions have remained relatively undisturbed for millions of years.

(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.

# SECTION - B

**17.** List any four characteristics of an ideal contraceptive.

**OR**

A woman decides to take contraceptive pills. What do contraceptive pills contain and how do they act as contraceptives?

**18.** Enumerate four most common warning signs of drug and alcohol abuse amongst the youth.

**19.** What is cryopreservation? Give its one use.

**20.** List the two main propositions of Oparin and Haldane.

**21.** Describe the gene therapy procedure for an ADA-deficient patient.

# SECTION - C

**22.** Linkage and crossing over of genes are alternative of each other. Justify with the help of an example.

**23.** (a) Expand VNTR and describe its role in DNA fingerprinting.

(b) List any two applications of DNA fingerprinting technique.

**24.** Explain the importance of following:

(a) Restriction endonuclease
(b) "Ori"
(c) Gel electrophoresis in recombinant DNA technology

**25.** Explain double fertilisation in an angiosperm.

**26.** "Prevention is better than cure" is an apt slogan to safeguard adolescents from drug abuse. List any 6 steps that could be taken in this regard.

**27.** List the post-fertilisation events in angiosperms.

**OR**

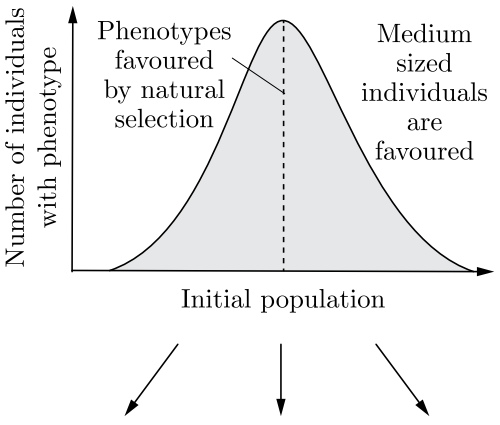
Double fertilisation is reported in plants of both castor and groundnut. However, the mature seeds of groundnut are non-albuminous and castor are albuminous. Explain the post fertilisation events that are responsible for it.

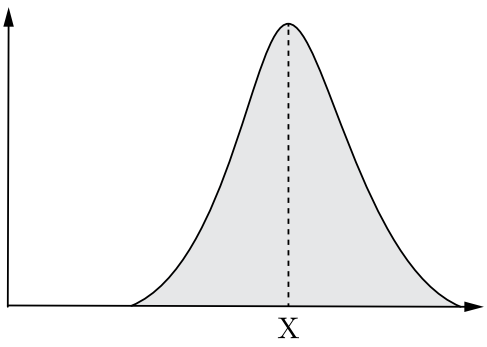
**28.** Differentiate between two different types of pyramids of biomass with the help of one example of each.

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** Natural selection can influence distribution of phenotype in three different ways as shown below in the figure. On the basis of this figure answer the questions that follow.

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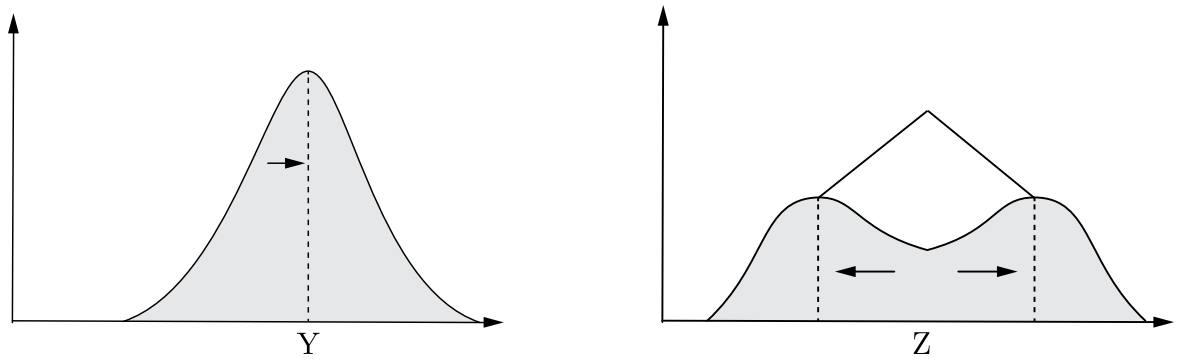
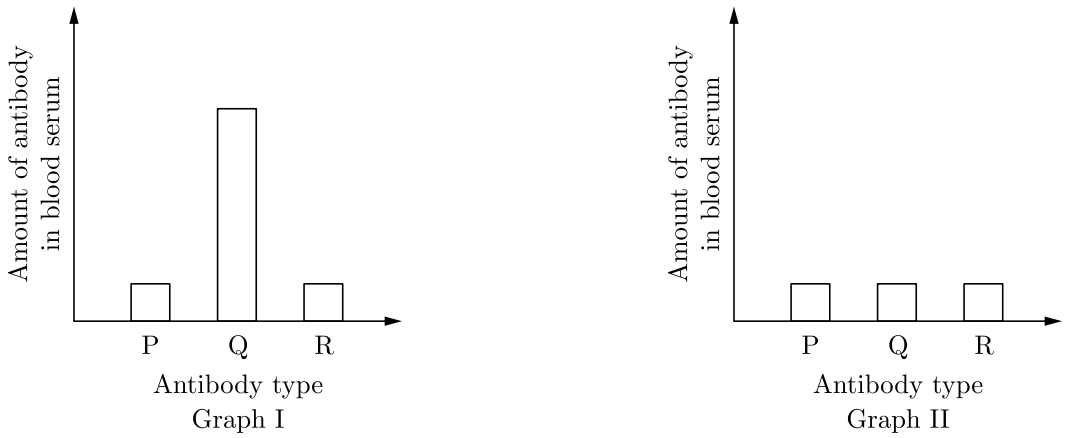



(a) On the basis of the given graphs, what conclusion can you draw about case X and Y?
(b) What is the significance of higher and narrower peak in case X?
(c) What does graph in case Y indicates? Give suitable example.

**OR**

(c) What would happen if population is converted into case Z?

**30.** The graphs below show the result of blood tests of a person X during illness (Graph I) and after recovering (Graph II).




(a) With reference to the above graphs, what will you inferred about the disease in a person X?
(b) What would be the possible explanation with regards to no change in antibody type P and R in both the graphs I and II.?
(c) Which antibody type among P, Q and R confirms that the person X is suffered from infection and how?

**OR**

(c) If person X has contracted with an allergen, then which type of antibody will be produced in his body?

# SECTION - E

**31.** (a) Explain the following phases in the menstrual cycle of a human female :

(i) Menstrual phase
(ii) Follicular phase
(iii) Luteal phase

(b) A proper understanding of menstrual cycle can help immensely in family planning. Do you agree with the statement? Provide reasons for your answer.

**OR**

When does oogenesis start in humans? Name the three hormones and their role in oogenesis. Explain different phases of oogenesis in human female.

**32.** (a) Why are certain cotton plants called Bt-cotton plants?

(b) Why does Bt toxin not kill the bacterium that produces it but kill the insect that ingests it?

**OR**

(a) What is biopiracy? Explain its significance with example.
(b) State the initiative taken by Indian Parliament against biopiracy.

**33.** Describe the process of synthesis of fully functional mRNA in a eukaryotic cell.

**OR**

Explain the process of translation.

# Sample Paper 10

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION-A

**1.** ABO blood group system is due to

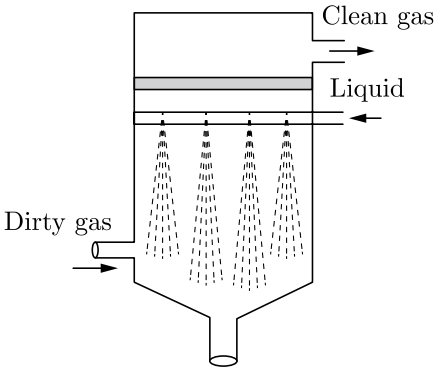
(a) multiple allelism

(b) incomplete dominance

(c) multifactor inheritance

(d) epistasis

**2.** According to size of air pollutants, range and types of chemical the device given below is best used to control which of the following pollutants?




(a) Dissolved gases

(b) charged particulate matter

(c) large particulates

(d) fine particles

**3.** Which of the following is incorrect regarding ZW-ZZ type of sex determination?

(a) It occcurs in birds and some reptiles

(b) 1 : 1 sex ratio is produced in the offsprings

(c) Females are homogametic and males are heterogametic

(d) All of these

**4.** Plasmid has been used as vector because

(a) It transfer the piece of DNA attached to it.

(b) it can move between prokaryotic and eukaryotic cells.

(c) both its ends show replication.

(d) it has antibiotic resistance gene.

**5.** Which of the following statements regarding the asexual reproduction is incorrect?

(a) It is uniparental and usually occurs in unicellular organisms.

(b) It does not contribute to evolution and speciation.

(c) Both mitotic and meiotic division occurs.

(d) There is no variation and the offsprings have the same phenotype and genotype.

**6.** DNA replication is

(a) semiconservative and discontinuous

(b) semiconservative and semi discontinuous

(c) conservative and discontinuous

(d) conservative

**7.** The 'mule' is the result of

(a) inbreeding depression (b) inter-specific hybridization

(c) cross-breeding (d) out-breeding

**8.** The site of origin of the new plantlets in potato, dahlia, ginger and banana is

(a) nodes of modified stem. (b) internodes of modified stem.

(c) floral buds present on stem. (d) adventitious buds present on root.

**9.** The linking of antibiotic resistance gene with the plasmid vector became possible with

(a) DNA polymerase (b) endonucleases

(c) DNA ligase (d) exonucleases

**10.** Inbreeding depression

(a) usually reduces fertility and productivity

(b) usually reduces productivity only.

(c) usually increases fertility only.

(d) usually increases fertility and productivity

**11.** The kangaroo rats of North American deserts do not need to drink water because

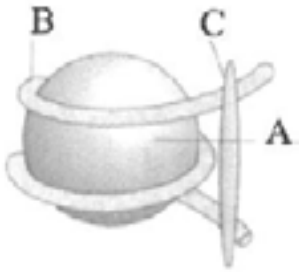
(a) they are able to concentrate urine, to minimize water loss.

(b) they meet their water requirement through internal fat oxidation when the water is a byproduct.

(c) they do not have sweat glands.

(d) all of the above

**12.** Refer the given figure of nucleosome and select the option that correctly identifies the parts A, B and C.




| | **A** | **B** | **C** |
|---|---|---|---|
| (a) | DNA | Histone octamer | H1 histone |
| (b) | Histone octamer | H1 histone | DNA |
| (c) | Histone octamer | DNA | H1 histone |
| (d) | DNA | H1 histone | Octamer |

**13.** **Assertion:** Insects visit flowers to gather honey.
**Reason:** Attraction to flowers prevents the insects from damaging other parts of the plant.

(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.

**14.** **Assertion:** Curdling is required in the manufacture of cheese.
**Reason:** Lactic acid bacteria are used for the purpose.

(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.

**15.** **Assertion:** Female mosquito is an example of temporary parasite.
**Reason:** Plasmodium is an endoparasite.

(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.

**16.** **Assertion:** Insulin is said to be anabolic hormone.
**Reason:** Failure of insulin secretion causes diabetes.

(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.

# SECTION-B

**17.** Write about the importance of family planning programme in India ?

**18.** Why are angiosperm anthers called dithecous? Describe the structure of microsporangium and draw a well labelled diagram.

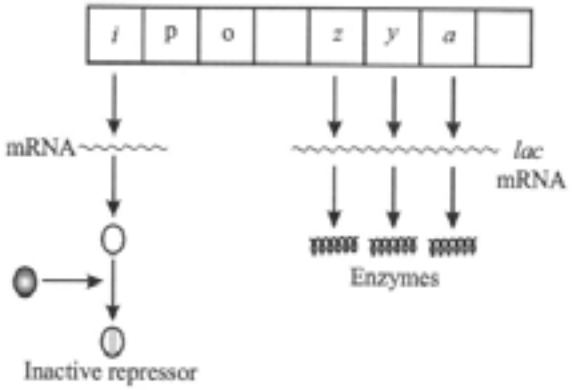
**19.** What is meant by transgenic animal? List any four areas in which transgenic animals have wide applications.

**20.** Make a list of any three outbreeding devices that flowering plants have developed and explain how they help to encourage cross-pollination.

**21.** Sex determination is based on particular chromosomes in both birds and humans. State two points of difference between their mechanisms of sex determination.

# SECTION-C

**22.** Study the figure given below and answer the questions.




Continue on next page.....

(a) What does the figure express?
(b) When does the transcription of lac mRNA stop?
(c) Name the enzymes transcribed by the genes 'z' and 'a'.

**or**

(a) Name the scientist who suggested that the genetic code should be made of a combination of three nucleotides. Explain the basis on which he arrived at this conclusion.
(b) Name two salient features of genetic code.

**23.** Name a disorder, give the karyotype and write the symptoms where a human male suffers as a result of an additional X-chromosome.

**24.** "Stability of a community depends on its species richness." Write how did David Tilman show this experimentally.

**25.** (a) A mixture of fragmented DNA was electrophoresed in an agarose gel. After staining the gel with ethidium bromide, no DNA bands were observed. What could be the reason?
(b) Do eukaryotic cells have restriction endonucleases? Justify your answer.

**26.** Explain adaptive radiation and convergent evolution by taking example of some of Australian marsupials and Australian placental mammals.

**or**

Australian Marsupials and placental mammals are suitable examples of adaptive radiation and convergent evolution. Explain giving reasons.

**27.** (i) Write the scientific name of most common species of honeybee reared.
(ii) Mention the kind of areas that are suitable for bee keeping practices.
(iii) Mention any two uses of bee-wax.

**28.** (i) Explain the events taking place at the time of fertilisation of an ovum in a human female.
(ii) Trace the development of the zygote up to its implantation in the uterus.
(iii) Name and draw a labelled sectional view of the embryonic stage that gets implanted.

# SECTION-D

**29.** Read the following and answer any four questions from 29(i) to 29(iv) given below :

**Events of Menstrual Cycle:**

The major events of the menstrual cycle are as follows as the cycle starts with the menstrual phase, when menstrual flow occurs and it lasts for 3-5 days. The menstrual flow results due to breakdown of endometrial lining of the uterus and its blood vessels which forms liquid that comes out through vagina. Menstruation only occurs if the released ouvm is not fertilised. Lack of menstruation may be indicative of pregnancy. However, it may also be caused due to some other underlying causes like stress, poor health etc. The menstrual phase is followed by the follicular phase.

During this phase, the primary follicles in the ovary grow to become a fully mature Graafian follicle and simultaneously the endometrium of uterus regenerates through proliferation. These changes in the ovary and the uterus are induced by changes in the levels of pituitary and ovarian hormones. The secretion of gonadotropins (LH and FSH) increases gradually during the follicular phase, and stimulates follicular development as well as secretion of estrogens by the growing follicles. Both LH and FSH attain a peak level in the middle of cycle (about 14th day). Rapid secretion of LH leading to its maximum level during the mid-cycle called LH surge induces rupture of Graafian follicle and thereby the release of ovum (ovulation). The ovulation (ovulatory phase) is followed by the luteal phase during which the remaining parts of the Graafian follicle transform as the corpus luteum.

Continue on next page.....

The corpus luteum secretes large amounts of progesterone which is essential for maintenance of the endometrium. Such an endometrium is necessary for implantation of the fertilised ovum and other events of pregnancy. During pregnanacy, all events of the menstrual cycle stop and there is no menstruation. In the absence of fertilisation, the corpus luteum degenerates. This causes disintegration of the endometrium leading to menstruation, marking a new cycle. In human beings, menstrual cycles cease around 50 years of age; that is termed as menopause. Cyclic menstruation is an indicator of normal reproductive phase and extends between menarche and menopause.

(i) What causes menstrual flow?
(ii) Why secretory phase is also known as luteal phase?
(iii) What happen if LH secreted rapidly?
(iv) Which of the hormone has no role in menstruation?

**30.** Read the following and answer any four questions from 30(i) to 30(iv) given below:

**Bt Cotton:**

Some strains of Bacillus thuringiensis produce proteins that kill certain insects such as lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes). B. thuringiensis forms protein crystals during a particular phase of their growth. These crystals contain a toxic insecticidal protein. Why does this toxin not kill the Bacillus. Actually, the Bt toxin protein exist as inactive protoxins but once an insect ingest the inactive toxin, it is converted into an active form of toxin due to the alkaline pH of the gut which solubilise the crystals. The activated toxin binds to the surface of midgut epithelial cells and creates pores that cause cell swelling and lysis and eventually cause death of the insect. Specific Bt toxin genes were isolated from Bacillus thuringiensis and incorporated into the several crop plants such as cotton (Figure 12.1). The choice of genes depends upon the crop and the targeted pest, as most Bt toxins are insect-group specific. The toxin is coded by a gene named cry. There are a number of them, for example, the proteins encoded by the genes cryIAc and cryIIAb control the cotton bollworms that of cryIAb control corn borer.

(i) What is role of cry II Ab and cry I Ab?
(ii) Specific Bt toxin gene was isolated from which organism?
(iii) Name the gene that encodes for Bt protein specific to cotton bollworm?
(iv) Consider the following statements (A-D) about organic farming
  (A) utilizes genetically modified crops like Bt cotton
  (B) uses only naturally produced inputs like compost
  (C) does not use pesticides and urea
  (D) produces vegetables rich in vitamins and minerals.

Which of the above statements are correct?

(a) B, C and D
(b) C and D only
(c) B and C only
(d) A and B only

# SECTION-E

**31.** Mr. Oberoi angrily says to his daughter not to marry Mohan since their family is known to inherit haemophilia. The daughter objected to her father's order. Mr. Oberoi was adamant and threatened also. Brijmohan's daughter explained the biological interpretation of his fear and convinced her father.

(a) Briefly discuss the inheritance pattern of haemophilia.
(b) Mohan was not haemophilic though his father is haemophilic. Explain the condition of Mohan by considering following three conditions of his mother:
  (i) Normal mother
  (ii) Carrier mother
  (iii) Haemophilic mother
(c) Is there any fear of haemophilia if Mr. Oberoi daughter marries Mohan (non-haemophilic)?

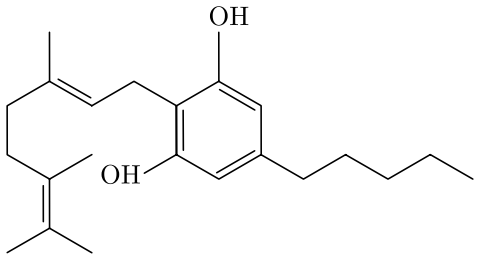
**or**

How Hershey and Chase proved that DNA is the genetic material?

