

Class: XII

Date: 10/01/2025

Duration: 3 Hr

Max. Marks: 70

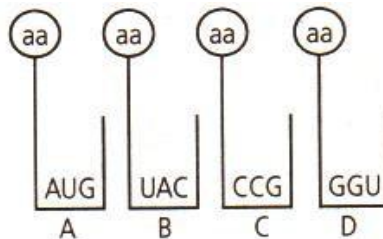
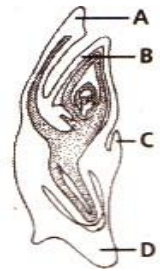
General Instructions:

All questions are compulsory.

- The question paper has five sections and 33 questions. All questions are compulsory.
- 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.
- 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.
- Wherever necessary, neat and properly labelled diagrams should be drawn.

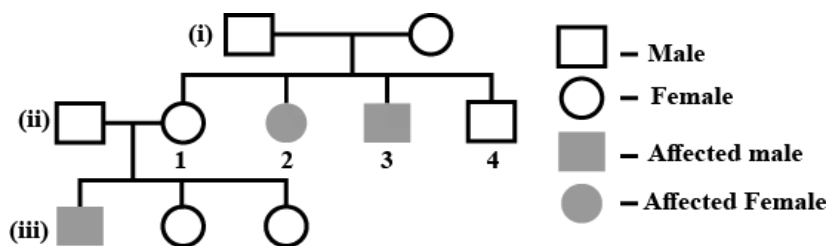
SECTION – A

- In which one of the following, both autogamy and geitonogamy are prevented?
 - Wheat
 - Papaya
 - Castor
 - Maize
- Refer to the given figure and identify the correct option regarding the statements identifying its parts A – D.
 - A is cotyledon of monocot embryo, situated towards lateral side of embryonal axis.
 - B is axis above the level of attachment of A.
 - C is hollow foliar structure enclosing shoot apex and leaf primordia.
 - D is differentiated sheath enclosing plumule.



- Find the sequence of binding of the following aminoacyl tRNA complexes during translation to mRNA transcribed by a DNA segment having the base sequences 3 'TACATGGGTC CG5'. Choose the answer showing the correct order of alphabets.
 - C, D, B, A
 - A, B, D, C
 - D, C, A, B
 - B, A, D, C
- How many of the following traits of pea plant studied by Mendel are dominant? Round seed, Constricted pod, yellow seed, white flower, green pod, terminal flower.
 - 2
 - 3
 - 4
 - 5
- Blue eye color is recessive to brown eye color. In a population of 100 individuals, how many will have blue eye color if the allelic frequency is 0.2, given that the population is in Hardy Weinberg equilibrium.
 - 32
 - 64
 - 8
 - 4
- Which one of the following sequences was proposed by Darwin and Wallace for organic evolution?

- Overproduction, variations, constancy of population size, natural selection.
 - Variations, constancy of population size, overproduction, natural selection.
 - Overproduction, constancy of population size, variations, natural selection.
 - Variations, natural selection, overproduction, constancy of population size.
7. To form a nucleoside, a nitrogenous base is linked to a pentose sugar,
- through a P glycosidic linkage at carbon atom number 1.
 - through a P glycosidic linkage at carbon atom number 5.
 - through a N glycosidic linkage at carbon atom number 1.
 - through a N glycosidic linkage at carbon atom number 5.
8. Study the given pedigree chart for the disease caused by mutation Y and select the most appropriate option for the genotypes.



Genotypes of parents

Genotypes of 1st and 3rd child on F1

- | | |
|------------------------------|-------------------------|
| a) $Hb^A Hb^S$, $Hb^A Hb^A$ | $Hb^A Hb^A$ $Hb^A Hb^S$ |
| b) $Hb^A Hb^S$, $Hb^A Hb^S$ | $Hb^A Hb^A$ $Hb^A Hb^A$ |
| c) $Hb^A Hb^A$ $Hb^A Hb^S$ | $Hb^A Hb^A$ $Hb^S Hb^S$ |
| d) $Hb^A Hb^S$ $Hb^A Hb^S$ | $Hb^A Hb^S$ $Hb^S Hb^S$ |
9. Read the following statements and select the correct one:
- The property of contact inhibition is shown by cancerous cell.
 - The cancer patients are administered with alpha interferon to destroy the tumour.
 - The most feared property of the benign tumour is metastasis.
 - Cancerous cells divide in a regulated manner.
10. Cultivation of Bt Cotton has been much in the news. The prefix 'Bt' here means
- 'barium treated' cotton seeds
 - 'bigger thread' variety of cotton with better tensile strength
 - produced by biotechnology using restriction enzyme and ligases from *Bacillus thuringiensis*
 - carrying an endotoxin gene
11. Significance of 'heat shock' method in bacterial transformation is to facilitate -
- Binding of DNA to the cell wall.
 - Uptake of DNA through membrane transport proteins.

c) Uptake of DNA through transient pores in the bacterial cell wall.

d) Expression of antibiotic resistance gene.

