

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. Match Column-I with Column-II and choose the correct option:

Column-I Column-II

- a. Biolistic gun i. Bacterial cell
b. Chitinase ii. Tumour inducing
c. Ti iii. Animal cell
d. Ca^{2+} iv. Fungal cell
 v. Plant cell

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

2. Microbes commonly used in kitchen are

- (A) Lactobacillus and Yeast (B) Penicillium and Yeast
(C) Microspora and E.coli (D) Rhizopus and Lactobacillus

3. The features of some structures of human male reproductive system are given below. Choose the correct option that matches the features with the structures.

- (i) It opens into the Vasa efferentia through rete testis.
(ii) It carries semen as well as urine.
(iii) It maintains temperature ($2 - 2.5^{\circ}\text{C}$) lower than body temperature for sperm formation.
(iv) It leads to vas deferens that ascends to the abdomen.

- (A) (i) Seminal vesicle, (ii) Urethra, (iii) Scrotum, (iv) Seminiferous tubule
(B) (i) Prostate, (ii) Scrotum, (iii) Testes, (iv) Vas Deferens
(C) (i) Seminiferous tubule, (ii) Urethra, (iii) Scrotum, (iv) Epididymis
(D) (i) Seminiferous tubule, (ii) Vas Deferens, (iii) Urethra, (iv) Sertoli cells

4. Exploration of molecular, genetic and species level diversity for gaining products of economic importance is called

- (A) Exploitation (B) Bio-prospecting
(C) Bio-patenting (D) Bio-piracy

5. Which connective tissue connects ovary to pelvic wall and uterus?

- (A) Tendons (B) Ligaments
(C) Cartilage (D) Bone

6. Which of the following is not a component of detritus food chain?

- (A) Dead Leaves (B) Bacteria
(C) Fungi (D) Zooplankton

7. Identify the plant in which emasculation is not required for artificial hybridization.

- (A) Rice (B) Wheat
(C) Pea (D) Papaya

8. Pomato was produced by fusing protoplasts of

- (A) Tomato and Potato (B) Pomegranate and Tomato
(C) Pomegranate and Potato (D) Pomegranate, Potato and Tomato

9. Which of the following sacred groves is found in Meghalaya?

- (A) Jaintia hills (B) Bastar
(C) Chanda (D) Sarguja

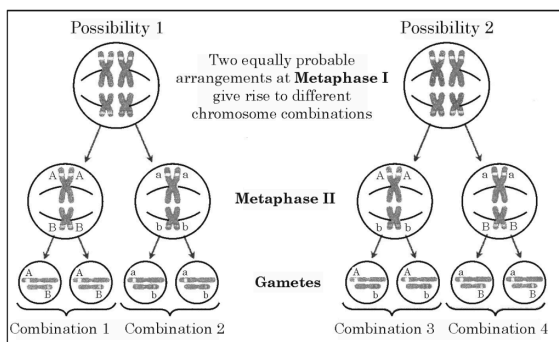
10. Messelson and Stahl's experiment carried out centrifugation in CsCl_2 density gradient to separate:

- (A) DNA from RNA (B) DNA from protein
(C) RNA from protein (D) Normal DNA from heavy DNA

11. Which one of the following is not a component required for Polymerase Chain Reaction (PCR)?

- (A) Template DNA (B) Primers
(C) DNA Ligase (D) DNA Polymerase

12. In the following figure, two ways of pairing of two homologous pairs of chromosomes are shown. Which of the following phenomena is expressed?



- (A) Linkage of genes (B) Independent assortment of genes
(C) Multiple alleles (D) Incomplete dominance

13. Assertion (A): When we see stars, we are apparently peeping into the past.

Reason (R): What we see today is an object whose emitted light started its journey millions of years back reaching our eyes now.

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

14. Assertion (A): Flocs are masses of bacteria associated with fungal filaments in secondary treatment of sewage.

Reason (R): Flocs help in digestion of solid waste by anaerobic respiration.

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

15. Assertion (A): In terrestrial ecosystem much larger fraction of energy flows through grazing food chain.

Reason (R): Grazing food chain may be connected to Detritus food chain at some levels.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation for Assertion (A).
(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation for 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): The milk produced by transgenic cow 'Rosie' was nutritionally more balanced product for human babies than natural cow milk.

Reason (R): It was human protein enriched milk containing human alpha lactaglobulin.

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

Section B

17(a). What is the role of LAB (Lactic Acid Bacteria) in preparation of curd?

17(b). Mention two health benefits of consuming curd.

18(a). Name the muscular and glandular layers of female uterus. Mention one function of each.

OR

18(b)(i). Why are STI (Sexually Transmitted Infections) not detected in time? (2 pts.)