**32.** Briefly explain the lifecycle of plasmodium. What measures would you take to control malaria?

**or**

(a) What measures do you suggest for prevention and control of alcohol and drug abuse among adolescents?
(b) The outline structure of a drug is given below.




(i) Which group of drugs does this represent? Name the plant from which it is obtained.
(ii) What are the modes of consumption of these drugs?
(iii) Name the organ of the body which is affected by consumption of these drugs.

**33.** Mention the factors which cause changes in the size of population of a species.

**or**

(a) State how ex-situ conservation helps in protecting biodiversity. Name four types of ex-situ methods.
(b) Explain the importance of sacred groves.

□□□□□□□

# Sample Paper 11

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** Percentage of photosynthetically active radiation (PAR) in the incident solar radiation is

(a) 1 - 5%
(b) 2 - 10%
(c) less than 50%
(d) approx. 100%

**2.** Mendel formulated the law of purity of gametes on the basis of

(a) monohybrid cross
(b) dihybrid cross
(c) test cross
(d) back cross

**3.** During the life cycle of Plasmodium, sexual reproduction takes place in which of the following hosts?

(a) Human
(b) Female Anopheles mosquito
(c) Male Anopheles mosquito
(d) Both (a) and (b)

**4.** Which one of the following is a population ?

(a) A spider and some trapped flies in its web.
(b) Earthworm that lives in a grassland along with other arthropods.
(c) All the plants in a forest.
(d) All the oak trees in a forest.

**5.** A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using

(a) EcoR I
(b) Taq polymerase
(c) DNA polymerase III
(d) ligase

**6.** In fruit flies, long wing is dominant to vestigial wing. When heterozygous long-winged flies were crossed with vestigial-winged flies, 192 offsprings were produced. If an exact Mendelian ratio had been obtained, then the number of each phenotype would have been

| | **Long-winged** | **Vestigial-winged** |
|---|---|---|
| (a) | 64 | 128 |
| (b) | 96 | 96 |
| (c) | 128 | 64 |
| (d) | 192 | 0 |

**7.** If the energy produced at the level of the producers is 1000 J, the energy available for the secondary consumers is

(a) 1000 J (b) 100 J

(c) 10 J (d) 1 J

**8.** Embryo with more than 16 blastomeres formed due to in vitro fertilisation is transferred into

(a) uterus (b) fallopian tube

(c) fimbriae (d) cervix.

**9.** A population has more young individuals compared to the older individuals. What would be the status of the population after some years?

(a) It will decline. (b) It will stabilise.

(c) It will increase. (d) It will first decline and then stabilise.

**10.** Identify the blank spaces A, B, C and D in the given table and select the correct option.

| **Type of microbe** | **Scientific name** | **Product** | **Medical application** |
|---|---|---|---|
| Fungus | A | Cyclosporin A | B |
| C | Monascus Purpureus | Statin | D |

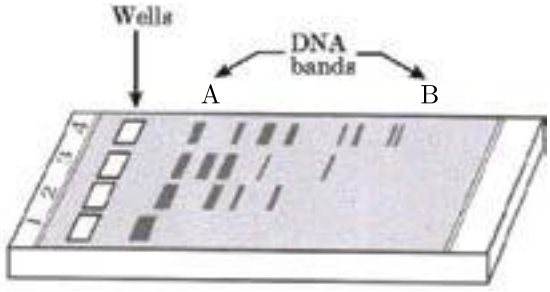
(a) A-Trichoderma polysporum, B-As an immunosuppressive agent, C-Yeast (Fungus), D-Lowering of blood cholesterol

(b) A-Trichoderma polysporum, B-Lowering of blood cholesterol, C-Yeast (Fungus), D-As an immunosuppressive agent

(c) A-Penicillium notatum, B-Lowering of blood cholesterol, C-Bacteria, D-As an immunosuppressive agent

(d) A-Streptococcus, B-As an immunosuppressive agent, C-Bacterium, D-Lowering of blood cholesterol

**11.** Study the given figure carefully and select the incorrect statements regarding this.

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(i) It represents a typical agarose gel electrophoresis in which lane 1 contains undigested DNA.
(ii) Smallest DNA bands are formed at A and largest DNA bands are formed at B.
(iii) The separated DNA fragments can be visualised after staining in the visible light.
(iv) The separated DNA bands are cut out from the agarose gel and extracted from the gel piece. This step is known as elution.

(a) (i) and (ii) (b) (ii) and (iii)
(c) (ii) and (iv) (d) (i) and (iv)

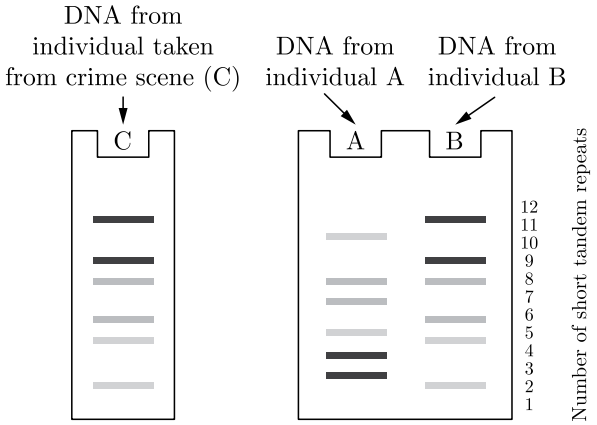
**12.** When a natural predator (living organism) is applied on the other pathogen organisms to control them, this process is called

(a) biological control (b) genetic engineering
(c) artificial control (d) confusion technique

**13.** **Assertion :** There are 32 biodiversity hotspots in the world.
**Reason :** High level of species richness is a criteria for selection of a biodiversity hotspot.

(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.

**14.** Given below is the representation of the DNA fingerprinting depicting the amplified repeats separated by size using gel electrophoresis. Study the given picture and comment upon the appropriateness of the Assertion and Reason.




**Assertion :** It shows that individual B commits the crime.
**Reason :** The banding pattern of DNA from crime scene (C) matches with individual B rather than A.

(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.

**15.** **Assertion :** Only the pre-pollination growth of male gametophyte occurs inside the microsporangium whereas the remaining growth occurs over the female reproductive organs.
**Reason :** Whole of the growth of female gametophyte occurs inside the megasporangium.

(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.

**16.** **Assertion :** The regions outside the seminiferous tubules are called interstitial spaces, which contain Leydig's cells.

**Reason :** Leydig's cells synthesise and secrete testicular hormones called androgens.

(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.

# SECTION - B

**17.** Explain why it is scientifically incorrect to blame the mother for bearing female child.

**18.** Why is fertilisation in an angiosperm referred to as double fertilisation? Mention the ploidy of the cells involved.

**19.** (a) Name the scientist who suggested that the genetic code should be made of a combination of three nucleotides.

(b) Explain the basis on which he arrived at this conclusion.

**20.** (a) What is biopiracy?

(b) State the initiative taken by the Indian parliament against it.

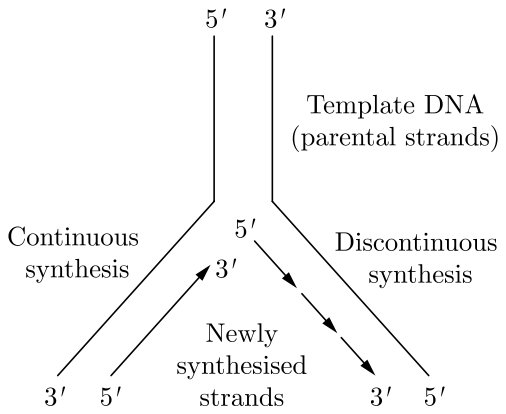
**21.** (a) Mention the significant role of the thymus as a lymphoid organ.

(b) What kind of cells are released from thymus and how they help in immunity?

# SECTION - C

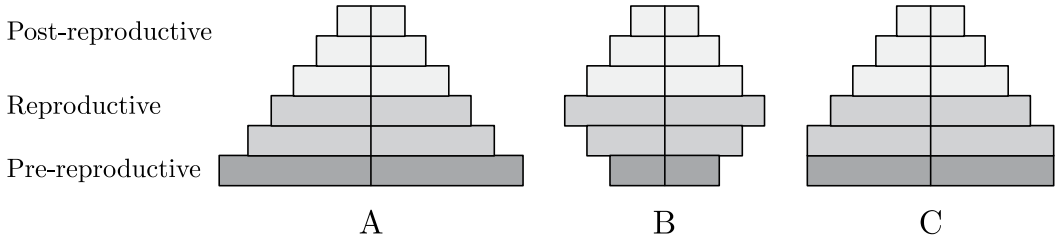
**22.** Explain the work carried out by Cohen and Boyer that contributed immensely in biotechnology.

**23.** (a) Identify the structure shown below.




(b) Mention the difference in the synthesis based on the polarity of the two template strands.

**24.** Study the age pyramids 'A, 'B' and 'C' of the human population given below and answer the questions that follow :




(a) Identify pyramids 'B' and 'C'.

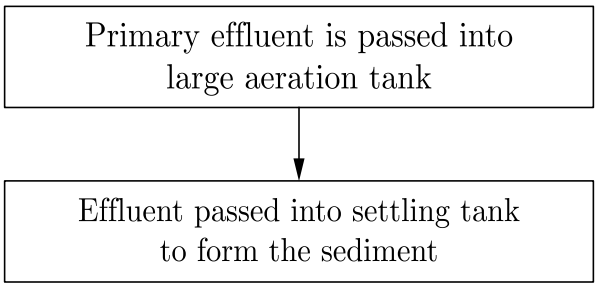
(b) Write the basis on which the above pyramids are plotted.

**OR**

Draw and explain expanding age pyramid of human population. Why is it so called?

**25.** Differentiate between homology and analogy. Give one example of each.

**26.** Large quantities of sewage is generated everyday in cities and towns, which is treated in Sewage Treatment Plants (STPs) to make it less polluted. Given below is the flow chart of one of the stages of STP.
Observe the given flow chart and answer the questions accordingly.




(a) Why primary effluent is passed into large aeration tanks?

(b) Write the technical term used for the sediment formed? Mention its significance.

(c) Explain the final step that results in the formation of biogas in the large tank before the treated effluent is released into water bodies.

**27.** How is detritus decomposed step-by-step by different agents and made available as nutrients to the plants? Explain.

**OR**

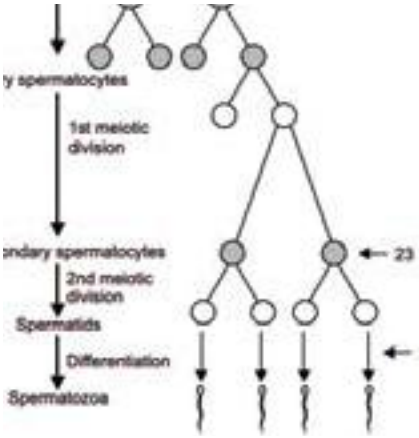
(a) Describe the events during humification and mineralisation during decomposition in the soil.

(b) Enlist the conditions affecting the rate of decomposition.

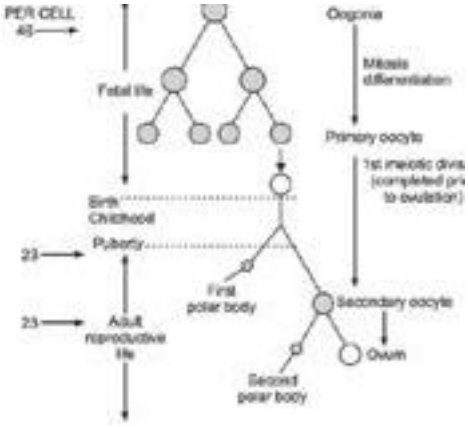
Continue on next page.....

**28.** With reference to the following schematic diagram of (a) Spermatogenesis and (b) Oogenesis, answer the following questions.

(a)




(b)




(a) About 300 million spermatozoa may be present in a human male ejaculation at one time. Calculate how many primary spermatocytes will be involved to produce this number of spermatozoa.

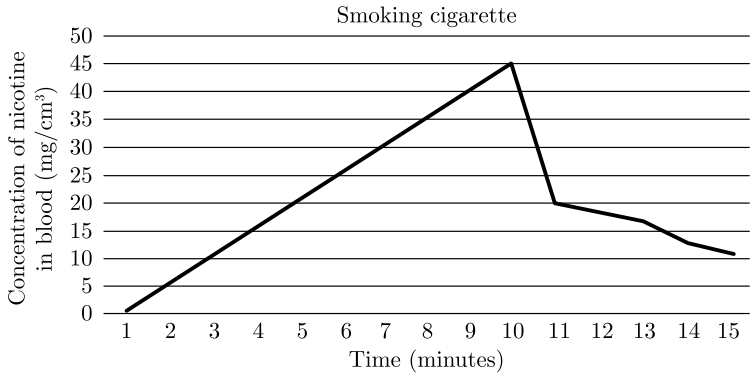
(b) How many spermatids will be formed?

(c) How many chromatids are found during oogenesis in primary oocyte and first polar body in a human female?

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

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




(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?

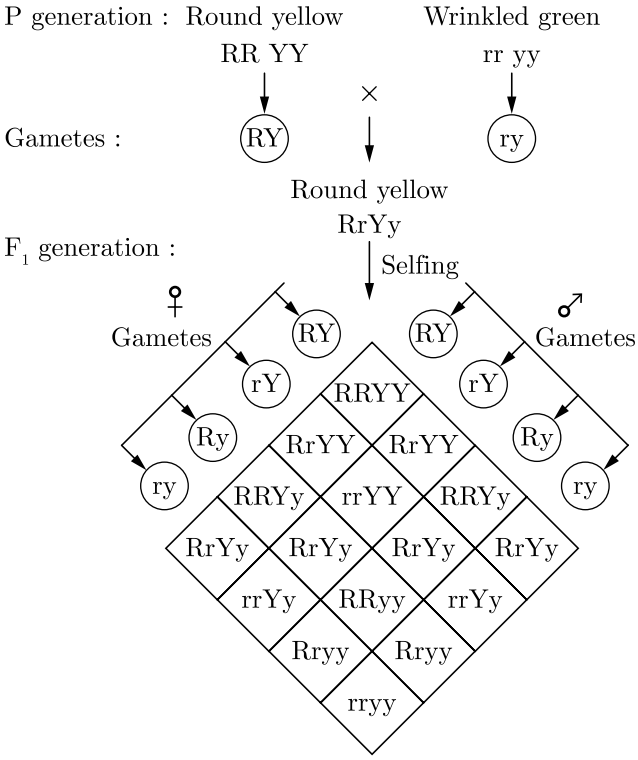
(c) How does cigarette smoking result in high blood pressure and increase in heart rate?

**OR**

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

Continue on next page.....

**30.** A geneticist crosses round yellow seeded pea plant to wrinkled green seeded pea plant and observed the inheritance of both traits as per the following pattern. He collected total 1600 seeds in $F_2$ generation.




(a) What would be the total number of seeds that are homogenous for yellow colour and heterogenous for round seed shape?

(b) What phenotypic ratio would be obtained if the plants of $F_1$ generation would be crossed with homogenous wrinkled green seeded plant?

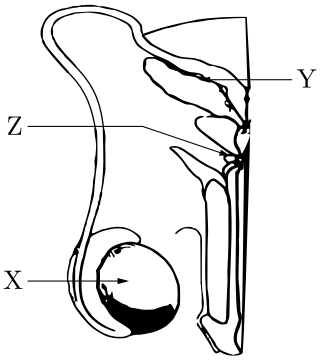
(c) How many seeds would be homogenous for wrinkled yellow and wrinkled green?

**OR**

(c) Explain the "law of independent assortment" according to the given dihybrid cross.

# SECTION - E

**31.** Refer to the given diagram that shows the human male reproductive system (one side only).



(a) Identify 'X' and write its location in the body.

(b) Name the accessory gland 'Y' and its secretion.

(c) Name and state the function of 'Z'.

**OR**

(a) Draw a sectional view of human ovary and label the following parts:
(i) Primary follicle
(ii) Secondary oocyte
(iii) Graafian follicle
(iv) Corpus luteum

(b) Name the hormones influencing follicular development of corpus luteum.

**32.** Answer the following questions regarding origin of life.

(a) Who proposed Modern theory of origin of life?

(b) Which compound was formed in S. Miller's dassic experiment of origin of life?

(c) Which compound was absent in primitive atmosphere?

(d) Name two views of the modern theory of origin of life.

**OR**

(a) How do the observations made during moth collection in pre- and post-industrialised era in England support evolution by natural selection?

(b) Explain the phenomenon that is well represented by Darwin's finches other than natural selection.

**33.** Describe the role of heat, primers and the bacterium Therm us aquaticus in the process of PCR.

**OR**

Why is a recombinant protein so called? How can it be harvested on a large scale? Write two precautions to maintain a higher yield.

# Sample Paper 12

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION-A

**1.** Egg apparatus consists of

(a) egg cell and two synergids.

(b) egg cell and central cell.

(c) egg cell and antipodal cells.

(d) egg cell and one synergid.

**2.** The ratio of phenotypes in F2 of a monohybrid cross is

(a) 9 : 3 : 3 : 1

(b) 1 : 2 : 1

(c) 3 : 1

(d) 2 : 1

**3.** Progestogens in the contraceptive pill

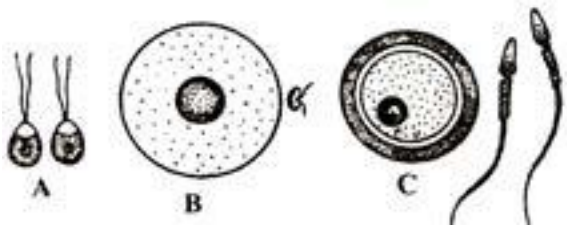
(a) checks attachment of zygote endometrium

(b) inhibits estrogen

(c) prevents ovulation

(d) All of the above

**4.** The given figures (A, B and C) are types of gametes of different organisms. Identify gametes (A, B and C) respectively.




(a) Heterogametes, isogametes, Homogametes

(b) Homo/Isogametes, heterogametes, heterogametes

(c) Homogametes, isogametes, heterogametes

(d) Isogametes, homogametes, heterogametes

**5.** What is meant by the term Darwin fitness?

(a) Healthy appearance

(b) High aggressiveness

(c) The ability to survive and reproduce

(d) Physical straight

**6.** The feature of some structures of male reproductive system is given below. Identify the structure on the basis of the characteristics which surrounds the primary sex organ of male reproductive system.

