

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

Maximum Marks: 70

General Instructions

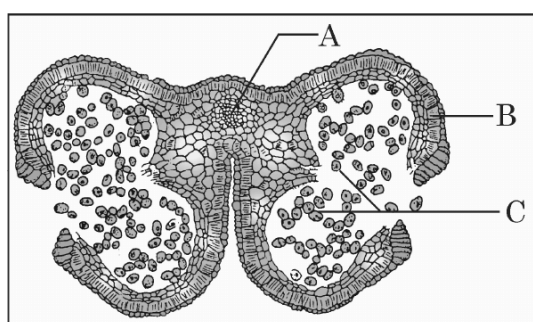
- (i) This question paper contains **33 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 16 carry 1 mark each.
- (iii) Section B: Questions 17 to 21 carry 2 marks each.
- (iv) Section C: Questions 22 to 28 carry 3 marks each.
- (v) Section D: Questions 29 to 30 carry 4 marks 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. In a fertilized ovule of an angiosperm, the cells in which n , $2n$ and $3n$ conditions respectively occur are:

- | | |
|-------------------------------------|---|
| (A) antipodal, zygote and endosperm | (B) zygote, nucellus and endosperm |
| (C) endosperm, nucellus and zygote | (D) antipodals, synergids and integuments |

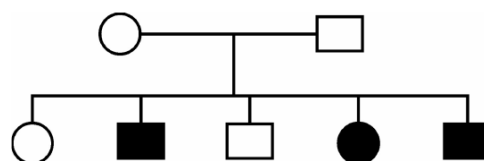
2. Study the following diagram of Transverse Section of a young anther of an angiosperm:



Select the option where parts 'A', 'B' and 'C' are correctly identified.

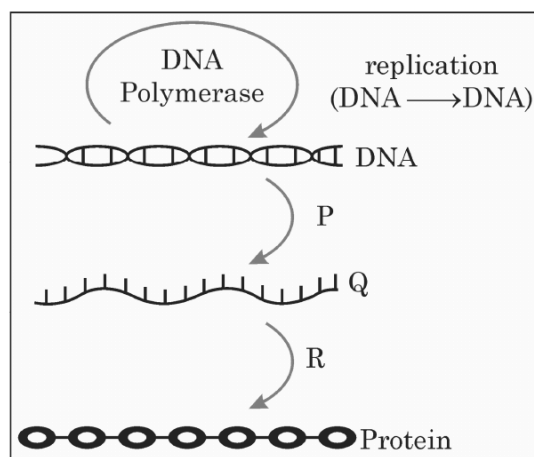
- | | |
|---|---|
| (A) A - Connective, B - Endothecium, C - Pollen grain | (B) A - Endothecium, B - Connective, C - Pollen grain |
| (C) A - Pollen grain, B - Connective, C - Endothecium | (D) A - Endothecium, B - Pollen grain, C - Connective |

3. Identify the category of genetic disorder depicted in the pedigree chart given below:



- | | |
|-------------------------|------------------------|
| (A) X-Linked recessive | (B) X-Linked dominant |
| (C) Autosomal recessive | (D) Autosomal dominant |

4. Which of the options has correct identification of 'P', 'Q' and 'R' in the illustration of 'Central Dogma' given below?



- | | |
|--|--|
| (A) P - Replication, Q - rRNA, R - Transcription | (B) P - Translation, Q - mRNA, R - Transcription |
| (C) P - Replication, Q - mRNA, R - Translation | (D) P - Transcription, Q - mRNA, R - Translation |

5. Hugo de Vries proposed the mutation theory of organic evolution after his experiments on:

- (A) Garden pea (B) Evening primrose
(C) Fruit fly (D) Four O' clock plant

6. A list of organisms is given in column 'R', whereas in column 'S' a list of products produced by them:

Column R (Organisms) Column S (Products)

- (A) Lactobacillus - (i) Cheese
(B) Saccharomyces cerevisiae - (ii) Curd
(C) Aspergillus niger - (iii) Citric acid
(D) Acetobacter aceti - (iv) Bread
(v) Acetic acid

Select the option where the organisms are correctly matched with the product.

