

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

Maximum Marks: 70

General Instructions

- (i) This question paper contains **33 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 16 carry 1 mark each.
- (iii) Section B: Questions 17 to 21 carry 2 marks each.
- (iv) Section C: Questions 22 to 28 carry 3 marks each.
- (v) Section D: Questions 29 to 30 carry 4 marks each.
- (vi) Section E: Questions 31 to 33 carry 5 marks each.
- (vii) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (viii) Draw neat, properly labelled diagrams wherever necessary.

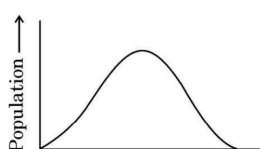
Section A

1. pBR which is frequently used as a vector for cloning gene in *E. coli* is a/an:

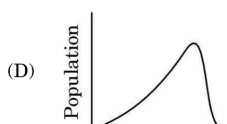
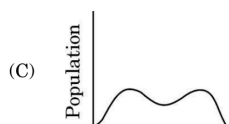
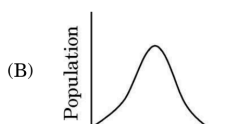
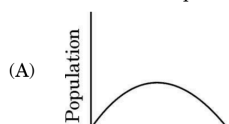
- | | |
|--------------------------------|--------------------------------|
| (A) Original bacterial plasmid | (B) Modified bacterial plasmid |
| (C) Viral genome | (D) Transposon |

2. The given graph shows the range of variation among population members, for a trait determined by multiple genes. If this population is subjected to disruptive selection for several generations, which of the following distributions is most likely to result?

Choose the correct option:



Choose the correct option :



(A) A

(B) B

(C) C

(D) D

3. 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) Macrophages -
Mucus-secreting cells that trap microbes entering into the body. |
| (C) B-Lymphocytes -
Produce antibodies in response to pathogens into blood to fight with them. | (D) IgA - Present in colostrum in early days of lactation to protect infants from diseases. |

4. During the process of oogenesis in human female, the primary oocyte results in the formation of which of the following? Choose the correct option.

- | | |
|--|--|
| (A) Unequal cells - a smaller haploid secondary oocyte and a larger diploid polar body | (B) Unequal cells - a larger haploid secondary oocyte and a smaller haploid polar body |
| (C) Unequal cells - a smaller diploid secondary oocyte and a larger haploid polar body | (D) Equal cells - a haploid secondary oocyte and a haploid polar body |

5. A dwarf pea plant was treated with gibberellic acid and it becomes as tall as a tall pea plant. If these treated pea plants are crossed with pure tall pea plants, the phenotypic ratio in F_1 generation will be:

- (A) All tall (B) 50% tall, 50% dwarf
(C) 75% tall, 25% dwarf (D) 25% tall, 75% dwarf

6. Out of the following, select the correct match:

- (A) Transgenic cow milk - Human beta-lactalbumin protein (B) ELISA - Antigen antibody interaction
(C) Corn Borer - Cry II Ab gene (D) Cotton plant - Meloidogyne Incognita

7. The following information is about drugs and tobacco. Select the correct statement from the options given below.

- (A) Cocaine is given to patients after surgery as it stimulates recovery. (B) Chewing tobacco lowers blood pressure and heart rate.
(C) Barbiturates when given to criminals makes them tell the truth. (D) Morphine is often given to persons who have undergone surgery as a painkiller.

8. India has only 2.4% of the world's land area but its share of the global species diversity is:

- (A) 8.1% (B) 12.9%
(C) 7.3% (D) 5.1%

9. Name the microbe that is used as biocontrol agent for controlling pest butterfly caterpillars:

- (A) Streptococcus spp. (B) Trichoderma spp.
(C) Bacillus thuringiensis (D) Saccharomyces cerevisiae

10. Study the table given below showing the relationship between organism, its trophic level and kind of food chain it belongs to.

Organism	Trophic level	Food chain
Eagle	P	Grazing
Earthworm	Primary consumer	Q
Frog	R	Grazing

Select the option that correctly identifies P, Q and R in the table given below:

- (A) P - Top Carnivore; Q - Detritus; R - Secondary Consumer (B) P - Top Carnivore; Q - Detritus; R - Primary Consumer
(C) P - Scavenger; Q - Grazing; R - Secondary Consumer (D) P - Scavenger; Q - Grazing; R - Producer

11. What are minisatellites?

- (A) 10-40 bp sized small sequences within the genes. (B) Short coding repetitive sequences region on the eukaryotic genome.
(C) Short non-coding repetitive sequences forming a large portion of eukaryotic genome. (D) Regions of coding strand of DNA.