(a) It is responsible for maintaining the low temperature by about 2 - 2.5° C from normal body temperature to mature sperm.

(b) It travels through the penis and carry semen as well as urine.

(c) Its enlarged end is called glans penis.

(d) Stores sperms prior to ejaculation.

**7.** Which of the following crosses will give tall and dwarf pea plants in same proportions?

(a) TT × tt (b) tt × tt

(c) TT × Tt (d) Tt × tt

**8.** Which of the following is a plasmid?

(a) Sal I (b) Barn HI

(c) pBR322 (d) Eco RI

**9.** Amniocentesis technique is used for the

(a) sex determination of foetus

(b) determination of any genetic abnormality in the embryo

(c) determination of errors in amino acid metabolism in embryo.

(d) Both (b) and (c)

**10.** Dark coloured Peppered Moth is able to survive in industrial areas as compared to light coloured form because of

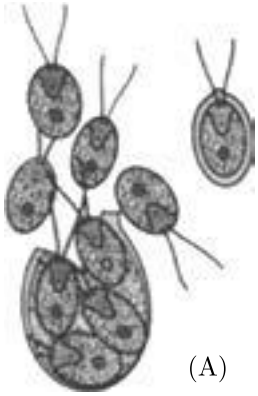
(a) Natural selection in smoky environment

(b) Mimicry

(c) High fecundity

(d) Lethal mutation

**11.** The given figures show the members of fungi and simple plants such as algae which undergo asexual reproduction. Identify the correct asexual reproductive structures found in the members A, B, C and D.

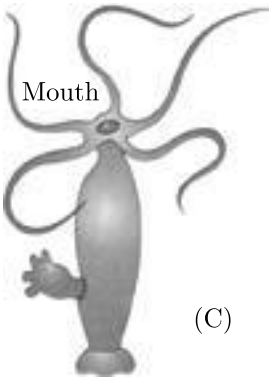


(A)

Chlamydomonas

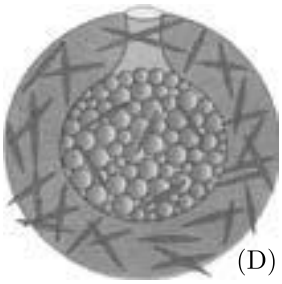
(B)

Penicillium




(C)

Hydra



(D)

Sponge

(a) A-Zoogamete, B-Conidia, C-Bud, D-Gemmule

(b) A-Aplanospore, B-Conidia, C-Bud, D-Gemmule

(c) A-Zoospore, B-Conidiosporangium, C-Bud, D-Gemmule

(d) A-Zoospore, B-Conidia, C-Bud, D-Gemmule

**12.** Person having genotype IA IB would show the blood group as AB. This is because of

(a) Pleiotropy

(b) incomplete dominance

(c) segregation

(d) Codominance

**13.** **Assertion:** Pyramid of energy maybe upright or inverted.
**Reason:** Only 10% of energy goes to next trophic level.

(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.

**14.** **Assertion :** UAA, UAG and UGA terminate protein synthesis.
**Reason :** They are not recognised by tRNA.

(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.

**15.** **Assertion :** Bt cotton is resistant to insects.
**Reason :** Butterfly feeding on Bt cotton will die.

(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.

**16.** **Assertion:** Jave Ape man, Peking man and Heidelberg man are the fossils of Homo erectus.
**Reason:** Homo erectus evolved from Homo habilis.

(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.

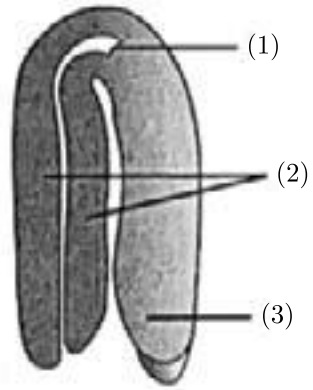
# SECTION-B

**17.** How is genetic engineering used in molecular diagnosis of disease ?

**18.** What does S-shaped pattern of population growth represent ? How is J-shaped pattern different from it and why ?

**19.** In humans, insulin is synthesised as a pro-hormone that needs to be processed before it becomes a fully mature and functional hormone. How is this challenge for production of insulin using rDNA techniques overcome for getting insulin assembled into a mature form? Explain the steps using flow chart.

**20.** In the adjacent figure of a typical dicot embryo, label the parts (1), (2) and (3). State the function of each of the labelled part.




**21.** What do you mean by gametogenesis ? Describe the structure of a human sperm.

# SECTION-C

**22.** Gregor Mendel conducted hybridisation experiments on garden peas and proposed the laws of inheritance in living organisms. For his experiments, Mendel

(A) conducted artificial pollination experiments using several true-breeding pea lines which were similar except for one character with contrasting traits.

(B) applied statistical analysis and mathematical logic to problems in biology

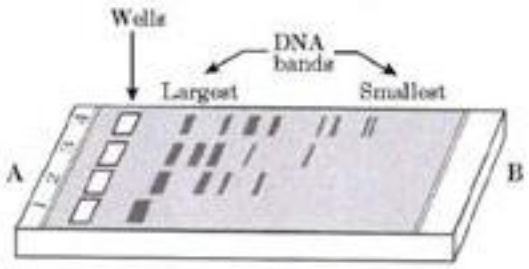
(a) What are true-breeding lines? Explain with the help of an example.

(b) Why did Mendel use true-breeding lines for his hybridisation experiments?

(c) Name one mathematical logic used by Mendel. Which other method can be used for the same?

**23.** A person is suffering from ringworm disease. Mention the pathogen. Give the symptoms of the disease along with the mode of transmission.

**24.**




Observe the diagram of gel electrophoresis and answer the questions which follow:

(a) Name the substance used as a medium/matrix in gel electrophoresis along with its source.

(b) Why does DNA move towards the anode in gel electrophoresis?

(c) How one can observe DNA in the gel after electrophoresis?

**25.** A decade ago, there was abundance of Abingdon tortoise in Galapagos Island but now this species has become extinct?

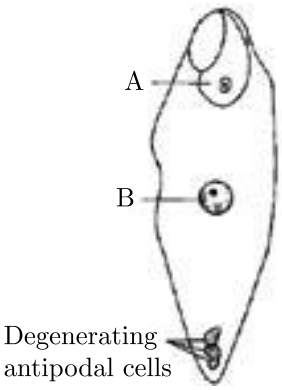
(a) Why have they become extinct?

(b) What can you say about such a relation?

**or**

Name and describe different hierarchial levels of biological diversity

**26.** The diagram below shows embryo sac after fertilisation. Observe it and answer the following questions.




(a) Give the names of the structures which develop from parts labelled as A and B in the above diagram.

(b) How is the structure developed from part '13' different from perisperm?

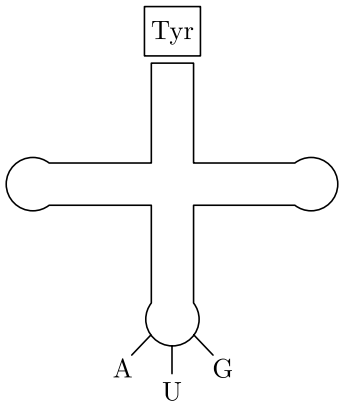
(c) Meiocyte of onion has 16 chromosomes. What will be the number of chromosomes in the structures developing from parts 'A' and `13'?

**27.** (a) Name any two copper releasing IUDs.

(b) Explain how do they act as effective contraceptives in human females.

**28.** (i) Francis Crick.

(ii)




Clovel leaf structure of tRNA

(iii) The actual structure of tRNA looks like inverted L.

# SECTION-D

**29.** Read the following and answer any four questions from 29(i) to 29 (iv) given below:

**Sex Determination:**

The cytological observations made in a number of insects led to the development of the concept of genetic/ chromosomal basis of sex-determination. Henking (1891) could trace a specific nuclear structure all through spermatogenesis in a few insects, and it was also observed by him that 50 per cent of the sperm received this structure after spermatogenesis, whereas the other 50 per cent sperm did not receive it. Henking gave a name to this structure as the X body but he could not explain its significance. Further investigations by other scientists led to the conclusion that the 'X body' of Henking was in fact a chromosome and that is why it was given the name X-chromosome. It was also observed that in a large number of insects the mechanism of sex determination is of the XO type, i.e., all eggs bear an additional X-chromosome besides the other chromosomes (autosomes). On the other hand, some of the sperms bear the X-chromosome whereas some do not. Eggs ertilised by sperm having an X-chromosome become females and, those fertilised by sperms that do not have an X-chromosome become males. Grasshopper is an example of X0 type of sex determination in which the males have only one X-choromosome besides the autosomes, whereas females have a pair of X-chromosomes. insects and mammals including man, XY type of sex determination is seen where both male and female have same number of chromosomes.

Among the males an X-chromosome is present but its counterpart is distinctly smaller and called the Y-chromosome. Females, however, have a pair of X-chromosomes. Both males and females bear same number of autosomes. Hence, the males have autosomes plus XY, while female have autosomes plus XX. In human beings and in Drosophila the males have one X and one Y chromosome, whereas females have a pair of X chromosomes besides autosomes. males produce two different types of gametes, (a) either with or without X-chromosome or (b) some gametes with X-chromosome and some with Y-chromosome. Such types of sex determination mechanism are designated to be the example of male heterogamety. Organisms, e.g., birds a different mechanism of sex determination is observed. In this case the total number of chromosome is same in both males and females. But two different types of gametes in terms of the sex chromosomes are produced by females, i.e., female heterogamety. In order to have a distinction with the mechanism of sex determination described earlier, the two different sex chromosomes of a female bird has been designated to be the Z and W chromosomes. In these organisms the females have one Z and one W chromosome, whereas males have a pair of Z-chromosomes besides the autosomes.

(i) Organism that have XO type of sex-determination?
(ii) What factors determines a human child's sex?
(iii) Which type of sex chromosome found in female bird?
(iv) Name the gametes produces by males?

**30.** Read the following and answer any four questions from 30(i) to 30 (iv) given below:

**Acquired immunity and Graft Rejection:**

Acquired immunity, on the other hand, is pathogen specific. It is characterised by memory. This means that our body when it encounters a pathogen for the first time produces a response called primary response which is of low intensity. Subsequent encounter with the same pathogen elicits a highly intensified secondary or anamnestic response. This is ascribed to the fact that our body appears to have memory of the first encounter. The primary and secondary immune responses are carried out with the help of two special types of lymphocytes present in our blood, i.e., B-lymphocytes and T- lymphocytes.The B-lymphocytes produce an army of proteins in response to pathogens into our blood to fight with them. These proteins are called antibodies. The T-cells themselves do not secrete antibodies but help B cells produce them. Each antibody molecule has four peptide chains, two small called light chains and two longer called heavy chains. Hence, an antibody is represented as $H_2L_2$. Different types of antibodies are produced in our body. IgA, IgM, IgE, IgG are some of them.

Continue on next page.....

Because these antibodies are found in the blood, the response is also called as humoral immune response. This is one of the two types of our acquired immune response - antibody mediated. The second type is called cell-mediated immune response or cell-mediated immunity (CMI). The T-lymphocytes mediate CMI. Grafts from just any source - an animal, another primate, or any human beings cannot be made since the grafts would be rejected sooner or later. Tissue matching, blood group matching are essential before undertaking any graft/transplant and even after this the patient has to take immuno-suppresants all his/her life. The body is able to differentiate 'self' and 'nonself and the cell-mediated immune response is responsible for the graft rejection.

(i) What type of response mediated by antibodies?
(ii) Which cell is responsible for cell mediated immunity?
(iii) Which molecules are most responsible for rejection of transplant?
(iv) Which immunoglobulin does constitute the largest percentage in human milk?

# SECTION-E

**31.** (a) Bacillus thuringiensis acts as a microbial biocontrol agent for protecting Brassica and fruit trees from butterfly caterpillers. Explain.
(b) (i) List the components of biogas.
(ii) How can the activated sludge be used as a source of biogas?

**32.** Many plant and animal species are on the verge of their extinction because of loss of forest land by indiscriminate use by the humans.
(a) Why there is a need to conserve biodiversity?
(b) Mention a method that you would suggest to protect such threatened species from getting extinct.
(c) Alien species are highly invasive and are a threat to indigenous species. Substantiate this statement with any two examples.

**or**

Refer the table given below and answer the following questions.
Table : Types of Interaction

| **Species A** | **Species B** | **Name of Interaction** |
|---|---|---|
| ÷ | + | P |
| — | — | Q |
| + | — | R |
| + | — | S |
| + | 0 | T |
| — | 0 | U |

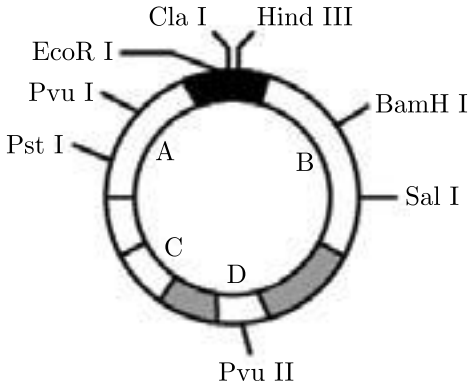
(a) Identify P, Q, R, S, T and U.
(b) (i) An orchid growing as an epiphyte on a mango branch is an example of which interaction?
(ii) Name the type of interaction seen between wasp and fig tree.
(c) Give one example of interaction 'P'.

**33.** DNA is a hydrophilic molecule so it cannot pass through cell membranes. In order to force host bacteria to take up the plasmid, the bacterial cells must first be made 'competent'. How are bacterial cells made competent? Summarise the steps that are performed to introduce alien DNA into competent bacterial cells? How can alien DNA be introduced into plant and animal host cells?

Continue on next page.....

**or**

Given below is the schematic diagram of a cloning vector pBR322. Observe the diagram and answer the following questions.




(a) Write the term for segment C of the vector. Why is it important?
(b) Segments A and B of the vector have restriction sites for many endonucleases, each of which is represented by letters followed by Roman numeral. Explain the naming of any one restriction enzyme.
(c) A foreign DNA has been inserted in the segment B. How one can identify E. coli cells with recombinant plasmids from cells with no plasmid or with non-recombinant plasmids?

□□□□□□□

# Sample Paper 13

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** Which of the following approaches does not give the defined action of contraceptive?

(a) Hormonal contraceptives - Prevent/retard entry of sperms, prevent ovulation and fertilisation

(b) Vasectomy - Prevents spermatogenesis

(c) Barrier methods - Prevent physical meeting of ovum and sperms

(d) Intrauterine devices - Increase phagocytosis of sperms, suppress sperm motility and fertilising capacity of sperms

**2.** Biogas is produced by (i) breakdown of biomass with the help of (ii) bacteria.

| | **(i)** | **(ii)** |
|---|---|---|
| (a) | anaerobic | Methanococcus |
| (b) | aerobic | Rhizobium |
| (c) | anaerobic | Rhizobium |
| (d) | aerobic | Methanobacterium |

**3.** On the rocky sea coasts of Scotland, the larger and competitively superior barnacle Balanus dominates the intertidal area and excludes the smaller barnacle Chathamalus from that zone.
Which kind of interaction is being depicted by this example?

(a) Predation (b) Parasitism

(c) Mutualism (d) Competition

**4.** Viral DNA after being converted from viral RNA by X, incorporates into host genome to undergo replication. What is 'X'?

(a) DNA polymerase

(b) Restriction endonuclease

(c) RNA polymerase

(d) Reverse transcriptase

**5.** In a grassland ecosystem, if the number of primary producers (plants) is approximately 6 million, the number of top carnivores, which may be supported by them will be

(a) 3 million

(b) 30 million

(c) 6 million

(d) 60 million

**6.** Which of the following statements is true?

(a) Wings of birds and insects are homologous organs.

(b) Human hands and bird's wings are analogous organs.

(c) Human hands and bat's wings are analogous organs.

(d) Flipper of penguin and dolphin are analogous organs.

**7.** Which of the following is a correct statement?

(a) IUDs once inserted need not be replaced.

(b) IUDs are generally inserted by the user herself.

(c) IUDs increase phagocytosis of sperms in the uterus.

(d) IUDs suppress gametogenesis.

**8.** Which of the following is not a property of the genetic code?

(a) Non-overlapping

(b) Ambiguous

(c) Degeneracy

(d) Universal

**9.** Elderly people are advised to get influenza (flu) vaccinations every year. Each year, a different type of flu vaccine has to be made. This is because

(a) different viruses attack people of different ages, so each year as the population ages, a new vaccine must be produced

(b) vaccines are unstable and cannot be stored for more than one year

(c) the body learns to destroy the antibodies made against the vaccine, so a new type of vaccine is needed for each vaccination

(d) flu viruses change their genetic constituents so rapidly that vaccines against them rapidly become obsolete.

**10.** The population of an insect species shows an explosive increase in numbers during rainy season followed by its disappearance at the end of the season. What does this show?

(a) The food plants mature and die at the end of the rainy season.

(b) Its population growth curve is of J-type.

(c) The population of its predators increases enormously.

(d) S-shaped or sigmoid growth of this insect.

**11.** Which one of these is not included in the biodiversity hotspots of India?

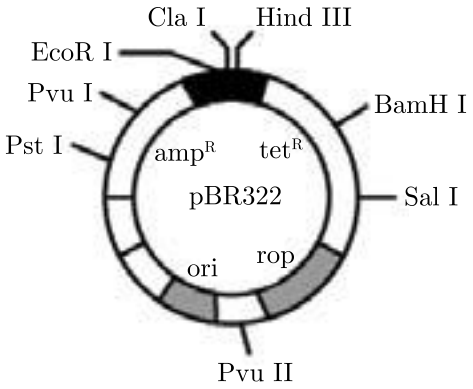
(a) Western Ghats

(b) Himalayas

(c) Indo-Burma

(d) North Indian Plains

**12.** Observe the diagram of pBR322 and select the incorrect statement.




(a) 8 restriction sites are shown in the diagram.

(b) 4 restriction sites have no concern with losing of antibiotic resistance.

(c) If *Pvu* II acts on its restriction site, then antibiotic resistance offered by pBR322 will be totally lost.

(d) If foreign DNA is ligated at *Bam*H 1 site, ampicillin resistance will continue.

**13.** **Assertion :** Elimination of a competitively inferior species in a closely related or otherwise similar group is known as competitive exclusion principle.
**Reason :** If two species compete for the same resource, they could avoid competition by choosing different times for feeding or different foraging patterns.

(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.

**14.** **Assertion :** Mouse is the most preferred mammal for studies on gene transfers.
**Reason :** Mouse possesses features like short oestrous cycle and gestation period, relatively short generation time, production of several offspring per pregnancy, etc.