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

7. Study the table given below:

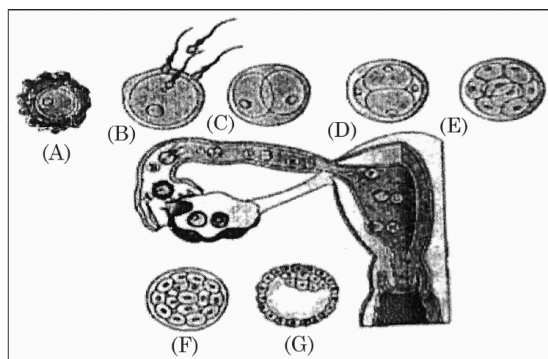
Contraceptive / Contraceptive Method	Mode of Action
A. The pill - I. Prevent sperm reaching cervix	
B. Condom - II. Prevent implantation	
C. Vasectomy - III. Inhibits ovulation	
D. Copper-T - IV. Semen contains no sperm	

- A. The pill - I. Prevent sperm reaching cervix
B. Condom - II. Prevent implantation
C. Vasectomy - III. Inhibits ovulation
D. Copper-T - IV. Semen contains no sperm

Select the option where contraceptive/contraceptive method are correctly matched with their mode of action.

- (A) A-III, B-II, C-I, D-IV (B) A-II, B-III, C-I, D-IV
(C) A-III, B-I, C-IV, D-II (D) A-IV, B-III, C-II, D-I

8. Select the option that gives the correct identification of ovum, morula and blastocyst in a human female reproduction system as shown in the following diagram:



- (A) Ovum - B, Morula - D, Blastocyst - F (B) Ovum - A, Morula - B, Blastocyst - G
(C) Ovum - A, Morula - E, Blastocyst - G (D) Ovum - B, Morula - D, Blastocyst - G

9. The commonly used vector for human genome sequencing was/were:

- (A) Retrovirus (B) T-DNA
(C) BAC and YAC (D) Plasmid Vector

10. Turner's syndrome in humans occurs due to:

- (A) Aneuploidy (B) Euploidy
(C) Polyploidy (D) Autosomal abnormality

11. ELISA technique is based on the principle of:

- | | |
|------------------------------------|-----------------------------------|
| (A) DNA replication | (B) antigen-antibody interaction |
| (C) pathogen - antigen interaction | (D) antigen - protein interaction |
-

12. The 'molecular scissors' fall in the category of:

- | | |
|---------------------|-------------------------|
| (A) Cleaving enzyme | (B) Endonuclease |
| (C) Exonuclease | (D) Restriction enzymes |
-

13. Assertion (A): Plasmids are autonomously replicating circular extra-chromosomal DNA.

Reason (R): Plasmids are usually present in Eukaryotic 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 (A): A given fig species can be pollinated only by its 'partner' wasp.

Reason (R): The wasp pollinates the fig inflorescence while searching for suitable egg laying sites.

- | | |
|--|--|
| (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 (A): Some aquatic ecosystems have inverted biomass pyramids.

Reason (R): More energy is required by the organisms occupying higher trophic levels.

- | | |
|--|--|
| (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): Patents are granted by government to an inventor.

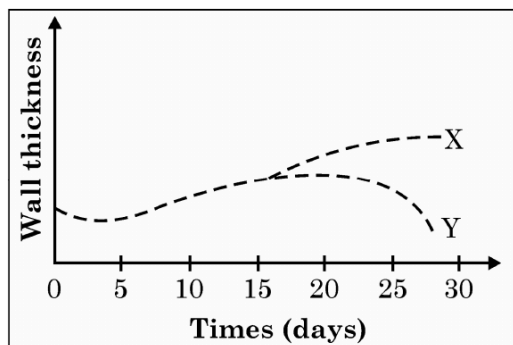
Reason (R): Patents prevents others from commercial use of an invention.

- | | |
|--|--|
| (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) Name the first developed transgenic cow.
(b) Explain the improvement in the quality of the milk produced by it.

18. Study the graph given below that represents the changes in the thickening of the uterine wall in women 'X' and women 'Y' over a period of one month:



What does the graph with respect to woman 'X' and woman 'Y' indicate? Give suitable reason.

19. (a) Mention any two ways by which HIV and Hepatitis-B can be transmitted to a healthy person.

(b) Why is an early detection of these diseases essential?