12. Choose the option that correctly describes the gynoecium of Michelia:

- | | |
|------------------------------------|---------------------------------|
| (A) Multicarpellary,
Apocarpous | (B) Bicarpellary,
Apocarpous |
| (C) Multicarpellary,
Syncarpous | (D) Bicarpellary,
Syncarpous |
-

13. Assertion (A): A piece of DNA inserted into an alien organism generally does not replicate, if not inserted into a chromosome.

Reason (R): Chromosomes have specific sequences called 'ori' region, where DNA replication is initiated.

- | | |
|--|---|
| (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). | (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). |
| (C) Assertion (A) is true, but Reason (R) is false. | (D) Assertion (A) is false, but Reason (R) is true. |
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14. Assertion (A): Swiss cheese is characterized by large holes due to CO₂ production.

Reason (R): It is ripened by growing a specific fungi.

- | | |
|--|---|
| (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). | (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). |
| (C) Assertion (A) is true, but Reason (R) is false. | (D) Assertion (A) is false, but Reason (R) is true. |
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15. Assertion (A): Human male is referred to as heterogametic.

Reason (R): The male produces millions of sperms of the same kind.

- | | |
|--|---|
| (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). | (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). |
| (C) Assertion (A) is true, but Reason (R) is false. | (D) Assertion (A) is false, but Reason (R) is true. |
-

16. Assertion (A): Replication of DNA takes place in S phase of the cell cycle.

Reason (R): DNA replication and cell division cycle should be highly coordinated.

- | | |
|--|---|
| (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). | (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). |
| (C) Assertion (A) is true, but Reason (R) is false. | (D) Assertion (A) is false, but Reason (R) is true. |
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Section B

17(a). Biotechnology has helped farmers to get pest-resistant cotton plants. Explain the technique adopted along with its mode of action.

OR

17(b). Explain any two molecular diagnostic techniques that help to detect pathogens from suspected patient.

18(a). How does a human body respond when vaccine is introduced into it? It is said that vaccinations are a must for a healthy society. Justify.

OR

18(b). Humans have innate immunity for protection against pathogens that may enter the gut along with food. What are the two barriers in our body that protect it from such pathogens?

19(a). "A fully developed foetus initiates its delivery from the mother's womb." Explain.

OR

19(b). Give reasons for the following:

(i) Why can a woman generally not conceive a child after 50 years of age?

(ii) Polar bodies are formed during oogenesis and not during spermatogenesis.

20. A few stages and their respective time period in the evolutionary history of human beings are mentioned in the flowchart given below:

15 mya - Primates walking like gorillas and chimpanzees existed. (a)

3-4 mya - Man-like primates walked in Eastern Africa. Fossils of their bones were discovered. (b)

2 mya - This ancestor lived in the East African grasslands and ate fruits. (c)

1.5 mya - This hominid had a brain size of 900 cc and probably ate meat. (d)

Based on the above information, answer the following questions:

(a) Name one primate about 15 mya.

(b) Name one place where fossils of primates were discovered in Eastern Africa.

(c) Name the ancestor that lived in the East African grasslands about 2 mya.

(d) Name the hominid that was found around 1.5 mya.

21. (a) Write the scientific name of the fruit fly.

(b) Why did Morgan prefer to work with fruit flies for his experiments? State two reasons.

Section C

22. Name the type of food chains responsible for the flow of larger fraction of energy in an aquatic ecosystem and a terrestrial ecosystem, respectively. Mention any two differences between the two food chains.

23. Name the process involved in the production of nematode-resistant tobacco plants, using genetic engineering. Explain the strategy adopted to develop such plants.

24. The base sequence in one of the strands of DNA is: 'TAGCATGAT'

(a) Give the base sequence of its complementary strand.

(b) How are these base pairs held together in DNA molecule?

(c) Explain the base complementarity rule. Name the scientist who framed this rule.

25. A village health worker was taking a session with women. She tells them that one has to be careful while using oral pills as a method of birth control. Wrong usage can actually promote conception.

(a) Analyse the above statement and compare the merits and demerits of using oral pills and surgical methods of birth control.

(b) Village women are confused as to how a thin metallic copper loop can provide protection against pregnancy. Explain the mode of action of IUDs. Give two points.

26. (a) Mention any two advantages of micropropagation techniques.

(b) Write in brief how the process is carried out in the laboratory.