(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.

**15.** **Assertion :** Pairing and separation of pair of chromosomes would lead to segregation of a pair of factors they carried.
**Reason :** Two alleles of a gene pair are located on similar sites of non-homologous chromosomes.

(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.

**16.** **Assertion :** Chasmogamous flowers require pollinating a gents.
**Reason :** Cleistogamous flowers do not expose their sex organs.

(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.

# SECTION - B

**17.** Some of the microbes used as biofertilisers are prokaryotes. Name the taxonomic group they come under. With the help of an example, mention how they act as biofertilisers.

**18.** Why is Taq polymerase preferred in PCR? Mention the source of this enzyme?

**19.** The given figure shows karyotype of a child who is suffering from a sex chromosomal abnormality which occurs during failure of segregation of chromatids during cell division cycle. This results in the gain or loss of a chromosome (s), called aneuploidy. Study the figure and answer the questions that follow :

(a) Identify the disease from the given karyotype.

(b) Write the chromosomal complement of the child.

**20.** Name the stage of the human embryo that gets implanted in the uterus and draw its labelled diagram.

**21.** Write two differences between Homo erectus and Homo habilis.

# SECTION - C

**22.** Differentiate between the genetic codes given below :

(a) Unambiguous and Universal

(b) Degenerate and Initiator

**23.** (a) Why are transgenic animals so called?

(b) Explain the role of transgenic animals in (i) vaccine safety and (ii) biological products with the help of an example each.

**24.** Explain mechanism of sex-determination in birds.

**25.** "In a food chain, a trophic level represents a functional level, not a species". Explain.

**OR**

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

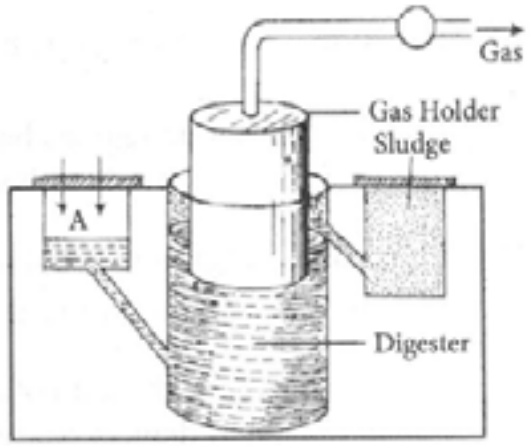
(b) State the relationship between gross and net primary productiviy.

**26.** Study the given picture of biogas plant and answer the following questions:

(a) Name the components gaining entry from A into the chamber.

(b) Mention the group of bacteria and the condition in which they act on the component that entered from A in the digester.

(c) Name the components that get collected in gas holder.




**27.** Medically it is advised to all young mothers that breast feeding is the best for their newborn babies. Do you agree? Give reasons in support of your answer.

**28.** Describe the process of parturition in humans.

**OR**

Draw a labelled diagram of a human sperm.

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** Human evolution is a lengthy evolutionary process within the history of primates. The stages given here show the order of evolutionary history of man.

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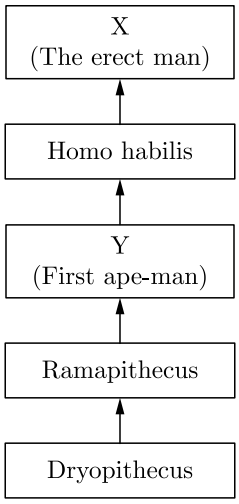



(a) Identify 'X' and 'Y

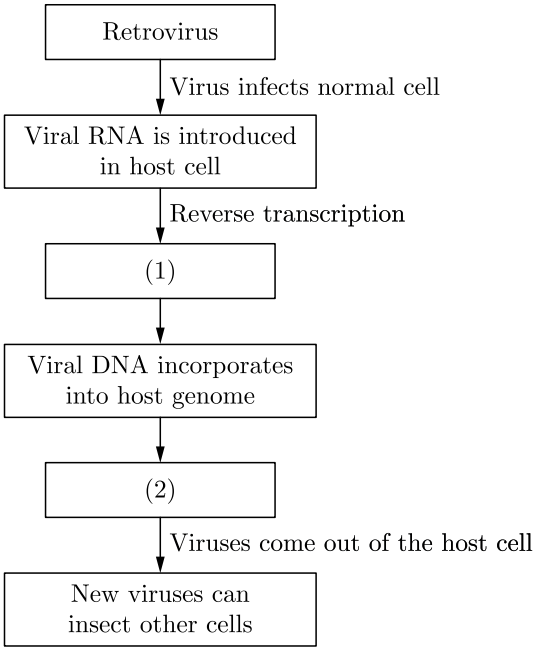
(b) What was the brain capacity of 'X'?

(c) Give some important features of 'Y'.

**OR**

(c) When was 'X' discovered?

**30.** In the given flow chart, the replication of retrovirus in a host is shown. Observe and answer the following questions.




(a) What can be placed in blanks (1) and (2)?

(b) Why is the virus called retrovirus? Give one example.

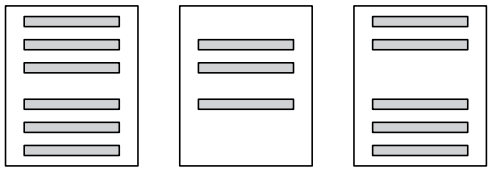
(c) Can the infected cell survive while viruses are being replicated and released?

**OR**

(c) Name the disease which is caused by a retrovirus. How this virus gets transmitted?

# SECTION - E

**31.** Blood samples from a crime scene was collected and DNA analysis for the same was done. Given below are the marker profiles collected at the crime scene of the victim and a suspect.



Crime scene Victim Suspect

(a) What will you conclude on the basis of above observation?

(b) Discuss how this technique helps in determining that the blood samples picked up from the crime scene belong to a single person or two different persons.

(c) How can be the maternal and paternal identity disputes sorted out using the technique used above?

**OR**

(a) Select the homologous structures from the combinations given below :
(i) Forelimbs of whales and bats
(ii) Tuber of potato and sweet potato
(iii) Eyes of octopus and mammals
(iv) Thorns of Bougainvillea and tendrils of Cucurbita.

(b) State the kind of evolution represent by the homologous structures.

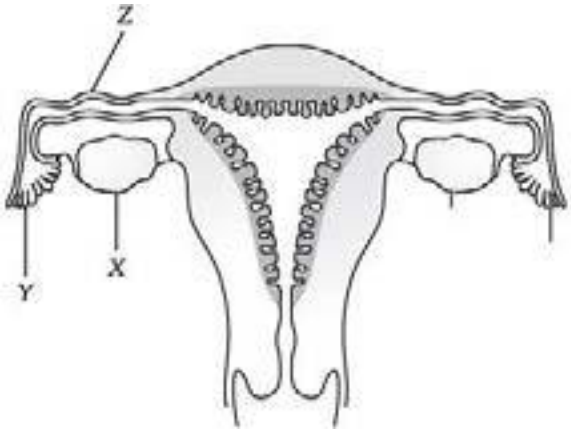
(c) What are analogous structures? How are they different from homologous structures? Provide one example for each.

**32.** Describe the various stages involved in the commercial production of human insulin by Eli Lilly.

**OR**

Explain the application of biotechnology in producing Bt cotton.

**33.** (a) The given diagram shows a part of the human female reproductive system.




(i) Name the gamete cells that would be present in 'X' if taken from a newborn baby.
(ii) Name 'Y' and write its function.
(iii) Name 'Z' and write the events that take place here.

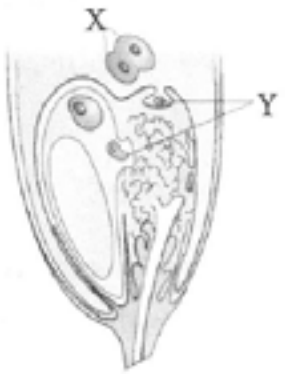
Continue on next page.....

(b) Name the muscular and the glandular layers of human uterus. Which one of these layers undergoes cyclic changes during menstrual cycle? Name the hormone essential for the maintenance of this layer.

**OR**

(a) Refer to the given figure and answer the following questions :
(i) Identify the labelled parts X and Y.
(ii) Write the role of X and Y.
(iii) Draw labelled prior stage of the given figure.

(b) Why is fertilisation in an angiosperm referred to as double fertilisation? Mention the ploidy of the cells involved.

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# Sample Paper 14

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** Match column I with column II and select the correct option from the codes given below.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Statins | (i) | Methanobacterium |
| B. | Biogas | (ii) | Saccharomyces cerevisiae |
| C. | Ethanol production | (iii) | Monascus purpureus |
| D. | Converts milk to curd | (iv) | Lactobacillus |

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

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

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

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

**2.** Rate of decomposition depends upon

(a) chemical composition of detritus (b) temperature

(c) soil moisture and soil pH (d) all of these

**3.** Which of the following factors has a negative effect on the population growth rate?

(a) Emigration (b) Immigration

(c) Natality (d) Both (b) and (c)

**4.** Single step large mutation leading to speciation is called

(a) founder effect (b) saltation

(c) branching descent (d) natural selection

**5.** Which of the following diseases are treated by antibiotics?
(i) Plague
(ii) Diphtheria
(iii) Leprosy
(iv) Whooping cough

(a) (i), (ii) and (iii) (b) (i), (iii) and (iv)

(c) (ii), (iii) and (iv) (d) (i), (ii), (iii) and (iv)

**6.** Which type of pyramid is always upright?

(a) Number (b) Biomass

(c) Weight (d) Energy

**7.** If a recombinant DNA bearing gene for resistance to antibiotic ampicillin is transferred to E.coli cells, the host cells become transformed into ampicillin resistant cells. If such bacteria are transferred on agar plates containing ampicillin, only transformants will gmw and the untransformed recipient cells will die. The ampicillin resistant gene in this case is called as

(a) selectable marker (b) recombinant protein

(c) cloning site (d) chemical scalpels

**8.** In which organ does the sexual stage (gametocytes) of Plasmodium form?

(a) Salivary glands of mosquito (b) Human RBC

(c) Intestine of mosquito (d) Human liver

**9.** Tubectomy is a method of sterilisation in which

(a) small part of the fallopian tube is removed or tied up

(b) ovaries are removed surgically

(c) small part of vas deferens is removed or tied up

(d) uterus is removed surgically

**10.** Match column I with column II and select the correct option from the codes given below.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Mutation | (i) | Change in allele frequency in a population due to chance alone |
| B. | Gene flow | (ii) | Differences in survival and reproduction among variant individuals |
| C. | Natural selection | (iii) | Immigration, emigration change allele frequencies |
| D. | Genetic drift | (iv) | Random and directionless |

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

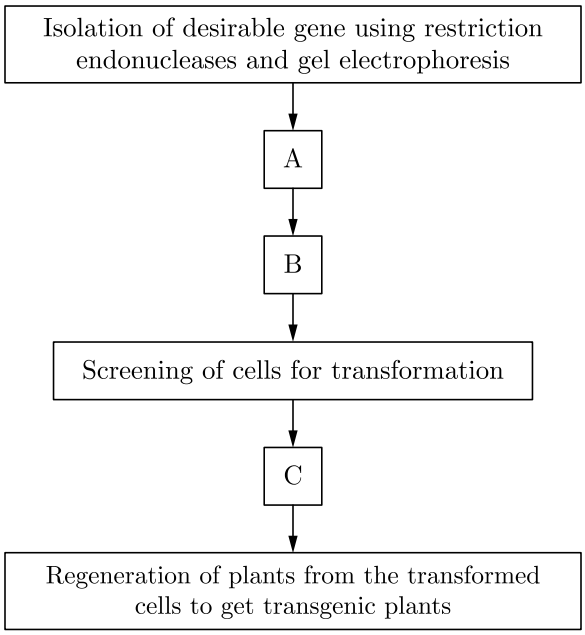
(c) A-(iii), B-(i), C-(iv), D-(ii) (d) A-(iv), B-(iii), C-(ii), D-(i)

**11.** 'Verhulst - Pearl' is associated with the equation

(a) $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$ (b) $\frac{dN}{dt} = tN\left(\frac{K-N}{N}\right)$

(c) $\frac{dN}{dt} = rN\left(\frac{K-N}{N}\right)$ (d) $\frac{dN}{dt} = tN\left(\frac{K-N}{K}\right)$

**12.** The given flow chart depicts the steps to transfer a desirable gene of interest into a plant.
Isolation of desirable gene using restriction endonucleases and gel electrophoresis




Identify the missing steps (A, B and C) with regard to following statements and select the correct option.
(i) Joining of desirable gene to a suitable cloning vector using ligases to create a recombinant DNA molecule.
(ii) Selection of transformed cells.
(iii) Transferring the recombinant DNA molecules to the target cells.

A B C

(a) (i) (ii) (iii) (b) (i) (iii) (ii)

(c) (ii) (iii) (i) (d) (iii) (i) (ii)

**13.** **Assertion :** Tropical regions have got a long evolutionary time for species diversification as compared to temperate regions.
**Reason :** Temperate regions have undergone frequent glaciations in the past whereas tropical regions have remained relatively undisturbed for millions of years.

(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.

**14.** **Assertion :** Myometrium is an important component of uterus.
**Reason :** Myometrium produces strong contractions during parturition.

(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.

**15.** **Assertion :** Water constitutes a major mode of pollination in most of the aquatic angiospermous plants.
**Reason :** Vallisneria and Zostera are examples of water pollinated plants.

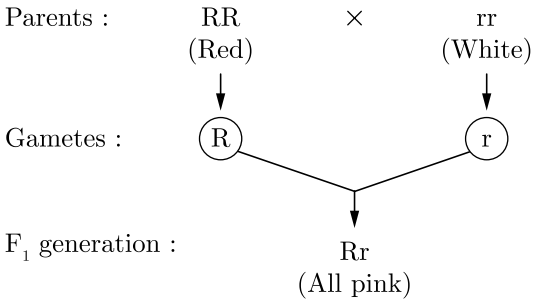
(a) Both A and R are true and R is the correct explanation of A.

(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.

**16.** Given below is the monohybrid cross. It depicts the cross between the red flower and white flower colour in the Antirrhinum sp. Study this monohybrid cross and comment upon the appropriateness of the Assertion and Reason.




**Assertion :** It shows the incomplete dominance.
**Reason :** The $F_2$ generation of Antirrhinum shows different phenotypic and genotypic ratio.

(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.

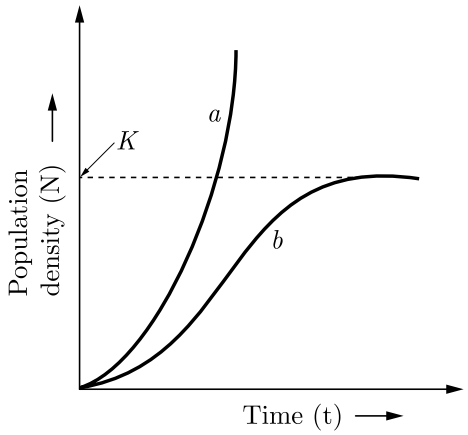
# SECTION - B

**17.** Principle of vaccination is based on the property of "memory" of the immune system. Taking one suitable example, justify the statement.

**18.** Why is making cells competent essential for biotechnology experiments? List any two ways by which this can be achieved.

**19.** Draw a diagram of the structure of a human ovum surrounded by corona radiata. Label the following parts :
(i) Ovum
(ii) Plasma membrane
(iii) Zona pellucida

**20.** Study the graph given below and answer the questions that follows:




The curve 'b' is described by the following equation:

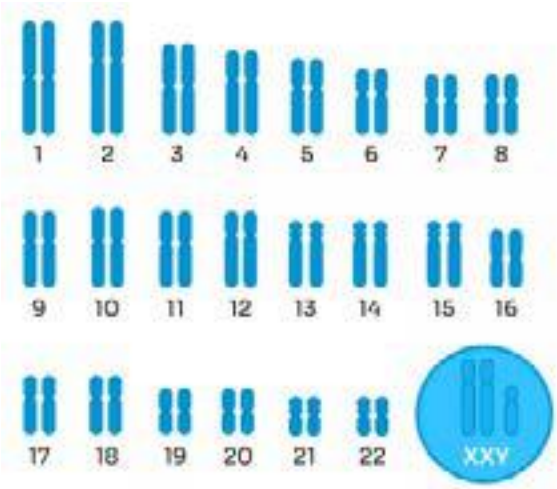
$$\frac{dN}{dt} = rN\left\{\frac{K-N}{K}\right\}$$

What does '$K$' stand for in this equation? Mention its significance.

**OR**

Which curve represent the human population growth at present? Do you think such a curve is sustainable? Give reason in support of your answer.

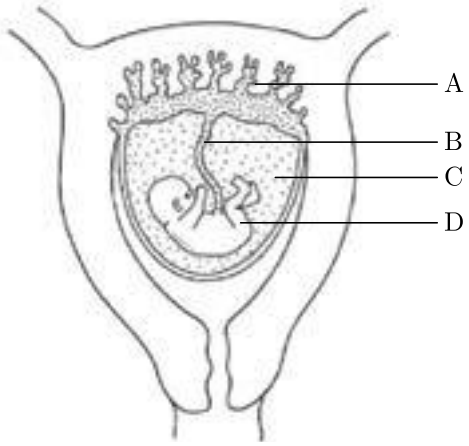
**21.** Given figure shows karyotype of a child who is suffering from a sex chromosomal abnormality which occurs during failure of segregation of chromatids during cell division cycle. This results in the gain or loss of a chromosome (s), called aneuploidy.




(i) Identify the disease from the given karyotype.
(ii) Mention the diagnostic features of this disease.

# SECTION - C

**22.** The following figure shows a fetus within the uterus. On the basis of the given figure, answer the questions that follow:




(a) Mention the role of B in the development of the embryo.

(b) Name the fluid surrounding the developing embryo.

(c) Identify A.

**23.** (a) Explain the cause responsible in a human to have sex chromosomes as XXY instead of 'XX' or 'XY'.
(b) List any two ways such individuals are different from the normal being.

**24.** State a functional difference between the following.

(a) AUG and UAA

(b) Specific and Degenerate

**25.** (a) How has the development of bioreactor helped in biotechnology?

(b) Name the most commonly used bioreactor and describe its working.

**26.** Mention any six differences between active immunity and passive immunity.

**27.** (a) How is placenta formed in the human female?

(b) Name any two hormones which are secreted by it and are also present in a non-pregnant woman.

**28.** Taking one example each of habitat loss and fragmentation, explain how are the two responsible for biodiversity loss.