20. (a) Biodiversity hotspots cover less than 2% of Earth's land area. Strict protection of these areas can reduce the rate of ongoing extinctions. Explain.

(b) Name any two hotspots in India.

- 21(a). Differentiate between grazing food chain and detritus food chain.

OR

- 21(b). Explain Brood parasitism with the help of a suitable example.

Section C

22. Draw a schematic diagram of the E.coli vector pBR 322 and mark the following in it:

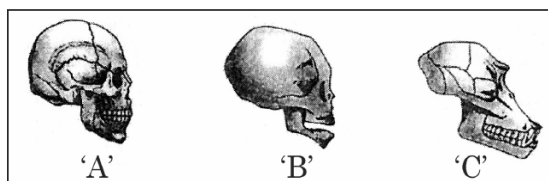
- (a) ori
- (b) rop
- (c) ampicillin resistant gene
- (d) tetracycline-resistant gene
- (e) restriction site Bam HI
- (f) restriction site EcoRI

23. How has the use of Agrobacterium as vector helped in controlling Meloidogyne incognita infestation in tobacco plants? Explain in correct sequence.

24. Explain the role of the following during the sewage treatment:

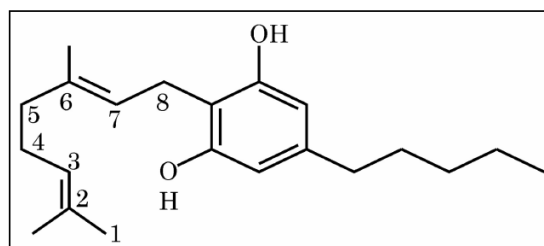
- (a) flocs
- (b) anaerobic sludge digester

25(a). Whose skulls 'A', 'B', and 'C' are shown below? Which of the two are more similar to each other?



25(b). Name the (i) ape like (ii) man like primates that existed 1.5 million years ago.

26(a). (i) Name the group of drugs whose skeletal molecule is shown below:



(ii) How are such drugs consumed?

(iii) Name the human body organ affected by the consumption of these drugs.

OR

26(b). Draw a schematic diagram of an antibody molecule and label any 4 parts. Mention their chemical nature. Name the cells which produce them.

27. A pea plant with purple flowers, when crossed with a plant with white, produced 50 plants with only purple flowers. On selfing these plants produced 482 plants with purple flower and 162 with white flowers. Explain the pattern of inheritance with the help of Punnet square.

28. Draw a well labelled diagram of sectional view of male gametophyte/microspore of an angiosperm and write the functions of any two parts labelled. (Any four labels).

Section D

29(a). Generally, in eukaryotic cells the average length of a transcription unit along a DNA molecule is about 8,000 nucleotides, so the RNA product of the transcription is also that long. But it only takes about 1200 nucleotides from the above RNA product to translate average sized polypeptide of 400 Amino acids.

Name this RNA product transcribed from the DNA that subsequently translates into a polypeptide of 400 amino acids. Mention the enzyme responsible for transcribing this type of RNA from the DNA.

29(b). Generally, in eukaryotic cells the average length of a transcription unit along a DNA molecule is about 8,000 nucleotides, so the RNA product of the transcription is also that long. But it only takes about 1200 nucleotides from the above RNA product to translate average sized polypeptide of 400 Amino acids.

Name and explain the process the RNA molecule transcribed from 8000 nucleotide long DNA undergoes to be able to translate a polypeptide of 400 amino acids.

29(c). Generally, in eukaryotic cells the average length of a transcription unit along a DNA molecule is about 8,000 nucleotides, so the RNA product of the transcription is also that long. But it only takes about 1200 nucleotides from the above RNA product to translate average sized polypeptide of 400 Amino acids.

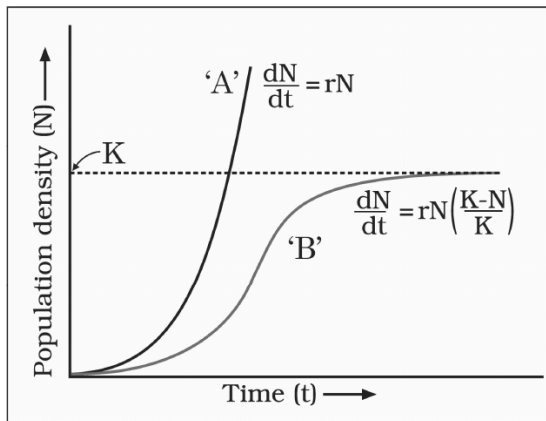
Write the number of RNA polymerases involved in the transcription of DNA in a prokaryote and eukaryotes.