12. If N = population density at time t , then population density at time $t + 1$ can be written as:

$$N_{t+1} = N_t + [(A + X) - (B + Y)]$$

In the above equation,

a) A is natality and Y is immigration.

b) B is mortality and X is immigration.

c) A is mortality and X is emigration.

d) B is natality and Y is emigration.

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

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

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

c) A is true but R is false.

d) A is false but R is true.

13. **Assertion:** Hybrids are widely used in agriculture to increase productivity and apomixes can be an important tool for maintaining hybrid culture.

Reason: Seeds produced by apomictic plants are identical to the parent as there is no segregation.

14. **Assertion:** Polymorphism forms the basis of DNA fingerprinting.

Reason: Polymorphism arises due to non-inheritable mutations.

15. **Assertion:** Acid of stomach kills most of the ingested microorganisms entered through food.

Reason: Stomach acid is a type of physical barrier for the body defence mechanism.

16. **Assertion:** *EcoRI* produces sticky ends.

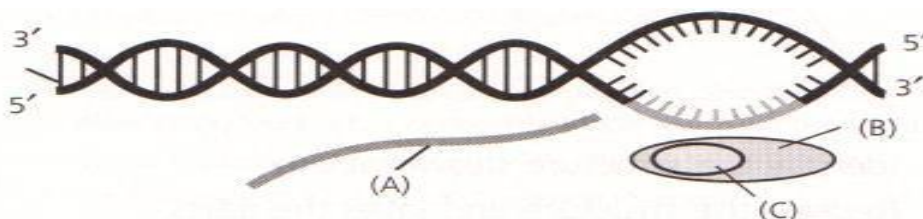
Reason: Stickiness of the ends facilitates the action of DNA polymerase.

SECTION – B

17. What is the number of chromosomes in the following cells of humans?

a) Primary oocyte b) Secondary oocyte c) Ootid d) Follicular cells

18. Transcription of DNA mainly consists of three steps. One of the steps of transcription is given below:

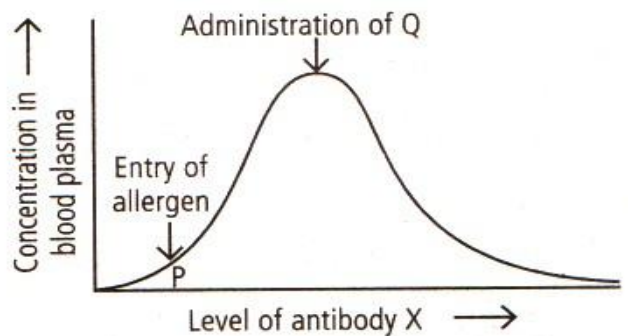


a) Identify C.

b) What changes will take place in A after the completion of above process in eukaryotes?

19. The given graph shows the concentration of antibody X in blood when an allergen enters the body and when a chemical X is given. Based on this answer the following questions:

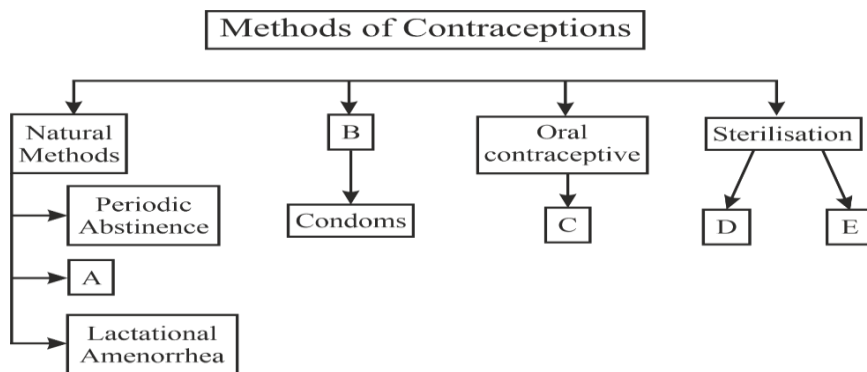
- a) With reference to the given graph explain why there is high level of antibody X after point P?
- b) Name the cells and their secretions responsible for the response after point P.
- c) Why there is a decrease in the level of antibody



20. In the year 1963, two enzymes responsible for re were isolated. How did these enzymes act to restrict the growth of the bacteriophage?
21. a) If the GPP for a patch of forest is 10 kg Carbon/m²/year, and the amount of carbon dioxide leaving the ecosystem is 5 kg Carbon/m²/year. Calculate the NPP?
b) In the patch of forest mentioned above, how much energy is available at the producer level for herbivore consumption? Assume 1 kg of carbon produces 10,000 kJ of energy.