**OR**

Several factors possess threats to indigenous species of a particular area. Introduction of alien species is one such threat. Justify it with few examples.

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** Study the two cases carefully regarding the pattern of inheritance of disease.

| Case | Mother | Father | Children |
|---|---|---|---|
| Case I | With disease | Normal | Sons always with diseases |
| Case II | With disease | Normal | Sons and daughters could show disease |

(a) Give two examples of case I diseases.

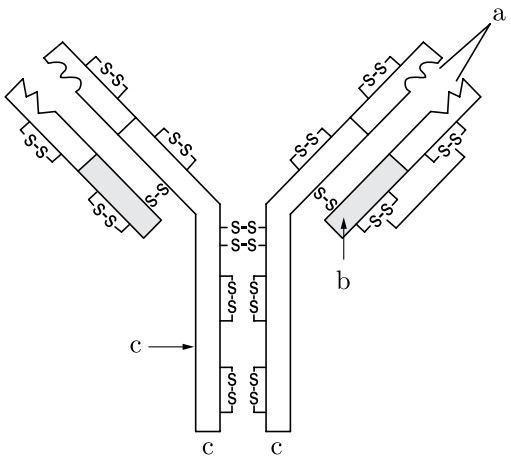
(b) On which chromosome case I diseases are present on?

(c) If inheritance pattern of disease is as case II and both parents are carrier of disease then what are the chances of pregnancy resulting in an affected child?

**OR**

(c) The possibility of a human female suffering from a hemophilia disease is rare. Why is it so?

**30.** Refer to the given figure of antibody and answer the following questions.




(a) Identify a, b and c in the given diagram.

(b) Write the chemical nature of an antibody.

(c) Mention the type of immune response provided by an antibody.

**OR**

(c) Name the cells that produce antibodies in humans.

# SECTION - E

**31.** According to Chargaff, almost all DNA-no matter what organism or tissue type it comes from maintains certain properties, even as its composition varies. In particular, the amount of adenine (A) is usually similar to the amount of thymine (T) and the amount of guanine (G) usually approximates the amount of cytosine (C).

(i) A sample of DNA having 5375 nucleotides was analysed, out of which the propagation of different bases were : Adenine = 33%, Guanine 18%, Cytosine = 33%, Thymine = 17%. What can be concluded from this data?

(ii) If one strand of DNA has the following percentage.

A = 26%, T = 23%, C = 24%, G = 27%

What percentage will be found in the complementary strand?

(iii) If a sample of DNA has a cytosine content of 26%, what proportion of thymine do you expect?

**OR**

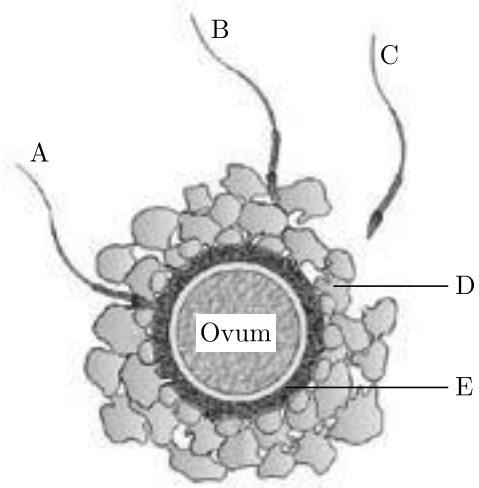
Pea seeds with BB alleles have round seeds and large starch grains, while seeds with bb alleles have wrinkled seeds with small starch grains. Work out the cross between these two parents. Explain the phenotypic ratio of the progeny with respect to seed shape and the starch grain size of the progeny produced.

**32.** Can you think and answer how a reporter enzyme can be used to monitor transformation of host cells by foreign DNA in addition to a selectable marker?

**OR**

Explain the application of rDNA technology to produce insulin with diagram. Explain the difference between humulin and insulin produced by rRNA technology.

**33.** Refer to the following diagram and answer the following questions:




(a) Identify D and E.

(b) How is the sperm able to penetrate inside the ovum?

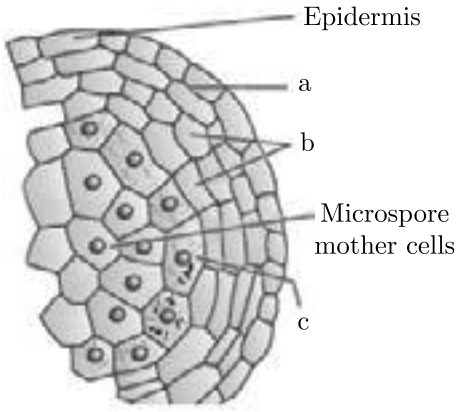
(c) Where exactly in the Fallopian tube does this occur?

(d) Explain the events thereafter upto morula stage.

Continue on next page.....

**OR**

Given below is an enlarged view of one microsporangium of a mature anther.




(i) Name 'a' , 'b' and 'c' wall layers.
(ii) Mention the characteristics and function of the cell wall forming wall layer 'c'.
(iii) An anther with malfunctioning layer 'c' often fails to produce viable male gametophytes. Give reason.

□□□□□□□

# Sample Paper 15

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

---

# SECTION - A

**1.** Along with nicotine, cigarette smokers also have the intake tars, phenols, hydrocarbons, arsenic and many other chemicals. Which of the following is not an effect of smoking tobacco?

(a) Narrowing or hardening of blood vessels in the heart and brain

(b) A higher frequency of respiratory infections (e.g., colds, pneumonia)

(c) A higher risk of cancer, including cancer of the lungs, mouth, larynx, bladder and kidneys

(d) None of these

**2.** Big holes in Swiss cheese are made by a

(a) a machine

(b) a bacterium that produces methane gas

(c) a bacterium producing a large amount of carbon dioxide

(d) a fungus that releases a lot of gases during its metabolic activities.

**3.** Fitness according to Darwin refers to

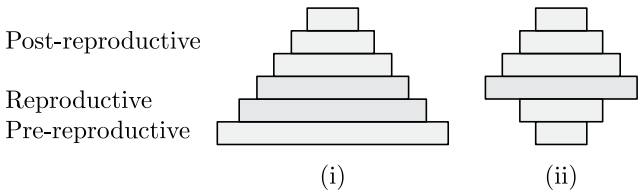
(a) number of species in a community

(b) useful variation in population

(c) strength of an individual

(d) reproductive fitness of an organism.

**4.** What does the shape of the given age pyramids reflects about the growth status of the related population?




(a) Expanding Stable

(b) Stable Declining

(c) Expanding Declining

(d) Declining Stable

**Click the Following Button to See the Free MS/Solutions**

**SOLUTIONS**

**5.** In pBR322, tetracycline resistance gene ($tet^R$) has recognition site for which of the following restriction endonuclease?

(a) *Hind* III (b) *Bam*H I

(c) *Eco*R I (d) *Pst* I

**6.** What is the correct sequence of sperm formation?

(a) Spermatogonia, spermatozoa, spermatocytes, spermatids

(b) Spermatogonia, spermatocytes, spermatids, spermatozoa

(c) Spermatids, spermatocytes, spermatogonia, spermatozoa

(d) Spermatogonia, spermatocytes, spermatozoa, spermatids

**7.** The biomass available for consumption to heterotrophs and the rate of formation of new organic matter by consumers are referred to as

(a) gross primary productivity and net primary productivity respectively

(b) net primary productivity and gross primary productivity respectively

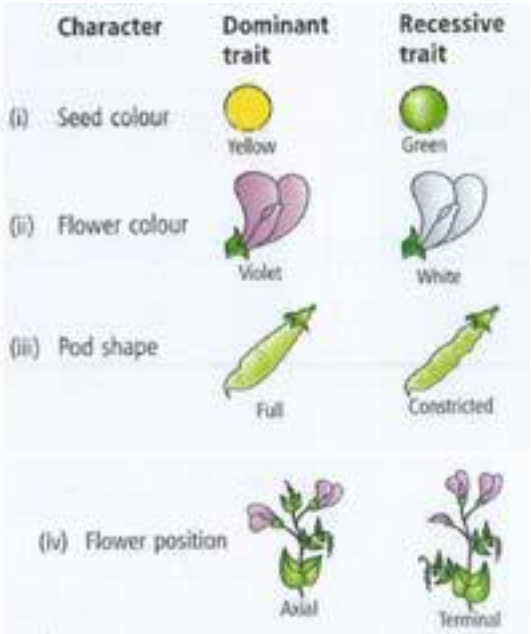
(c) gross primary productivity and secondary productivity respectively

(d) net primary productivity and secondary productivity respectively.

**8.** Which of the following approaches does not give the defined action of contraceptive?

| | | |
|---|---|---|
| (a) | Hormonal contraceptives | Prevent/retard entry of sperms, prevent ovulation and fertilisation |
| (b) | Vasectomy | Prevents spermatogenesis |
| (c) | Barrier methods | Prevent fertilisation |
| (d) | Intra uterine devices | Increase phagocytosis of sperms, suppress sperm motility and fertilising capacity of sperms |

**9.** Refer to the given table of contrasting traits in pea plants studied by Mendel.

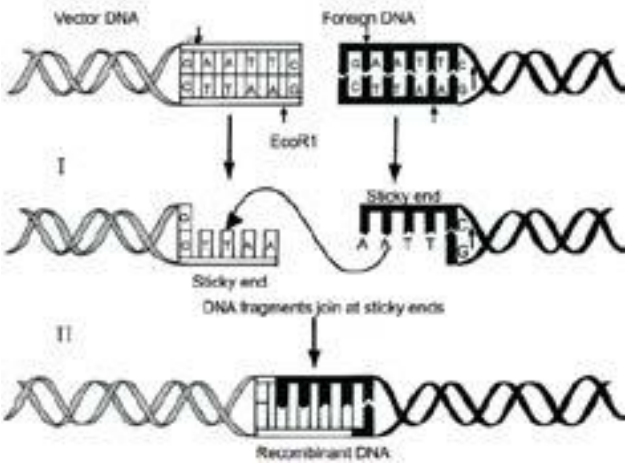



Which of the given traits are incorrectly placed?

(a) (i), (ii) and (iii) only (b) (ii), (iii) and (iv) only

(c) (i) and (iv) only (d) (iii) only

**10.** Study the following figures and identify the enzymes involved in steps I and II respectively.




(a) *Eco*R I and DNA ligase

(b) *Hind* II and DNA ligase

(c) *Eco*R I and *Hind* II

(d) Restriction endonuclease and exonuclease

**11.** Ernst Chain and Howard Florey's contribution was

(a) establishing the potential of penicillin as an effective antibiotic

(b) discovery of streptokinase

(c) production of genetically engineered insulin

(d) discovery of DNA sequence

**12.** Which of the following phenomena was experimentally proved by Meselson and Stahl?

(a) Transformation

(b) Transduction

(c) Semi-conservative DNA replication

(d) Central dogma

**13.** **Assertion :** Offsite collections can be used to restock depleted populations, reintroduce species in the wild and restore degraded habitats.
**Reason :** In situ conservation refers to the conservation of endangered species in their natural habitats.

(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.

**14.** **Assertion :** The introduction of Nile perch in lake Victoria caused cichlids to become extinct.
**Reason :** Nile perch is an indigenous species of East Africa.

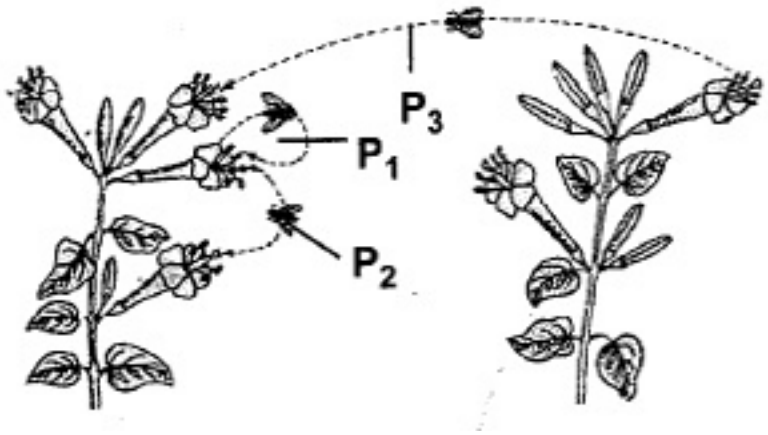
(a) Both A and R are true and R is the correct explanation of A.

(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.

**15.** In the given diagram two plants of the same species depict different types of pollination indicated by the labellings $P_1$, $P_2$ and $P_3$. Study this diagram and comment upon the appropriateness of the Assertion and Reason.




**Assertion :** $P_1$ is a type of self pollination.
**Reason :** In $P_1$, complete flower is pollinated by its own pollen.

(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.

**16.** **Assertion :** Biodiversity hotspots are the regions which possess low levels of species richness, high degree of endemism and no loss to habitats.

**Reason :** Total number of biodiversity hotspots in the world is 34 with three of these hotspots found in India.

(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.

# SECTION - B

**17.** Write the relationship between productivity, gross primary productivity, net primary productivity and secondary productivity.

**OR**

State the difference between the first trophic levels of detritus food chain and grazing food chain.

**18.** Tallness of pea plant is a dominant trait, while dwarfness is the alternate recessive trait. When a pure-line tall is crossed with pure-line dwarf, what fraction of tall plant in $F_2$ shall be heterozygous? Give reasons.

**19.** Refer to the given figure and answer the following questions.


(i) Which of the labelled structures is a pre-birth structure and is not formed thereafter?
(ii) Which of the labelled structures responds to LH surge by rupturing?

**20.** A young boy when brought a pet dog home started to complaint of watery eyes and running nose. The symptoms disappeared when the boy was kept away from the pet.

(a) Name the type of antibody and the chemicals responsible for such a response in the boy.

(b) Mention the name of any one drug that could be given to the boy for immediate relief from such a response.

**21.** State the functions of the following in the cloning vector pBR322 :

(a) ori (b) rop

# SECTION - C

**22.** Explain the steps in the formation of an ovum from an oogonium in humans.

**23.** (a) Can a plant flowering in Mumbai be pollinated by pollen grains of the same species growing in New Delhi? Provide explanations to your answer.

(b) Draw the diagram of a pistil where pollination has successfully occurred. Label the parts involved in transferring the male gametes to their desired destination.

**24.** (a) What do 'Y' and 'B' stand for in 'YAC' and 'BAC' used for DNA sequencing in Human Genome Project (HGP)? Mention their role in the project.

(b) Write the percentage of human genome that codes for proteins and the percentage of discovered genes whose functions are unknown.

(c) Expand `SNPs' identified by scientists in HGP.

**25.** (a) Explain adaptive radiation with the help of a suitable example.

(b) Cite an example where more than one adaptive radiation have occurred in an isolated geographical area. Name the type of a evolution your example depict and state why it is so named.

**26.** (a) Explain the basis on which the gel electrophoresis technique works.

(b) Write any two ways by which products obtained through this technique can be utilised.

**27.** Why are lymph nodes and bone marrows called lymphoid organs? Explain the functions of each one.

**OR**

(a) Name the causative organisms for the following diseases :

(i) Elephantiasis
(ii) Ringworm
(iii) Amoebiasis

(b) How can public hygiene help control infectious diseases?

**28.** Name and describe any three causes of biodiversity losses.

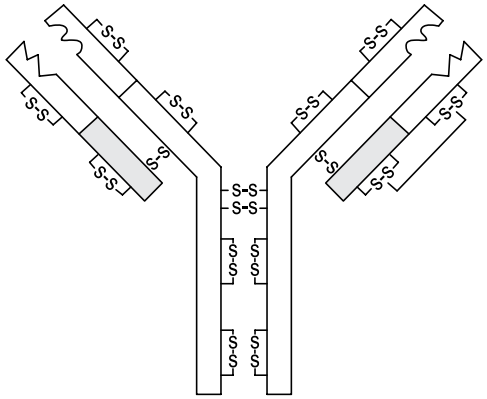
# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** Acquired immunity is pathogen specific and characterised by memory. Whenever our body encounters a pathogen for the first time, it produces a response. Subsequent encounter with the same pathogen elicts a highly intensified secondary response.

(a) Name the two lymphocytes which are responsible for acquired immunity.

(b) Identify the structure shown in the figure.



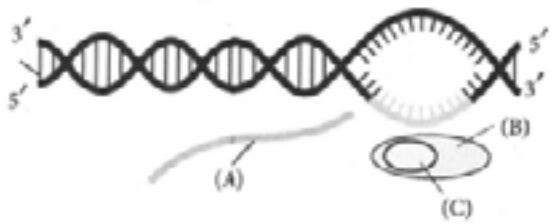

(c) It is generally observed that the children who had suffered from chicken-pox in their childhood may not contract the same disease in their adulthood. Explain giving reasons the basis of such an immunity in an individual. Name this kind of immunity.

**OR**

(c) Differentiate between the two lymphocytes responsible for acquired immunity.

**30.** The process of copying genetic information from template strand of DNA into RNA is called transcription. It is mediated by RNA polymerase. Transcription takes place in the nucleus of eukaryotic cells. In transcription, only a segment of DNA and only one of the strands is copied into RNA. Transcription mainly consists of three steps. One of the steps of transcription is given below.

Continue on next page.....




(a) Identify the given step and name the labels B and C.

(b) What will happen if C is not available in the above process?

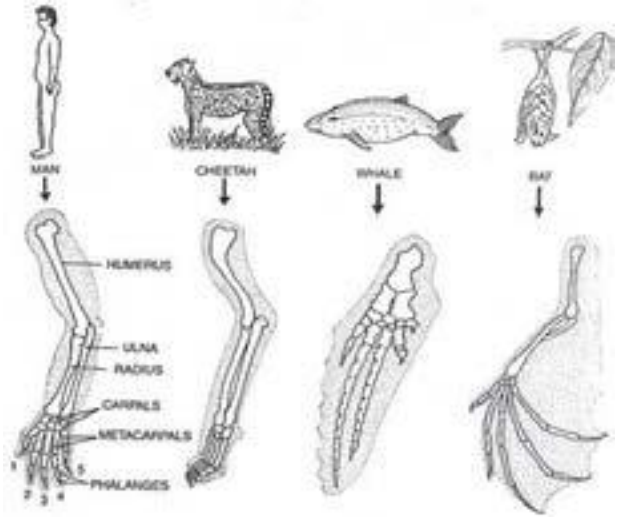
(c) What changes will take place in A after the completion of above process in eukaryotes?

**OR**

(c) Briefly explain the previous step or given figure taking place in prokaryotes.