OR

29(c). Generally, in eukaryotic cells the average length of a transcription unit along a DNA molecule is about 8,000 nucleotides, so the RNA product of the transcription is also that long. But it only takes about 1200 nucleotides from the above RNA product to translate average sized polypeptide of 400 Amino acids.

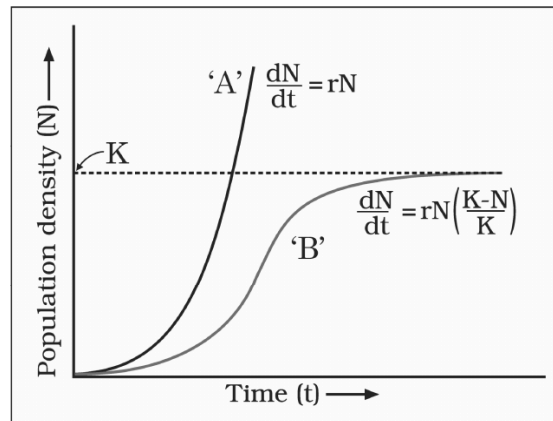
Mention the difference in the site of transcription in a prokaryote and eukaryote cell.

30(a). Populations evolve to maximise their reproductive fitness in the habitat in which they live. Ecologists suggest, the life history of organisms have evolved in relations to the constraints imposed by the biotic and abiotic components of the habitat in which they live. This gets reflected in the population growth pattern of all organisms including humans.



Study the population growth curves shown in the given graph and answer the questions that follow:
Identify the growth curves 'A' and 'B'.

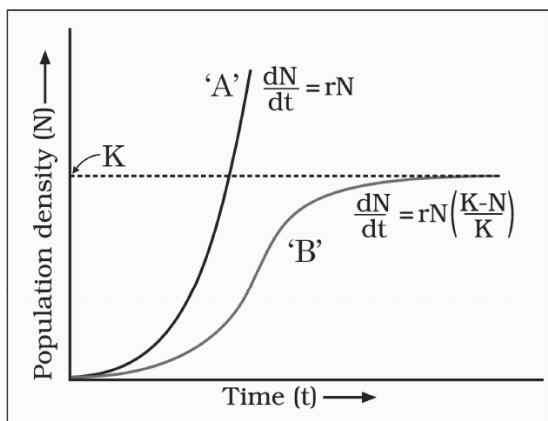
30(b). Populations evolve to maximise their reproductive fitness in the habitat in which they live. Ecologists suggest, the life history of organisms have evolved in relations to the constraints imposed by the biotic and abiotic components of the habitat in which they live. This gets reflected in the population growth pattern of all organisms including humans.



Study the population growth curves shown in the given graph and answer the questions that follow:
Mention what does the dotted line in the graph indicate and state its importance also.

OR

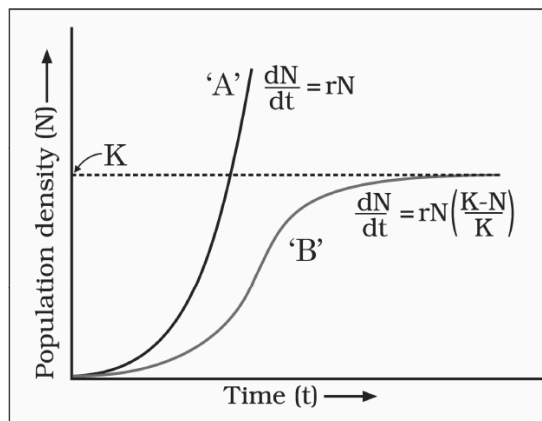
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Study the population growth curves shown in the given graph and answer the questions that follow:

Growth curve 'B' shows a different pattern from that of growth curve 'A'. Justify giving one reason.

30(c). Populations evolve to maximise their reproductive fitness in the habitat in which they live. Ecologists suggest, the life history of organisms have evolved in relations to the constraints imposed by the biotic and abiotic components of the habitat in which they live. This gets reflected in the population growth pattern of all organisms including humans.