(c) Name any two important food plants grown commercially by this method.

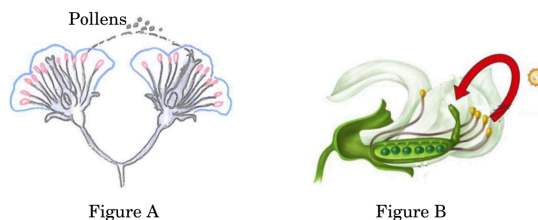
27. (a) "The process of evolution of different species in a given geographical area starts from a point and literally radiates to other geographical areas." Explain it with an example.

(b) Cite an example where more than one adaptive radiation has occurred in an isolated geographical area. Name the type of evolution your example depicts.

28. A person is suffering from high grade fever. Which symptoms will help to identify if he/she is suffering from Typhoid, Pneumonia or Malaria?

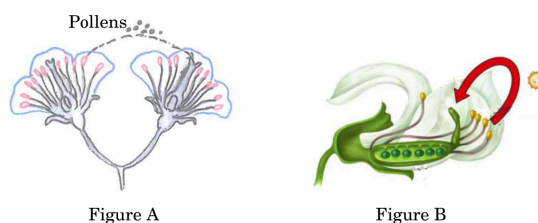
Section D

29(a). The following question is based on pollination. Study the figures carefully and answer the questions that follow.



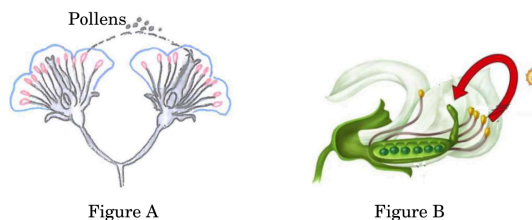
Give the scientific terms for the processes taking place in Figures A and B respectively.

29(b). The following question is based on pollination. Study the figures carefully and answer the questions that follow.



Mention two conditions necessary for the process occurring in Figure B.

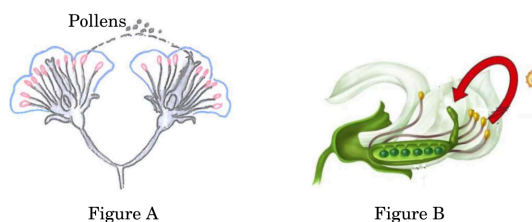
29(c)(i). The following question is based on pollination. Study the figures carefully and answer the questions that follow.



State one advantage and one disadvantage of the process occurring in Figure B.

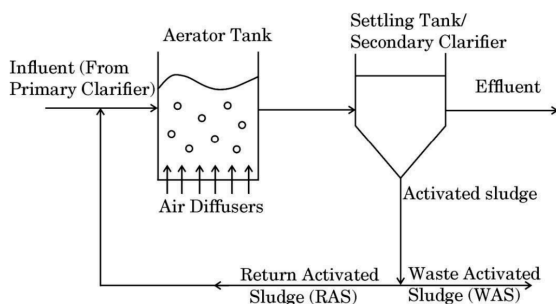
OR

29(c)(ii). The following question is based on pollination. Study the figures carefully and answer the questions that follow.



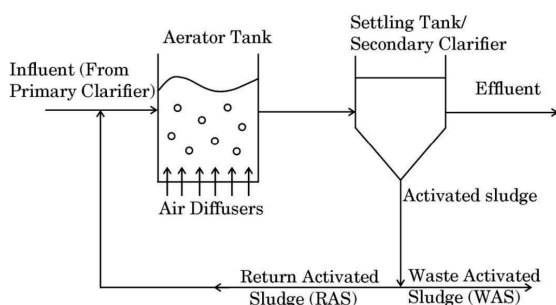
Name one plant where, in some flowers only, the process in Figure B takes place and give the reason responsible for it.

30(a). Study the figure given below and answer the questions that follow.



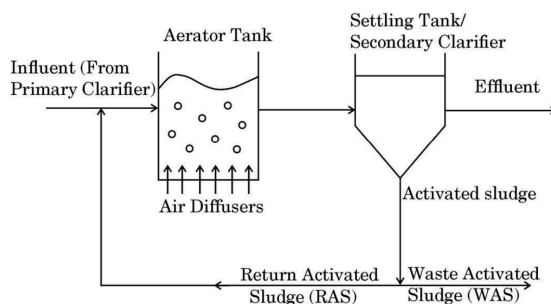
Identify the figure and state its importance.

30(b). Study the figure given below and answer the questions that follow.