# SECTION - E

**31.** (a) Forelimbs of given animals have the same basic structural plan. Such organs have similar developmental pattern and they develop in related organisms, but these do differ morphologically. What type of evolution and structure is exhibited by the organisms given in the figure.




(b) (i) Differentiate between analogy and homology giving one example each of plant and animal.

(ii) How analogy and homology considered as an evidence in support of evolution?

**OR**

Refer to the given information regarding human evolution given below and answer the following questions.
The fossil evidence clearly indicates that origin of man occured in Central Asia. About 15 mya, primates called Dryopithecus and Ramapithecus were existing. Among the stories of evolution, the story of evolution of modern man appears to parallel evolution of human brain and their charactristics development.

(a) Where did Australopithecus evolve?

(b) Write the scientific name of Java man.

(c) Name the first human like hominid. Mention his food habit and brain capacity.

(d) Write the characteristics of Ramapithecus and Neanderthal man.

**32.** Describe the roles of pituitary and ovarian hormones during the menstrual cycle in a human female.

**OR**

(i) Trace the development of megaspore mother cell up to the formation of a mature embryo sac in a flowering plant.

(ii) Draw a labelled diagram of the structure of mature dicot embryo.

**33.** (i) What is *Eco*RI? How does *Eco*RI differ from an exonuclease?

(ii) EcoRI is used to cut a segment of foreign DNA and that of a vector DNA to form a recombinant DNA.

Show with the help of schematic diagrams.

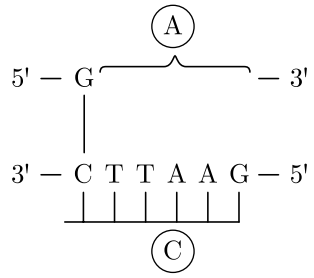
(a) The set of palindromic nucleotide sequence of base pairs the EcoRI will recognise in both the DNA segments. Mark the site at which EcoRI will act and cut both the segments.

(b) Sticky ends formed on both the segments where the two DNA segments will join later to form a recombinant DNA.

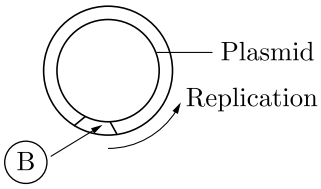
**OR**

(i) (a) Identify Ⓐ and Ⓑ illustrations in the following:

(i)




(ii)




(b) Write the term given to Ⓐ and Ⓒ and why?

(ii) (a) Expand PCR. Mention its importance in biotechnology.

(b) Describe the roles of heat, primers and the bacterium Thermus aquaticus in the process of PCR.

□□□□□□□

# Sample Paper 16

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** After double fertilisation, a mature ovule has

(a) 1 diploid and 1 haploid cell
(b) 1 diploid and 1 triploid cell
(c) 2 haploid and 1 triploid cell
(d) 1 haploid and 1 triploid cell

**2.** Which one of the following is the correct matching of the events occurring during menstrual cycle?

(a) Proliferative phase : Rapid regeneration of myometrium and maturation of Graafian follicle
(b) Secretory phase : Development of corpus luteum and increased secretion of progesterone
(c) Menstruation : Breakdown of myometrium and ovum not fertilised
(d) Ovulation : LH and FSH attain peak level and sharp fall in the secretion of progesterone

**3.** If the sequence of bases in one strand of DNA is ATGCATGCA, what would be the sequence of bases on complementary strand?

(a) ATGCATGCA
(b) AUGCAUGCA
(c) TACGTACGT
(d) UACGUACGU

**4.** Select the correct match.

| | **Gene** | **Target insect** |
|---|---|---|
| A. | *cry*IAC | Cotton bollworm |
| B. | *cry*IIAb | Corn borer |
| C. | *cry*IAb | Cotton bollworm |

(a) A only
(b) A and C only
(c) B and C only
(d) A, B and C

**5.** If a plasmid vector is digested with EcoRI at a single site, then

(a) one sticky end will be produced
(b) two sticky ends will be produced
(c) four sticky ends will be produced
(d) six sticky ends will be produced

**6.** Injection of antitoxin in tetanus confers which type of immunisation?

(a) Active immunisation (b) Passive immunisation

(c) Auto-immunisation (d) Humoral immunisation

**7.** The birth and death rates of four countries are given below. Which one will have the least population growth rate?

| **Country** | **Birth rate/1000** | **Death rate/1000** |
|---|---|---|
| P | 15 | 5 |
| Q | 25 | 10 |
| R | 35 | 18 |
| S | 48 | 41 |

(a) P (b) Q

(c) R (d) S

**8.** An isolated population of humans with approximately equal numbers of blue-eyed and brown-eyed individuals was decimated by an earthquake. Only a few brown-eyed people remained to form the next generation. This kind of change in the gene pool is called

(a) Hardy-Weinberg equilibrium (b) blocked gene flow

(c) genetic drift (d) gene migration

**9.** The diagnostic test that confirms typhoid in humans is

(a) ELISA (b) Widal

(c) MRI (d) amniocentesis

**10.** Which of the following in sewage treatment removes suspended solids?

(a) Secondary treatment (b) Primary treatment

(c) Sludge treatment (d) Tertiary treatment

**11.** Match column I with column II and select the correct option from the given codes.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Multiple allelism | (i) | Tt × tt |
| B. | Back cross | (ii) | Tt × TT |
| C. | Test cross | (iii) | Human blood groups |
| D. | Crossing over | (iv) | Non-parental gene combination |
| E. | Recombination | (v) | Non-sister chromatids |

(a) A-(iii), B-(i), C-(ii) D-(v), E-(iv) (b) A-(iii), B-(ii), C-(i), D-(v), E-(iv)

(c) A-(iii), B-(ii), C-(i), D-(iv), E-(v) (d) A-(iv), B-(ii), C-(i), D-(v), E-(iii)

**12.** In a life table, the number of individuals alive at the beginning of the $1^{St}$ year to $2^{nd}$ year interval is 800. During this interval, 200 individuals die. The death rate for this interval is

(a) 0.25 (b) 200

(c) 800 (d) 0.2

**13.** **Assertion :** Distribution of age groups is said to influence the population growth.
**Reason :** Population growth is a measure of increase in population over a period of time.

(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.

**14.** **Assertion :** Herbivores are also called key industry animals because they convert plant matter into animal matter.
**Reason :** Decomposers play a pivotal role in the ecosystem and they indirectly support the producers.

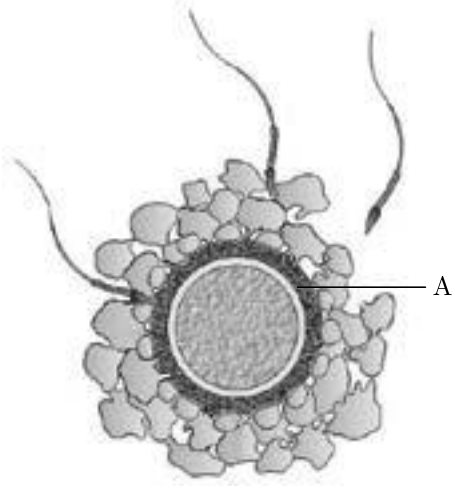
(a) Both A and R are true and R is the correct explanation of A.

(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.

**15.** Given below is the diagram of an ovum surrounded by few sperms. One of the sperms is observed to penetrate 'A' of the ovum. Study this figure and comment upon the appropriateness of the Assertion and the Reason.




**Assertion :** 'A' is zona pellucida, present just around the plasma membrane of the oocyte.
**Reason :** 'A' initiates acrosomal reaction of the sperms and also prevents polyspermy.

(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.

**16.** **Assertion :** The pyramid of biomass in sea is generally inverted.
**Reason :** The biomass of fishes far exceeds that of phytoplankton.

(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.

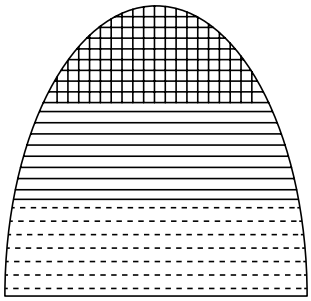
(d) A is false but R is true.

Continue on next page.....

# SECTION - B

**17.** Write the difference between proinsulin and mature insulin.

**18.** What does the given age pyramid signify about the status of a population? (The bar at the base represents pre-reproductive individuals.)



**19.** Why are copper containing intrauterine devices considered an ideal contraceptive for human females?

**OR**

What is amniocentesis? How is it misused?

**20.** With the help of an algebraic equation, how did Hardy-Weinberg explain that in a given population the frequency of occurrence of alleles of a gene is supposed to remain the same through generations?

**21.** How does a vaccine for a particular disease immunise the human body against that disease?

# SECTION - C

**22.** How does the HIV breakdown the immune system of the AIDS patient?

**23.** Explain the process of microsporogenesis in angiosperms.

**24.** Biotechnology is used to develop pest-resistant varieties of cotton plants. Justify the statement.

**25.** (a) How many kinds of phenotypes would you expect in $F_2$ generation in a monohybrid cross exhibiting co-dominance?

(b) How co-dominance is different from dominance?

**26.** How is 'oogenesis' markedly different from 'spermatogenesis' with respect to the growth till puberty in the humans?

**OR**

Name the pituitary hormones involved in the process of spermatogenesis. State their function.

**27.** Why is haemophilia generally observed in human males? Explain the conditions under which a human female can be haemophilic.

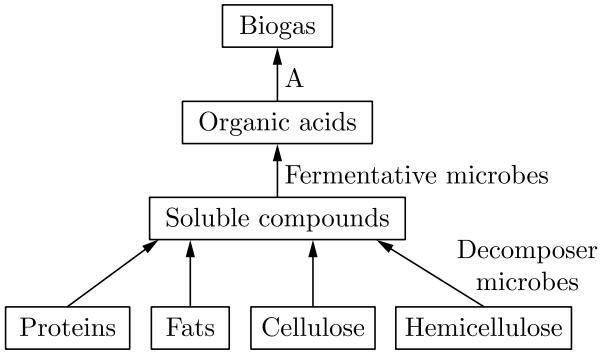
**28.** (a) How can you measure population density of a habitat?

(b) Mention the essential information that can be obtained by studying the population density of an organism.

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** The flow chart given below shows the different components of biogas plant.




(a) With reference to the given flow chart, explain why there is a need of A?

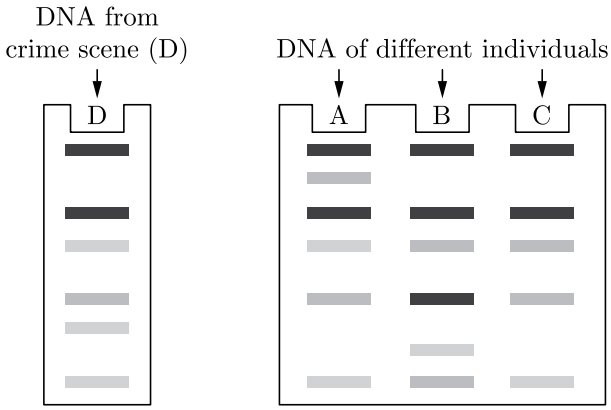
(b) What would happen if A is not added in the procedure?

(c) Where does A can be found apart from the biogas production?

**OR**

(c) What is the significance of biogas produced by A?

**30.** Study the given below picture of the gel electrophoresis showing the banding pattern of DNA from crime scene.




Amplified repeats in different individuals

(a) On the basis of the above given picture of gel electrophoresis, among A, B and C who will be the criminal? Give reason.

(b) Which technique is used in the given question for the identification of the criminals?

(c) On what basis, the DNA fragments of individual A, B and C are separated in the gel electrophoresis?

**OR**

(c) What is the basis of technique which is used in the criminal investigation and forensic science?

Continue on next page.....

# SECTION - E

**31.** State and explain the "law of independent assortment" in a typical Mendelian dihybrid cross.

**OR**

A tall pea plant bearing violet flowers is given with its unknown genotypes. Explain by working out the crosses how would you find the correct genotypes with respect to the two traits mentioned only by "selfing" the given plants.

**32.** Reproductive and Child Health Care (RCH) Programmes are currently in operation. One of the major tasks of these programmes is to create awareness amongst people about the wide range of reproduction related aspects as this is important and essential for building a reproductively healthy society.

(a) "Providing sex education in schools is one of the ways to meet this goal." Give four points in support of your opinion regarding this statement.

(b) List any two 'indicators' that indicate a reproductively healthy society

**OR**

(a) Mention the event that induces the completion of the meiotic division of the secondary oocyte.

(b) Trace the journey of the ovum from the ovary, its fertilisation and further development until the implantation of the embryo.

**33.** (a) Mention the number of primers required in each cycle of polymerase chain reaction (PCR). Write the role of primers and DNA polymerase in PCR. Give the characteristic feature and source organism of the DNA polymerase in PCR.

(b) Rearrange the following in the correct sequence to accomplish an important biotechnological reaction :

(i) Denaturation of ds-DNA
(ii) Chemically synthesised oligonucleotides
(iii) Primers
(iv) Complementary region of DNA
(v) Thermostable DNA polymerase (from Thermus aquaticus)
(vi) Nucleotides provided
(vii) Genomic DNA template
(viii) In vitro synthesis of copies of DNA of interest

**OR**

(a) Draw pBR322 cloning vector. Label 'ori', 'rop' and any one antibiotic resistance site on it and state their functions.

(b) State the role of 'biolistic gun' in biotechnology experiments.

# Sample Paper 17

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** Competition for light, nutrients and space is most severe between

(a) closely related organisms growing in different niches

(b) closely related organisms growing in the same area/niche

(c) distantly related organisms growing in the same habitat

(d) distantly related organisms growing in different niches.

**2.** Which one of the following immune system components does not correctly match with its respective role?

(a) Interferons-Secreted by virus-infected cells and protect non-infected cells from further viral infection.

(b) B-lymphocytes-Produce antibodies in response to pathogens into blood to fight with them.

(c) Macrophages-Mucus secreting cells that trap microbes entering in the body.

(d) IgA-Present in colostrum in early days of lactation to protect infant from diseases.

**3.** The age structure of a population influences population growth because

(a) younger females have more offsprings than older females

(b) different age groups have different reproductive capabilities

(c) more the number of immature individuals, slower the growth of population

(d) a shorter generation time results in slower population growth.

**4.** MALT is

(a) Muscle Associated Lymphoid Tissue

(b) Mucosal Associated Lymphoid Tissue

(c) Mucosal and Lymphoid Tissue

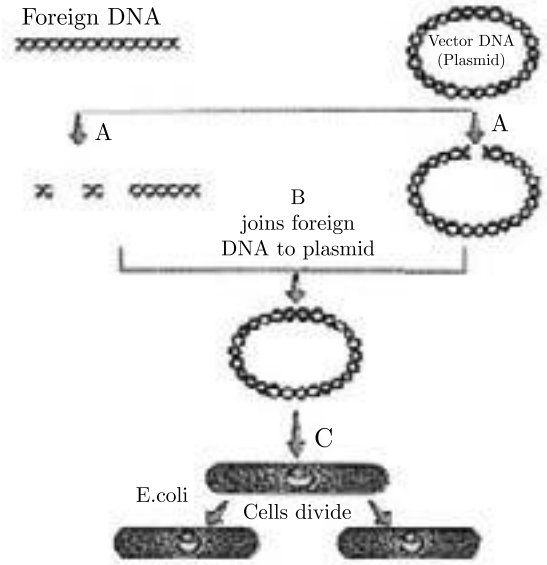
(d) Memory Associated Lymphoid Tissue.

**5.** In a 3.2 Kbp long piece of DNA, 820 adenine bases were found. What would be the number of cytosine bases?

(a) 780 (b) 1560

(c) 740 (d) 1480

**6.** Identify A, B and C in the flow chart given below that represents the process of recombinant DNA technology.




(a) A-Restriction exonuclease, B-DNA ligase, C-Transformation

(b) A-Restriction endonuclease, B-DNA ligase, C-Transformation

(c) A-Restriction endonuclease, B-Hydrolase, C-Transcription

(d) A-Restriction exonuclease, B-Hydrolase, C-Transcription

**7.** Evolutionary convergence is characterised by

(a) development of dissimilar characteristics in closely related groups

(b) development of a common set of characteristics in groups of different ancestry

(c) development of characteristics by random mating

(d) replacement of common characteristics in different groups.

**8.** From a sewage treatment plant, three water samples A, B and C are tested for BOD value and the recorded values of BOD are 6 mg/L, 400 mg/L and 20 mg/L respectively. What is correct about these samples?

(a) Sample A is taken from untreated sewage.

(b) Sample B belongs to secondary effluent of sewage treatment plant.

(c) Sample C is taken from primary effluent.

(d) Sample B is collected from untreated sewage.

**9.** Food chain in which microorganisms break down the dead organic matter is

(a) parasitic food chain

(b) detritus food chain

(c) consumer food chain

(d) predator food chain.

**10.** Which of the following is not an example of in situ conservation?

(a) Biosphere reserves

(b) National parks

(c) Wildlife sanctuaries

(d) Zoological parks

**11.** Given below are four methods (A-D) and their modes of action (i-iv) in achieving contraception. Select their correct matching from the four options that follow.

| | **Method** | | **Mode of Action** |
|---|---|---|---|
| A. | The pill | (i) | Prevents sperms reaching cervix |
| B. | Condom | (ii) | Prevents implantation |
| C. | Vasectomy | (iii) | Prevents ovulation |
| D. | Copper T | (iv) | Semen contains no sperms |

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

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

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

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

**12.** Which of the following contraceptive methods involve a role of hormone?

(a) Pills, Emergency contraceptives, Barrier methods

(b) LNG-20 Pills, Emergency contraceptives

(c) Barrier method, Lactational amenorrhea, Pills

(d) Copper T, Pills, Emergency contraceptive

**13.** **Assertion :** Human insulin can be produced into bacterial cells using biotechnology.
**Reason :** To produce human insulin the A, B and C polypeptides of the human insulin are produced separately in the bacterial cells, extracted and combined by creating disulphide bonds.

(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

**14.** **Assertion :** Linked genes do not show dihybrid ratio of 9 : 3 : 3 : 1.
**Reason :** Linked genes do not undergo independent assortment.