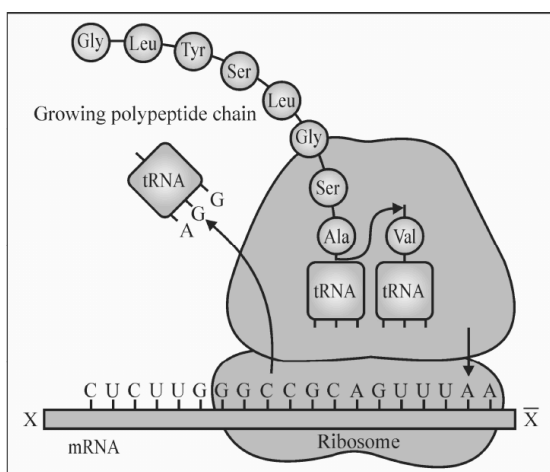
Study the population growth curves shown in the given graph and answer the questions that follow:

(i) Which one of the two curves is more 'realistic' and why?

(ii) Which one of the two curves is relevant in present days with respect to human population in our country and why?

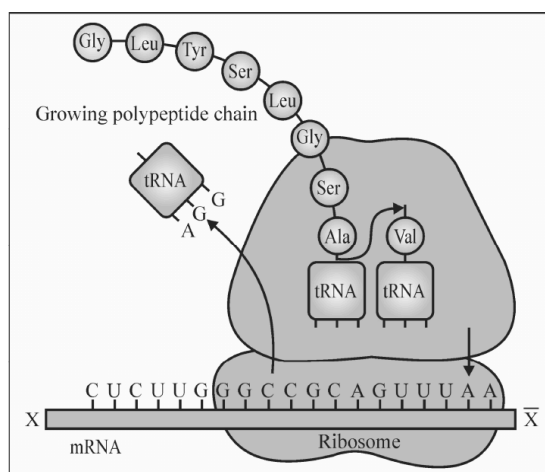
Section E

31(a)(i). Study the schematic diagram given below and answer the questions that follow:



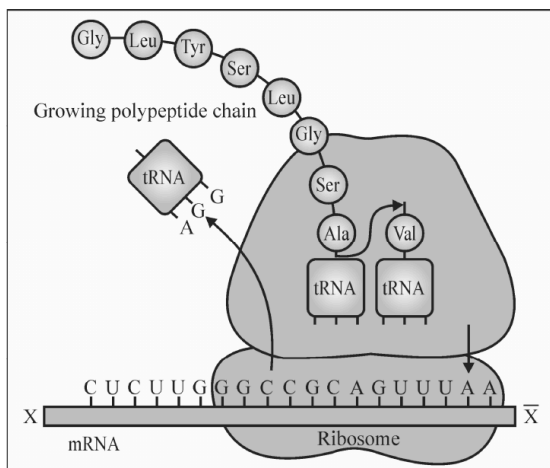
Identify the polarity from 'X' to 'X' in the mRNA segment shown. Mention how many more amino acids can be added to the polypeptide that is being translated and why.

31(a)(ii). Study the schematic diagram given below and answer the questions that follow:



Write the initiating codon for translation, its anticodon and the amino acid it codes for.

31(a)(iii). Study the schematic diagram given below and answer the questions that follow:



Explain the charging of an adaptor molecule. Why this molecule needs to be charged?

OR

31(b)(i). Why is sickle-cell anaemia, a human blood disorder so named?

OR

31(b)(ii). Explain the genetic basis that results in the expression of this disorder.

OR

31(b)(iii). Work out a cross to explain how normal parents may have a sickle-cell anaemic child.

32(a). Describe the life cycle of HIV from the time of its entry into the human body till full blown AIDS sets in.

OR

32(b)(i). Write the symptoms of malaria in human and explain what causes these symptoms.

OR

32(b)(ii). Describe the different steps in the sexual mode of reproduction in the life cycle of a malarial parasite from the time of its initiation till where it is completed and ready to start a fresh cycle.

33(a). (i) State the objective of adopting artificial hybridisation programme in plants.

(ii) Describe the steps followed in this technique.

OR

33(b)(i). Describe the development of placenta during pregnancy in a human female.

OR

33(b)(ii). Explain its role.

- End of Question Paper -