SECTION – C

22. Consider the given figure and answer the following questions -
a) Identify A, B, C, D, E.



- b) Name an IUD that you would recommend to promote the cervix hostility to sperms.

23. Explain the events in a normal woman during her menstrual cycle on the following days.
 - i) Ovarian event from 13-15 days.
 - ii) Ovarian hormones level from 16-23 days.
 - iii) Uterine events from 24-29 days.
24. 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) You are given the DNA shown below:

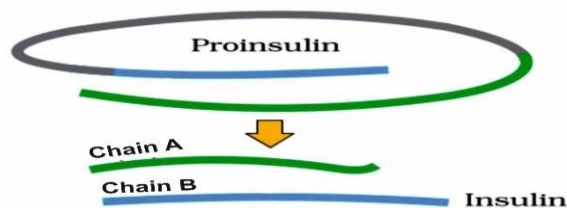
5' - ATTTTGAGGATCCGTAATGTCCT-3'

3' - TAAAACTCCTAGGCATTACAGGA-5'

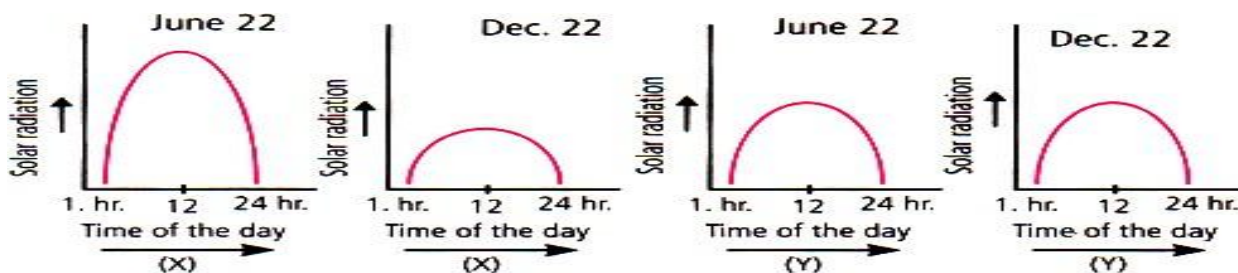
If this DNA was cut with *BamHI*, how many DNA fragments would you expect?
 - b) Write the sequence of these double stranded DNA fragments with their respective polarity.
 - c) Explain how the gene of interest is introduced into a vector.

OR

Observe the given structure of a hormone which is produced by beta cells of pancreas and help to treat diabetes. An American company produced this hormone using rDNA technique.



- a) What type of bonding is present between chains of this hormone?
 - b) Mention the chemical change that the pro hormone undergoes to be able to act as mature hormone.
 - c) Why is the hormone produced via rDNA technique considered better than the ones used earlier by diabetic patients?
25. The graphs (X) and (Y) below depict the diurnal variations in the solar radiations in the month of June (Summer) and in the month of December (Winter).
- a) Which of the two graphs depict tropical region and temperate regions respectively?
 - b) Which of the two regions (X) or (Y) will show high biological diversity and why?

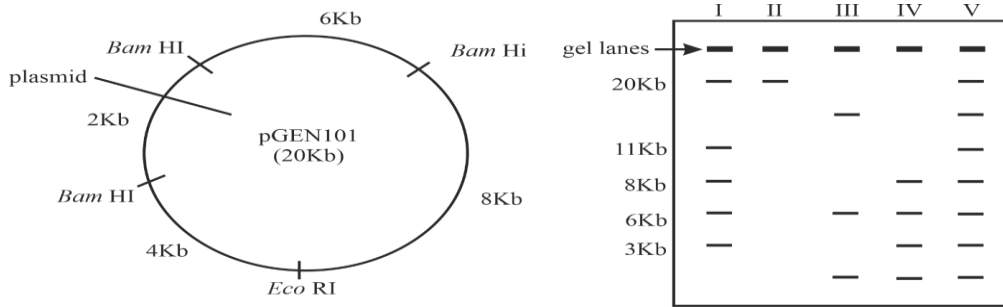


26. Meiotic division during oogenesis is different from that in spermatogenesis. Explain how and why?
27. With the help of any three suitable examples explain the effect of anthropogenic actions on organic evolution.
28. a) How does activated sludge get produced during sewage treatment?
b) Explain how this sludge is used in biogas production.