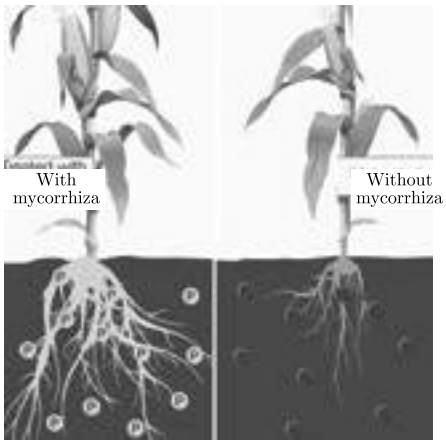
(a) Both A and R are true and R is the correct explanation of A

(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

**15.** Mycorrhizae are kind of association between plant roots and fungi. Their major role is to enhance nutrient and water uptake by the host plant by exploiting larger volume of soil than plant by exploiting larger volume of soil than roots alone can do. Mycorrhizae come in a number of forms dependent upon several factors such as host plants distribution climatic and soil conditions. Study the given figure showing plant growth with and without mycorrhizae and comment upon the appropriateness of the Assertion and the Reason.




**Assertion :** Mycorrhizae represent a mutually beneficial interspecific interaction of fungi with roots of higher plants.
**Reason :** In a mutualistic relationship, both the organisms enter into some sort of physiological exchange.

(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

**16.** **Assertion :** Ex-albuminous seeds do not possess any residual endosperm, as it is completely consumed during embryo development.
**Reason :** Wheat, castor, pea and groundnut all are examples of ex-albuminous seeds.

(a) Both A and R are true and R is the correct explanation of A

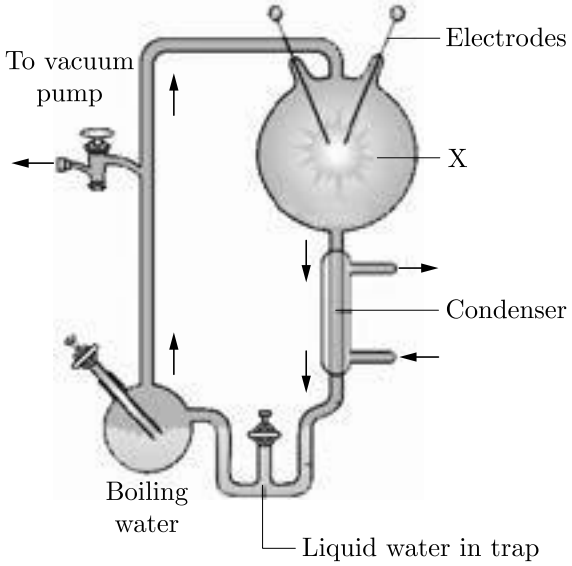
(b) Both A and R are true and R is not the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

# SECTION - B

**17.** Consider the following diagram




(a) State the hypothesis which S.L. Miller tried to prove in the laboratory with the help of the set up given above.

(b) Name the chemicals found in samples drawn from X.

**18.** Write a short note on hydrophily.

**19.** State the role of UV-light and ethidium bromide during gel electrophoresis of DNA fragments.

**20.** Different species belonging to genus Trichoderma are useful to humans as well as to plants. Justify their roles by giving one instance of each.

**21.** Study the table given below in regard to population interactions and answer the questions that follow:

| Species A | Species B | Name of Interaction |
|---|---|---|
| − | 0 | (a) |
| + | − | (b) |
| − | − | (c) |
| + | + | (d) |

[Note : (+) plus = beneficial interaction; (−) minus = detrimental interaction; (0) zero = neutral interaction]

(i) Identify the interactions (a) to (d).

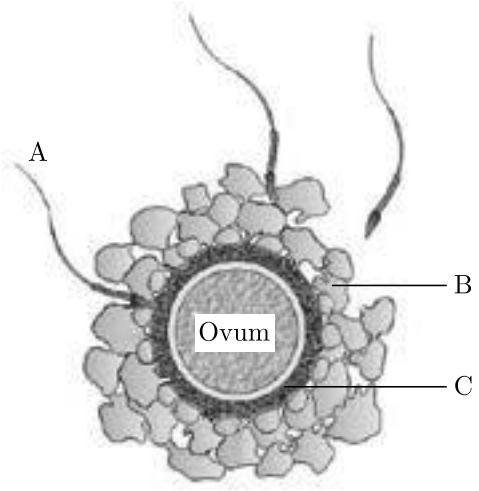
(ii) Explain interaction (a).

**OR**

List any three methods used by ecologists to measure the population size in a habitat.

# SECTION - C

**22.** Given below is the diagram of a human ovum surrounded by a few sperms. Study the diagram and answer the following questions:




(a) Identify 'B' and 'C' Mention the role of 'C'.

(b) Mention what helps the entry of sperm into the ovum.

(c) Name the specific region in the female reproductive system where the event represented in the diagram takes place.

**23.** In pea plants, the colour of the flower is either violet or white whereas human skin colour shows many gradations. Explain giving reasons how it is possible.

**24.** Given below is one of the strands of a DNA segment :

$3' \xrightarrow{\text{TACGTACGTACGTACG}} 5'$

(a) Write its complementary strand.

(b) Write a possible RNA strand that can be transcribed from the above DNA molecule formed.

(c) Mark promoter, terminator end, template and coding strand for the given segment.

**25.** (a) Name the blank spaces a, b, c and d in the table given below :

| Type of microbe | Scientific name | Product | Medical application |
|---|---|---|---|
| (i) Fungus | a | Cyclosporin A | b |
| (ii) c | Monascus | Statin | d |

(b) Why are some molecules called bioactive molecules? Give two examples of such molecules.

**26.** Describe the mutual relationship between fig tree and wasp and comment on the phenomenon that operates in their relationship.

**OR**

(a) Explain the birth rate and death rate in the population with the help of an example each.

(b) What is age-pyramid? Draw an age-pyramid of an expanding population.

**27.** (a) How is apomixis different from parthenocarpy?

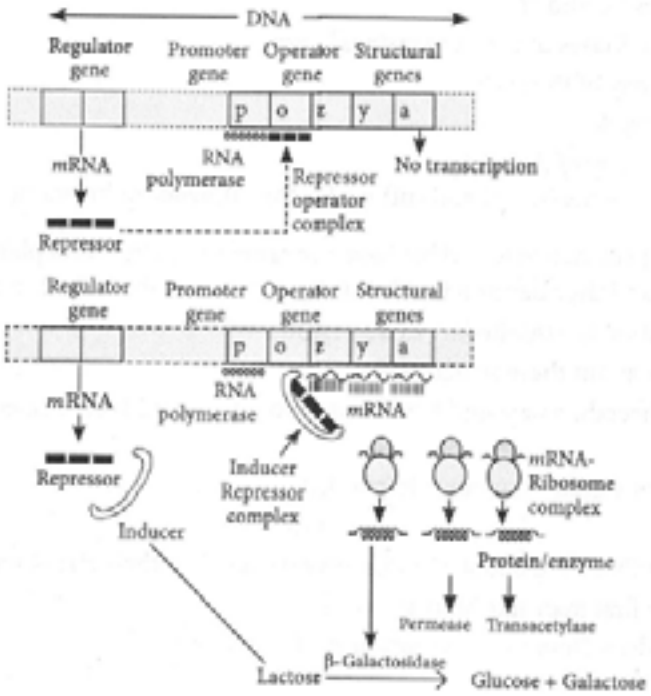
(b) Describe any two modes by which apomictic seeds can be produced.

**28.** What are biopatents? Mention their significance.

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** Lac operon is a unit of co-ordinated control of protein synthesis which consists of an operator gene which controls the activity of a number of structural genes which take part in the synthesis of proteins. The operator gene, in return is under the control of a repressor molecule synthesised by a regulator gene, which is not a part of the operon.




(a) When will be the lac operon switched on in E.coli?

(b) E.coli cells with mutated z gene cannot grow in medium containing only lactose. Justify

(c) What will happen if the operator gene (o gene) of lac operon is mutated?

**OR**

(c) How are the structural genes inactivated in lac operon in E.coli ? Explain.

**30.** Carefully observe the given structure and answer questions that follow :

(a) Name the compound obtained from given plant.

(b) What is the chemical nature of the compound obtained from this plant?

(c) What are the major effects of the compound obtained from the given plant?

**OR**

(c) Write the chemical formula and draw the chemical structure of compound obtained from given plant.

# SECTION - E

**31.** The forelimbs of man, cheetah, whale and bat have the same basic structural plan. Such organs have similar developmental pattern and they develop in related organisms, but these do differ morphologically.

(a) What type of evolution is exhibited by these organisms?

(b) What can you infer about these structures?

(c) The forelimbs of cheetah, whale and bat are used for X , Y and Z , respectively. Identify X, Y and Z here.

(d) Give one example of similar structures in plants.

**OR**

(a) Name the primates that lived about 15 million years ago. List their characteristic features.

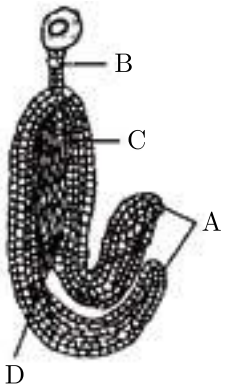
(b) (i) Where was the first man-like animal found?
(ii) When did modern Homo sapiens appear on this planet?

**32.** How is the desired DNA for biotechnology experiments first fragmented and later separated by gel-electrophoresis? Explain.

**OR**

Write the steps you would suggest to be undertaken to obtain a foreign-gene-product.

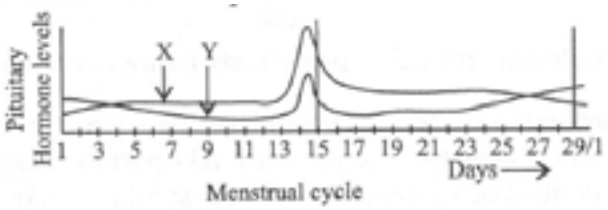
**33.** (a) Identify the given figure and its labelled parts A, B, C and D.




(b) Explain the development of the given above structure from the embryo sac of dicot flower.

**OR**

Study the graph given below and answer the questions that follow :




(a) Name the hormones 'X' and 'Y'

(b) Identify the ovarian phases during a menstrual cycle
(i) $5^{th}$ day to $12^{th}$ day of the cycle
(ii) $14^{th}$ day of the cycle
(iii) $16^{th}$ day to $25^{th}$ day of the cycle

(c) Explain the ovarian events (i), (ii) and (iii) under the influence of hormones 'X' and 'Y'.

# Sample Paper 18

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** The permissible use of the technique amniocentesis is for

(a) detecting sex of the unborn fetus

(b) artificial insemination

(c) transfer of embryo into the uterus of a surrogate mother

(d) detecting any genetic abnormality

**2.** The primary producers of the deep-sea hydrothermal vent ecosystem are

(a) green algae (b) chemosynthetic bacteria

(c) blue-green algae (d) coral reefs

**3.** Two closely related different species cannot live for long duration in the same niche or habitat. This law is called

(a) Allen's law (b) Gloger rule

(c) Competitive exclusion principle (d) Weismann's theory

**4.** Find the correct palindromic sequence for the given DNA segment.
5′ ATTGCAAT 3′

(a) 5′ GAACGTTA 3′ (b) 3′ TAACGTTA 5′

(c) 5′ AAACGTTT 3′ (d) 3′ ATTGCAAT 5′

**5.** Productivity at the second trophic level is always

(a) greater than the productivity at the first trophic level

(b) less than the productivity at the first trophic level

(c) equal to the productivity at the first trophic level

(d) extremely variable compared to the productivity at the first trophic level.

Continue on next page.....

**6.** Match column I with column II and select the correct option from the given codes.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Dihybrid test cross | (i) | 9 : 3 : 3 : 1 |
| B. | Law of segregation | (ii) | Dihybrid cross |
| C. | Law of independent assortment | (iii) | 1 : 1 : 1 : 1 |
| D. | ABO blood group in man | (iv) | Purity of gametes |
| | | (v) | Multiple allelism |

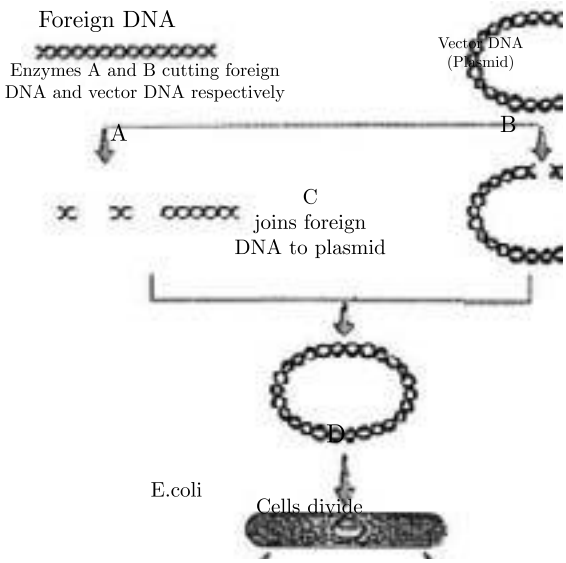
(a) A-(iii), B-(iv), C-(ii), D-(v)

(b) A-(i), B-(iv), C-(ii), D-(v)

(c) A-(iii), B-(ii), C-(iv), D-(v)

(d) A-(ii), B-(v), C-(iii), D-(i)

**7.** Identify A, B, C and D in the flow chart given below that represents the process of recombinant




(a) A-Restriction endonuclease, B-Restriction exonuclease, C-DNA ligase, D-Transformation

(b) A-Restriction endonuclease, B-Restriction endonuclease, C-DNA ligase, D-Transformation

(c) A-Restriction endonuclease, B-Restriction endonuclease, C-Hydrolase, D-Transformation

(d) A-Restriction endonuclease, B.-Restriction endonuclease, C-Hydrolase, D-Transduction

**8.** Statin, a blood-cholesterol lowering agent, is commercially obtained from

(a) Trichoderma polysporum

(b) Acetobacter aceti

(c) Clostridium butyricum

(d) Monascus purpureus

**9.** The age pyramid with broad base indicates

(a) high percentage of old individuals

(b) low percentage of young individuals

(c) a stable population

(d) high percentage of young individuals

**10.** A sewage treatment process in which a part of decomposer bacteria present in the wastes is recycled into the starting of the process is called

(a) primary treatment

(b) activated sludge treatment

(c) tertiary treatment

(d) none of these

**11.** The term 'immunity' refers to

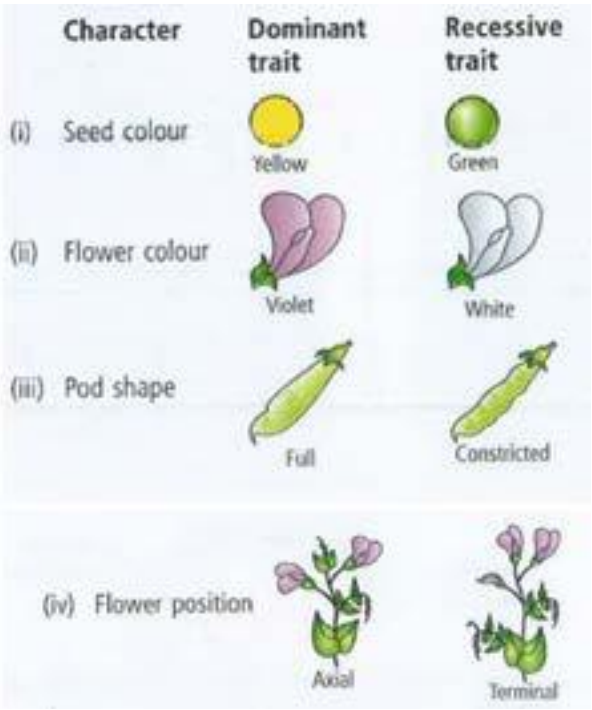
(a) mutualism between host and parasite

(b) ability of the host to fight the disease causing organisms

(c) ability of the parasite to survive within a host

(d) a fatal disease

**12.** Refer to the given table of contrasting traits in pea plants studied by Mendel.




Which of the given traits is correctly placed?

(a) (i), (ii) and (iii) only

(b) (ii), (iii) and (iv) only

(c) (ii) and (iii) only

(d) (i), (ii), (iii) and (iv)

**13.** **Assertion :** Production ecology deals with the productivity.
**Reason :** Desert has lowest productivity.

(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.

**14.** **Assertion :** The endometrium undergoes cyclical changes during menstrual cycle.
**Reason :** The myometrium exhibits strong contractions during delivery of the baby.

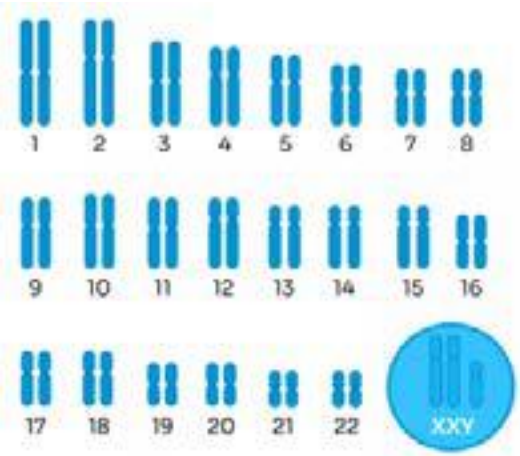
(a) Both A and R are true and R is the correct explanation of A.

(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.

**15.** Given below is the karyotype of a patient.
It depicts the arrangement of different sets of chromosome arranged in numerical order. It is basically used to look for abnormalities in chromosome number or structure. Study the given karyotype and comment upon the appropriateness of the Assertion and the Reason.




**Assertion :** The given karyotype shows that patient is suffering from Down's syndrome.
**Reason :** In patient, the chromosome abnormality is caused due to the absence of one of the sex chromosomes, i.e., 45 + X.

(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.

**16.** **Assertion :** The development of embryo sac from a single functional megaspore is termed as monosporic development.
**Reason :** In monosporic (*Polygonum*) type of embryo sac development, usually the megaspore which is situated towards micropylar end remains functional.

(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.

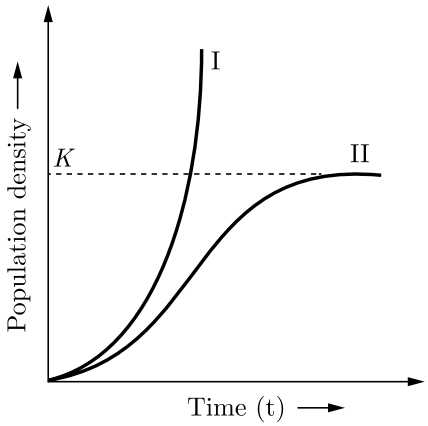
(c) A is true but R is false.

(d) A is false but R is true.

# SECTION - B

**17.** State the role of thymus as a lymphoid organ. Name the cells that are released from it and mention their function.

**18.** Two different types of population growth curves are used to measure population density. Study the two growth curves and answer the corresponding question.




A forest having unlimited food resource hardly has any carnivores. Identify the curve that will explain the population growth of herbivores in that forest. Also give the equation representing the graph.