Why is air diffused into the aerator tank? Explain.

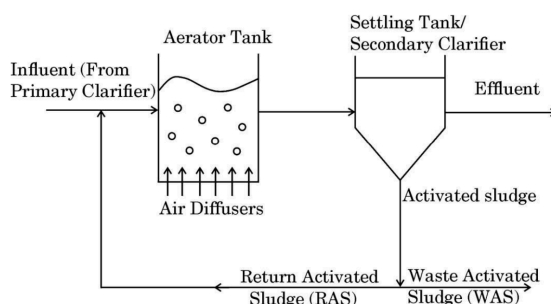
30(c)(i). Study the figure given below and answer the questions that follow.



What changes take place in the settling tank?

OR

30(c)(ii). Study the figure given below and answer the questions that follow.



How is BOD related to organic matter present in the water?

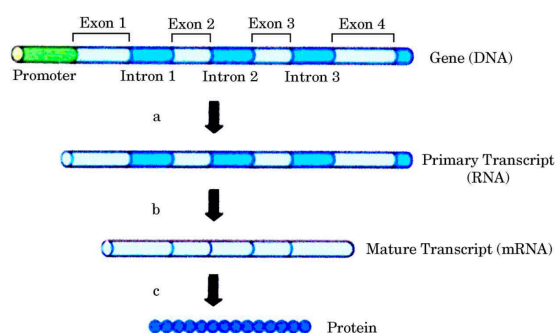
Section E

31(a). (i) What is a test cross? How can we find out the zygosity of a plant by the use of test cross?

(ii) Why are human females rarely haemophilic? Explain with the help of a cross. Under what conditions can a haemophilic female be born? How do haemophilic patients suffer?

OR

31(b). Name the two events 'a' and 'c' shown in the diagram below.



(i) Mention where in the cell these events take place.

(ii) Explain the changes taking place during event 'b' and mention why these are needed.

32(a). (i) How does alien species invasion cause a decline in biodiversity? Explain.

How have the following contributed to biodiversity loss?

I. Nile Perch

II. Lantana and Eichhornia

III. Clarias gariepinus

(ii) Why have certain regions been declared as biodiversity hotspots by environmentalists of the world? Name any two such regions in India.

OR

32(b). (i) Write an equation for Verhulst-Pearl Logistic Growth Curve where:

N = Population density at time 't'

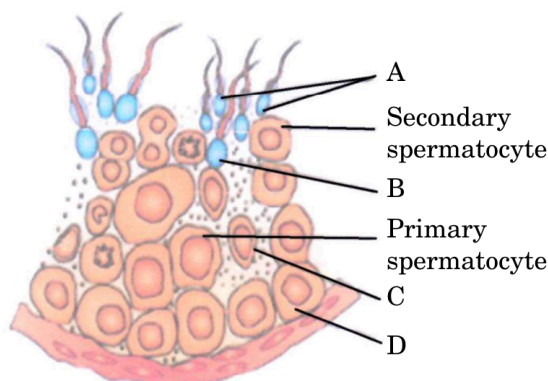
r = Intrinsic rate of natural increase

(ii) Draw a graph for a population whose population density has reached carrying capacity.

(iii) Draw a growth curve where resources are non-limiting to growth of population.

(iv) Which growth curve is considered more realistic and why? Explain.

33(a). Study the given diagram showing the sectional view of a seminiferous tubule.

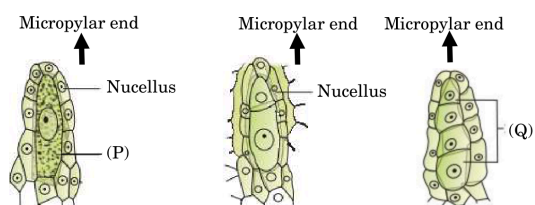


Answer the following questions:

- (i) Label A, B, C and D in the figure.
- (ii) What will be the number of chromosomes in secondary spermatocyte and spermatid respectively?
- (iii) Explain the terms - Spermiogenesis and Spermiation.

OR

33(b). Study the figures given below showing initial stages in the formation of female gametophyte and answer the questions that follow.



- (i) Identify (P) and (Q).
- (ii) I. What kind of division does cell (P) undergo to form (Q)?
- II. How many (Q) cells form the embryo sac? What is the name given to such kind of development?
- III. How many free nuclear mitotic divisions will the functional megaspore undergo to form the embryo sac?
- IV. Describe the structure of a mature female gametophyte.

- End of Question Paper -