SECTION – D

Q. No. 29 and 30 are case-based questions. Each question has 3 subparts with internal choice in one subpart.

29. When circular plasmids are cut with restriction enzymes, different sized fragments of DNA are produced. Use the following figure to answer the questions given below. The plasmid pGEN101 shown was treated with various mixtures of restriction enzymes. The electrophoresis gel shows the results of each of those digestions.



a) Which lane (I to V) represents the fragments produced using *Bam* HI only?

OR

Which lane represents the fragments produced using *Eco* RI only?

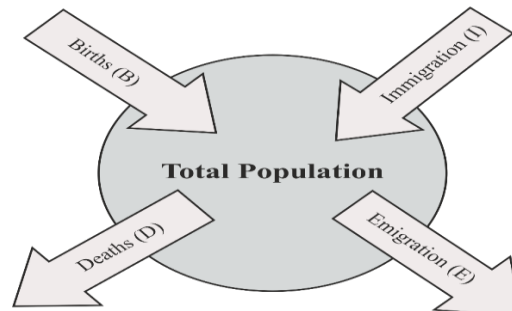
- b) In terms of efficiency, how is *Eco* RI better than *Bam* HI in the above case in creating a rDNA.
 c) It is theoretically possible for a gene from any organism to function in any other organism. Why is this possible? Discuss.

30. Using Model 1 and the letters B, D, E, and I, write mathematical expressions to show the types of population described below. Note: The use of > and < may be needed.

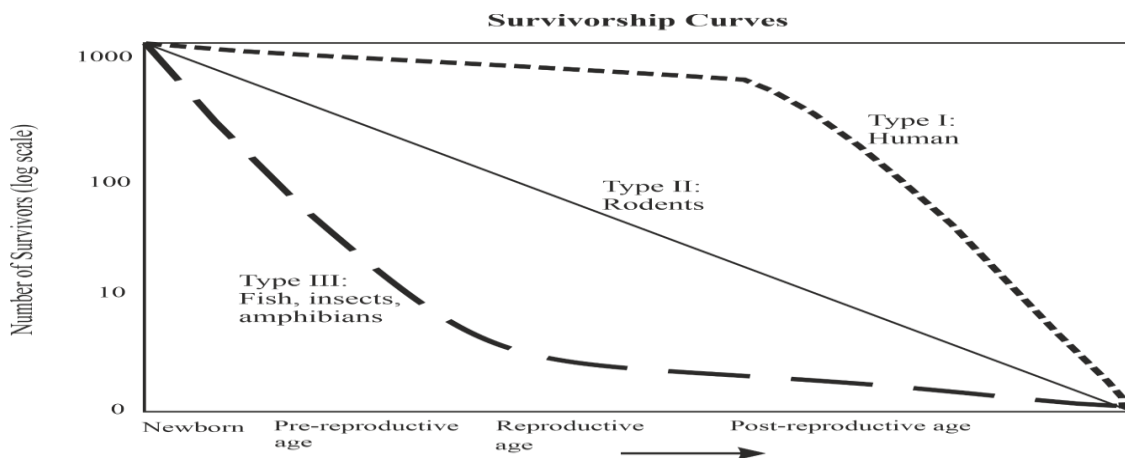
Model 1 - Population Growth

a) A declining population (total number of organisms is decreasing).

b) A growing population (total number of organisms is increasing).



c) Read the following graph and answer the questions given below.



- i. How do you think populations with Type II or III survivorship compensate for high pre-reproductive mortality?
 ii. Consider the evolutionary strategies that each survivorship type has developed for producing and rearing their young. Propose an explanation of why type I survivors have the highest

relative number of individuals / 1000 births that survive until they reach post-reproductive age?