**19.** How does *Eco*RI specifically act on DNA molecule? Explain.

**20.** "Australian marsupials exhibit adaptive radiation but they along with placental mammals show convergent evolution" . Justify the statement.

**21.** Describe the process of megasporogenesis in angiosperms until 8 nucleate stage.

**22.** What do oral pills contain and how do they act as effective contraceptives?

**OR**

When is sterilisation technique advised to married couples? How is it carried out in a human male and a female, respectively?

# SECTION - C

**23.** (a) What are the transcriptional products of RNA polymerase III?

(b) Differentiate between capping and tailing.

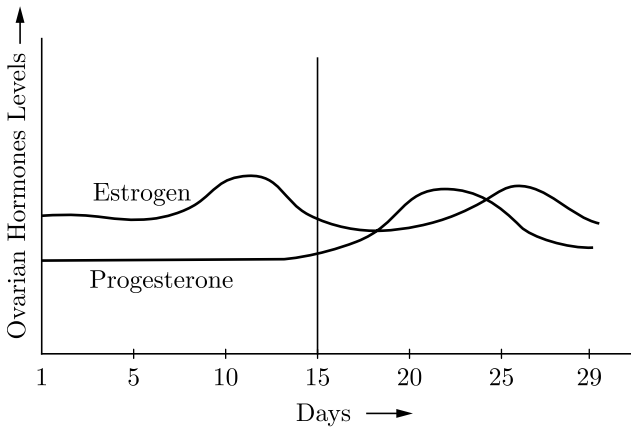
(c) Expand hnRNA.

**24.** (a) Explain parasitism with the help of one example.

(b) State Gause's competitive exclusion principle.

**25.** Work out a cross upto $F_2$ generation between two pure breed pea plants, one bearing purple flowers and the other white flowers.

**26.** (a)




Read the graph given above and correlate the uterine events that take place according to the hormonal levels on
(i) 6-15 days
(ii) 16-25 days
(iii) 26-28 days (if the ovum is not fertilised)

(b) Specify the sources of the hormones mentioned in the graph.

**OR**

Draw a sectional view of human ovary. Label the following parts :

(i) Primary follicle

(ii) Ovum

(iii) Graafian follicle

(iv) Corpus luteum

**27.** (a) Mention the cause of ADA deficiency in humans.

(b) How is gene therapy carried out to treat the patients suffering from this disease?

(c) State the possibility of a permanent cure of this disease.

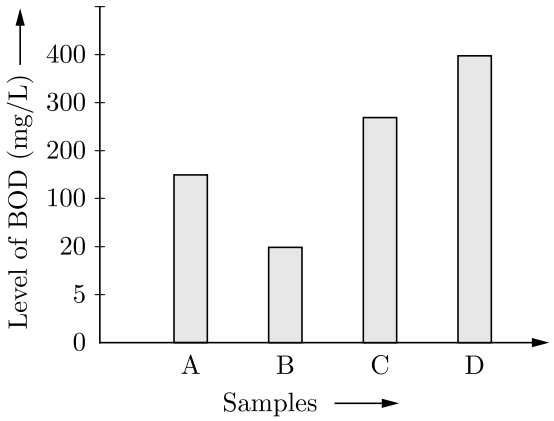
**28.** (a) What makes some viruses cause cancer in humans?

(b) How do benign tumors turn malignant? How does the latter harm the human body?

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** BOD is a measure of organic matter present in the water. The data below shows the concentration of BOD in different samples obtained from the primary effluent, secondary effluent, untreated sewage and river water.




(a) With reference to the above graph, identify the source of different samples A, B, C and D.

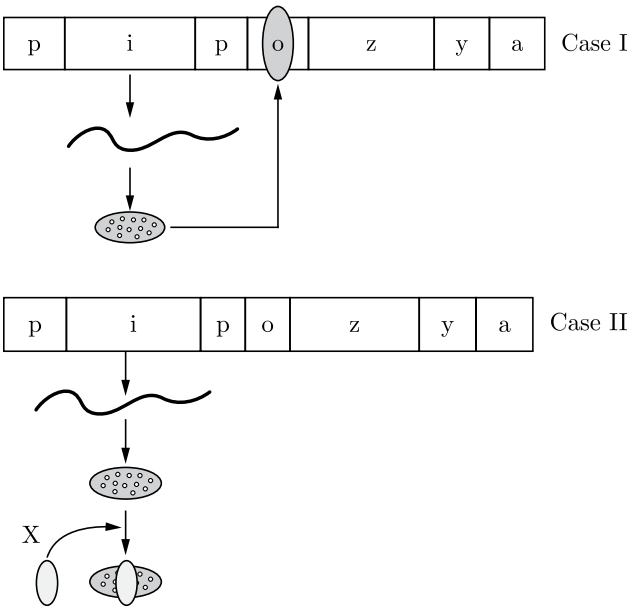
(b) What would happen if D is disposed off in B directly?

(c) Which among the given samples will contain large number of pathogenic microbes?

**OR**

(c) What would be the reason for the higher value of BOD in sample D?

**30.** From a number of studies on the metabolism of bacterium *Escherichia coli*, two French scientists Jacob and Monod in 1961 found that the genetic material possesses regulated gene units called operons. Study the given below operon system operating in *E.coli* and answer the questions that follow:

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(a) On the basis of the given operon system, what conclusion can you draw about case I and case II?

(b) What would happen in the presence of X in case II?

(c) What type of regulation can be seen in the given operon system by the repressor?

**OR**

(c) Which structural gene codes for permease in both the cases and what is its function?

# SECTION - E

**31.** A large number of married couples over the world are childless. It is shocking to know that in India the female partner is often blamed for the couple being childless.

(a) Why in your opinion the female partner is often blamed for such situations in India? Is it correct? Justify.

(b) State any two reasons responsible for the cause of infertility.

(c) "Intra-Cytoplasmic Sperm Injection" and 'Gamete Intra Fallopian Transfer' are two assisted reproductive technologies. How is one different from other?

**OR**

(a) Arrange the following hormones in sequence of their secretion in a pregnant woman. hCG; LH; FSH; Relaxin

(b) Mention their source and the function they perform.

**32.** Some restriction enzymes break a phosphodiester bond on both the DNA strands, such that only one end of each molecule is cut and these ends have regions of single stranded DNA. BamHI is one such restriction enzyme which binds at the recognition sequence, $5'$-GGATCC-$3'$ and cleaves these sequences just after the $5'$- guanine on each strand.

(a) What is the objective of this action?

(b) Explain how the gene of interest is introduced into a vector.

(c) You are given the DNA shown below.
$5'$ ATTTTGAGGATCCGTAATGTCCT $3'$
$3'$ TAAAACTCCTAGGCATTACAGGA $5'$
If this DNA was cut with BamHI, how many DNA fragments would you expect? Write the sequence of these double-stranded DNA fragments with their respective polarity.

(d) A gene M was introduced into *E.coli* cloning vector pBR322 at BamHI site. What will be its impact on the recombinant plasmids? Give a possible way by which you could differentiate non-recombinant from recombinant plasmids.

**OR**

(a) Write the palindromic nucleotide for the following DNA segment : $5'$-GAATTC-$3'$

(b) Name the restriction endonuclease that recognises this sequence.

(c) How are 'sticky-ends' produced? Mention their role.

**33.** (a) Dihybrid cross between two garden pea plants one homozygous tall with round seeds and the other dwarf with wrinkled seeds was carried.

(i) Write the genotype and phenotype of the $F_1$ progeny obtained from this cross.

(ii) Give the different types of gametes of the $F_1$ progeny.

(iii) Write the phenotypes and its ratios of the $F_2$ generation obtained in this cross along with the explanation provided by Mendel.

(b) How were the observations of $F_2$ progeny of dihybrid crosses in Drosophila by Morgan different from that of Mendel carried in pea plants? Explain giving reasons.

**OR**

How do "pleiotropy", "incomplete dominance", "co-dominance" and "polygenic inheritance" deviate from the observation made by Mendel? Explain with the help of one example for each.

□□□□□□□

# Sample Paper 19

## Biology (044)

## Class XII Session 2023-24

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

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# SECTION - A

**1.** During isolation of genetic material, the chemical used to precipitate out the purified DNA is

(a) bromophenol blue (b) chilled ethanol

(c) ethidium bromide (d) both (b) and (c)

**2.** The three codons which result in the termination of polypeptide chain synthesis are

(a) UAA, UAG, GUA (b) UAA, UAG, UGA

(c) UAA, UGA, UUA (d) UGU, UAG, UGA

**3.** Which of the following appeared during ice age between 75,000 - 10,000 years ago?

(a) Cro-Magnon man (b) Neanderthal man

(c) Modern Homo sapiens (d) Heidelberg man

**4.** Pollination in water hyacinth and water lily is brought about by the agency of

(a) water (b) insects or wind

(c) birds (d) bats

**5.** Introduction of Nile Perch in lake Victoria of South Africa resulted in

(a) excessive growth of water weeds (b) elimination of water weeds

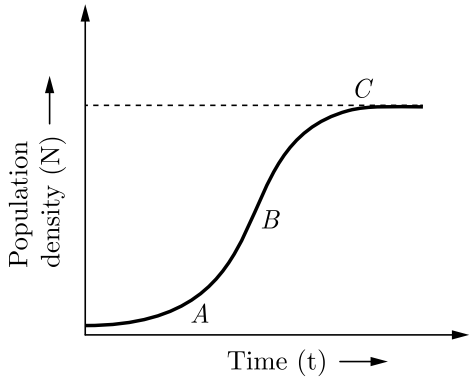
(c) elimination of many species of cichlid fish (d) excessive growth of cichlid fish.

**6.** Which of the following is widely used as a successful biofertiliser in Indian rice field ?

(a) Rhizobium (b) Acacia arabica

(c) Acalypha indica (d) Azolla pinnata

**7.** For a population, the population density (N) was plotted against time (t) and growth curve obtained is shown in figure marked by A, B and C. Find the correct information about marked phases.



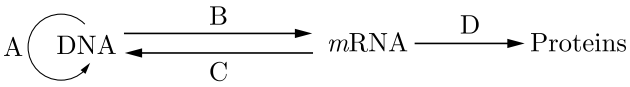

(a) A-initial log phase of growth

(b) C-final growth phase with rapid increase

(c) B-middle log phase with exponential growth

(d) A-initial exponential growth phase

**8.** The given flow chart represents the flow of genetic information between biomolecules. Identify the processes A, B, C and D and select the correct option.




(a) A-Translation, B-Transcription, C-Replication, D-Reverse Transcription

(b) A-Replication, B-Transcription, C-Translation, D-Reverse Transcription

(c) A-Replication, B-Transcription, C-Reverse Transcription, D-Translation

(d) A-Replication, B-Reverse Transcription, C-Transcription, D-Translation

**9.** Match column I with column II and select the correct option from the given codes.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Parthenocarpy | (i) | Seed formation without fertilisation |
| B. | Polyembryony | (ii) | More than one embryo in same seed |
| C. | Apomixis | (iii) | Seedless fruits without fertilsation |
| D. | False fruit | (iv) | Thalamus contributes to fruit formation |

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

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

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

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

**10.** Everytime, when the dosage of a drug has to be increased to achieve the same 'kick' that initially occurred in response to a smaller dose, this condition is known as

(a) rebound effect

(b) tolerance

(c) withdrawal symptoms

(d) addiction

**11.** Which of the following equations correctly represents Verhulst-Pearl logistic growth?

(a) $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$ (b) $\frac{dN}{dt} = \frac{rN}{K}$

(c) $\frac{dN}{dt} = \frac{N(K-N)}{K}$ (d) $\frac{dN}{dt} = \frac{r(K-N)}{K}$

**12.** Match column I (enzyme) with column II (characteristic/activity) and select the correct answer from the given codes.

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Taq DNA polymerase | (i) | Cleaves the ends of linear DNA |
| B. | Exonuclese | (ii) | Breakdown of fungal cell wall |
| C. | Protease | (iii) | Stable above 90° C |
| D. | Chitinase | (iv) | Made only by eukaryotic cells |
| | | (v) | Degradation of proteins |

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

(c) A-(ii), B-(i), C- (v), D-(iii) (d) A-(iii), B-(i), C-(v), D-(ii)

**13.** **Assertion :** Plasmodium is an endoparasite.
**Reason :** Plasmodium lives over the surface of their host.

(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.

**14.** **Assertion :** Net primary productivity is equal to gross primary productivity minus respiration.
**Reason :** Secondary productivity is produced by heterotrophs.

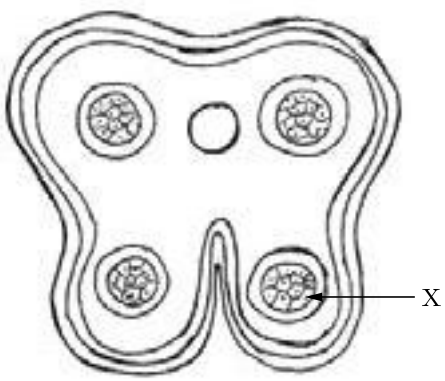
(a) Both A and R are true and R is the correct explanation of A.

(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.

**15.** Given below is the figure of a transverse section of a young anther. It depicts a bilobed, tetragonal structure consisting of four microsporangia located at the corners, two in each lobe. Study this figure and comment upon the appropriateness of the Assertion and the Reason.

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**Assertion :** 'X' represents innermost wall layer tapetum.
**Reason :** 'X' performs the function of protection only.

(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.

**16.** **Assertion :** A network of food chains existing together in an ecosystem is known as a food web.
**Reason :** An animal like kite cannot be a part of a food chain.

(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.

# SECTION - B

**17.** Why are copper containing intrauterine devices considered an ideal contraceptive for human females?

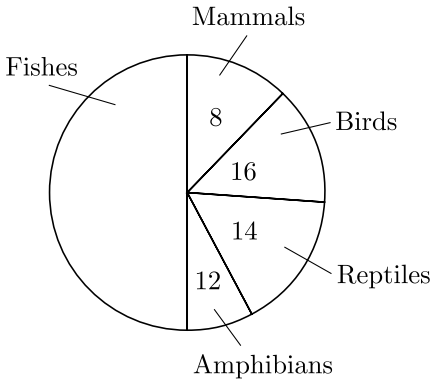
**OR**

What is amniocentesis? How is it misused?

**18.** Write two differences between Homo erectus and Homo habilis.

**19.** A patient showed symptoms of sustained high fever, stomach pain and constipation, but no blood clot in stools. Name the disease and its pathogen. Write the diagnostic test for the disease. How does the disease get transmitted?

**20.** Observe the global proportionate number of vertebrate diversity in the figure given below and answer the questions.




(a) Name the group that has :
  (i) the highest representation.
  (ii) the lowest representation.

(b) Mention the percentage of vertebrates that are
  (i) Oviparous
  (ii) Avians

**21.** "Intra-Cytoplasmic Sperm Injection" and 'Gamete Intra Fallopian Transfer' are two assisted reproductive technologies. How is one different from other?

**OR**

Why is ZIFT a boon to childless couples? Explain the procedure.

# SECTION - C

**22.** Cotton bollworms enjoy feeding on cotton plants but get killed when feed on Bt cotton plant. Justify the statement.

**23.** Double fertilisation is reported in plants of both castor and groundnut. However, the mature seeds of groundnut are non-albuminous and castor are albuminous. Explain the post fertilisation events that are responsible for it.

**24.** How is the phenotypic and genotypic ratio of $F_2$ generation in a dihybrid cross is different from monohybrid cross?

**25.** At what stage does Plasmodium gain entry into the human body? Write the different stages of its life cycle in the human body.

**26.** When does a geneticist need to carry a test cross? How is it carried?

**27.** Differentiate between mutualism and parasitism.

**28.** Describe the process of parturition in humans.

**OR**

Draw a labelled diagram of a human sperm.

# SECTION - D

**DIRECTION : Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.**

**29.** In an experiment to know the genotype of a red flowered plant it was crossed with a homozygous white flowered plant. The progenies obtained were of two types as shown below in the figure.

| | | | |
|---|---|---|---|
| Parents : | Red flowered plant with unknown genotype | × | White flowered homozygous plant (rr) |
| $F_1$ : | Red flowered plants | | White flowered plants |
| Phenotypic ratio : | 1 | : | 1 |

Continue on next page.....

Based on the above information, answer the following questions:

(a) On the basis of this cross, what conclusion can you draw?

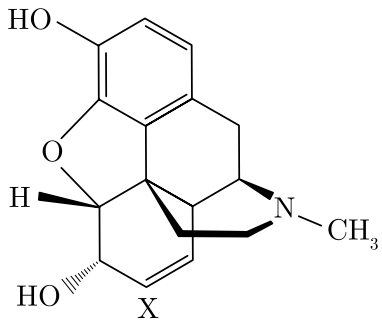
(b) What is the significance of the cross described above?

(c) What would be the genotype of red and white flowered plants in $F_1$ if Allele R/r is responsible for the this trait ?

**OR**

(c) What would be the probability of homozygous and heterozygous plants in $F_1$ progeny?

**30.** After a surgery drug 'X' was injected to the patient to counteract the effect of pain receptors in the body and to induce sleep in patient. The structure of the drug 'X' is provided :




(a) Identify the drug from the chemical structure that was injected to the patient.

(b) Give the scientific name of the plant that can be used to obtain drug X.

(c) Write the effects of compound obtained by drug X on the human body.

**OR**

(c) To which group X belongs to? Mention the location of its receptors in human body.

# SECTION - E

**31.** (a) Describe the lactational amenorrhea method of birth control.

(b) (i) Why removal of reproductive organs cannot be a contraceptive option?
(ii) "Complete lactation is a natural method of contraception". Justify this statement.

(c) Name and explain the surgical method advised to human males and females as a means of birth control. Mention its one advantage and one disadvantage.

**OR**

(a) Name two hormones that are constituents of contraceptive pills.

(b) What schedule should be followed for taking contraceptive pills.

(c) What is the advantage of 'Saheli' over other oral contraceptive pills?

**32.** A teacher wants his/her students to find the genotype of pea plants bearing purple coloured flowers in their school garden. Name and explain the cross that will make it possible.

**OR**

Explain the causes, inheritance pattern and symptoms of any two Mendelian disorders.

**33.** (a) Describe the characteristics a cloning vector must possess.

(b) Why DNA cannot pass through the cell membrane? Explain.

(c) How is bacterial cell made 'competent' to take up recombinant DNA from the medium?

**OR**

Many copies of a specific gene of interest are required to study the detailed sequencing of bases in it. Name and explain the process that can help in developing large number of copies of this gene of interest.

□□□□□□□