SECTION – E

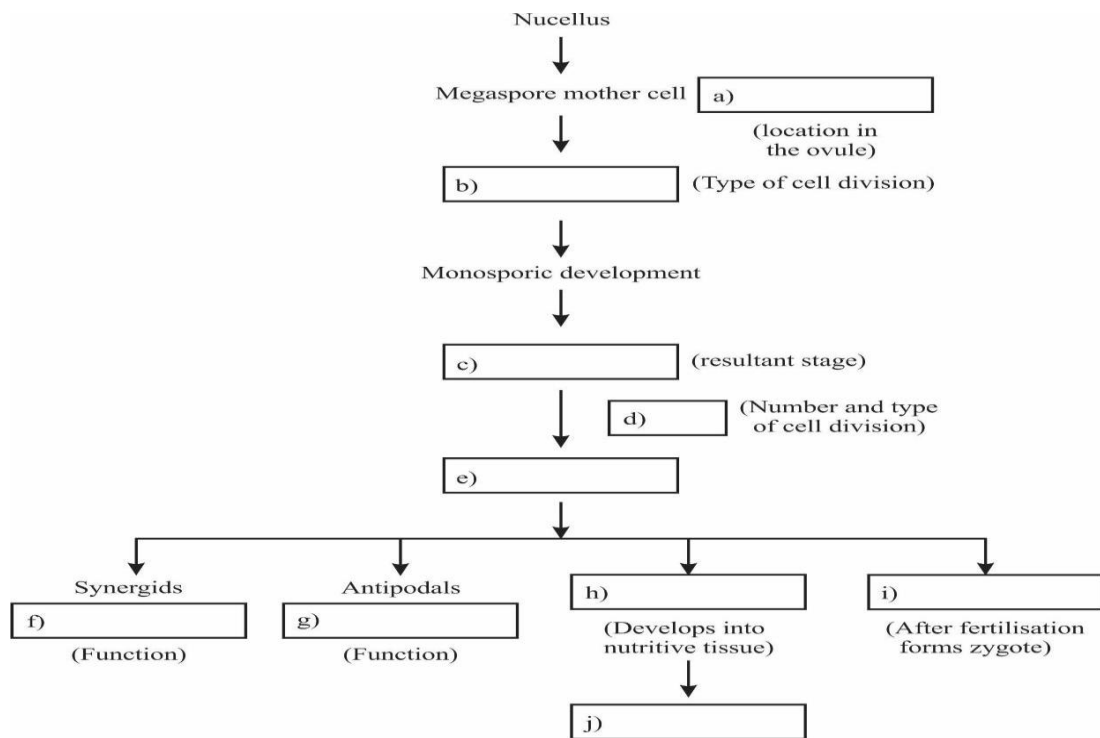
31. a) A flower of a tomato plant following the process of sexual reproduction produces 160 viable seeds. Complete the following table with proper information.

| Sl. No. | Type of units involved | No. of these units involved | Provide explanation for each of your answer |
|---------|-------------------------|-----------------------------|---|
| 1. | Pollen grains | 1a. | 1b. |
| 2. | Ovules | 2a. | 2b. |
| 3. | Mega spore mother cells | 3a. | 3b. |
| 4. | Microspore mother cells | 4a. | 4b. |

- b) How does nutritive tissue in black pepper seed differ from maize seed?

OR

Complete the given flow chart with the help of the clues given:



32. If the progeny of the cross $aaBB \times AAbb$ is testcrossed, and the following genotypes are observed among the progeny of the testcross, what is the frequency of recombination between these loci? Represent the test cross using a Punnet square.

AaBb-135

Aabb-430

aaBb-390

aabb-120

OR

- a) You have an individual who is totally heterozygous for 2 genes that are not linked. One gene is for ear size (AA or Aa being big ears whereas aa is for small ears) and the other gene is for bulgy eyes (BB and Bb for bulgy eyes whereas bb represents normal eyes). If you testcross this individual, what are the resulting genotypes and phenotypes?

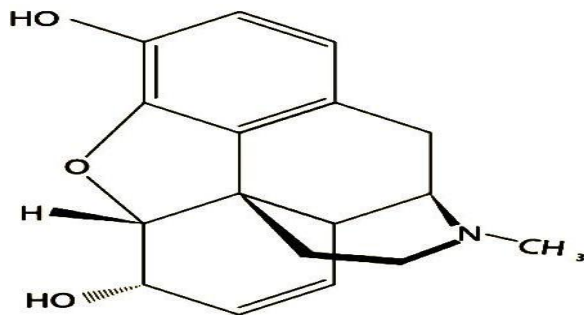
- b) If the 4 types of offspring from the above cross, did not show 1:1:1:1, but were as follows, what would this represent?

| PERCENTAGES | GENOTYPE | PHENOTYPE |
|-------------|----------|-------------------------|
| 48% | AaBb | Big ears, bulgy eyes |
| 2% | Aabb | Big ears, normal eyes |
| 2% | aaBb | Small ears, bulgy eyes |
| 48% | aabb | Small ears, normal eyes |

33. Describe the asexual and sexual phases of life cycle of *Plasmodium* that causes malaria in humans.

OR

- (a) Drugs and alcohol give short-term 'high' and long-term 'damages'. Discuss the damages by giving suitable examples.
- (b) Which group of drugs does this represent?



- (c) What are the modes of consumption of these drugs?

*****End Of Paper*****