OR

18(b)(ii). Write two complications caused in later stages.

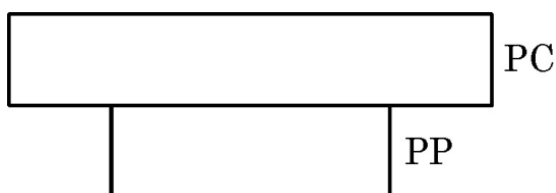
19(a). Write the importance of following in biotechnology:

Ori (Origin of Replication)

19(b). Write the importance of following in biotechnology:

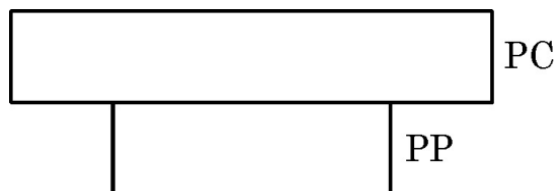
Enzyme Polymerase used in Polymerase Chain Reaction

20(a)(i). Given below is a pyramid found in an ecosystem, where each bar represents the standing crop available in the trophic level.



Identify the kind of pyramid and with the help of an example explain the conditions where this kind of pyramid is possible in nature.

20(a)(ii). Given below is a pyramid found in an ecosystem, where each bar represents the standing crop available in the trophic level.



Write any two limitations of ecological pyramids.

OR

20(b)(i). In an ecosystem there was loss of biodiversity due to some project in that area.

How will biodiversity be affected? (2 points)

OR

20(b)(ii). In an ecosystem there was loss of biodiversity due to some project in that area.

List two major causes of loss of biodiversity.

21(a). Analyse the following two cases of sex determination in different organisms:

Case I: Males have (XO) sex chromosomes and females have two copies of same sex chromosome (XX).

Case II: Females have two different sex chromosomes (ZW) and males have two copies of same sex chromosome (ZZ).

Identify the type of heterogamety in each case, giving one example of each.

OR

21(b)(i). Differentiate between a DNA and RNA nucleotide.

OR

21(b)(ii). Name the two types of bonds present within a single nucleotide.

Section C

22(a). A farmer grew two varieties of corn crop in field A and B. He grew normal corn crops in field A and GM corn crops in field B.

He observed that corn borers attacked only in field A. To control it, spores of Bt were sprayed on field A.

Name the gene in the spores responsible for control of pest.

22(b). A farmer grew two varieties of corn crop in field A and B. He grew normal corn crops in field A and GM corn crops in field B.

He observed that corn borers attacked only in field A. To control it, spores of Bt were sprayed on field A.

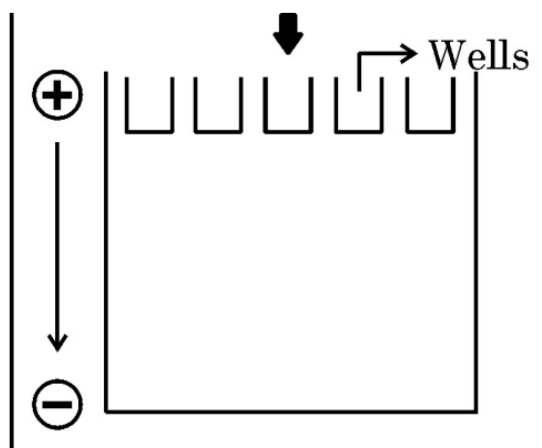
What effect will the spores of Bt have on insect pest?

22(c). A farmer grew two varieties of corn crop in field A and B. He grew normal corn crops in field A and GM corn crops in field B.

He observed that corn borers attacked only in field A. To control it, spores of Bt were sprayed on field A.

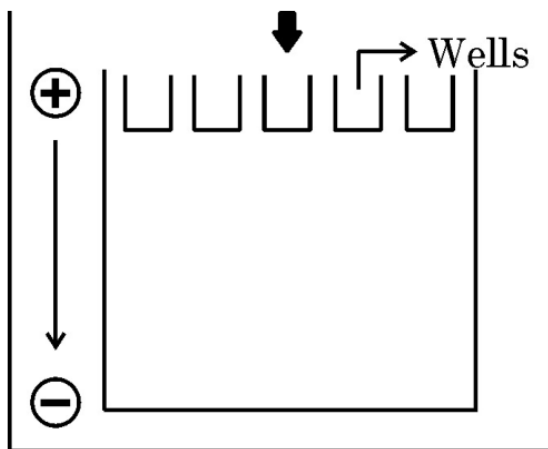
How has corn plants of field B developed resistance against this pest? Explain.

23(a). Observe the given picture carefully. A mixture of DNA with fragments ranging from 100 base pairs to 1800 base pairs were separated by electrophoresis on agarose gel with the following arrangement:

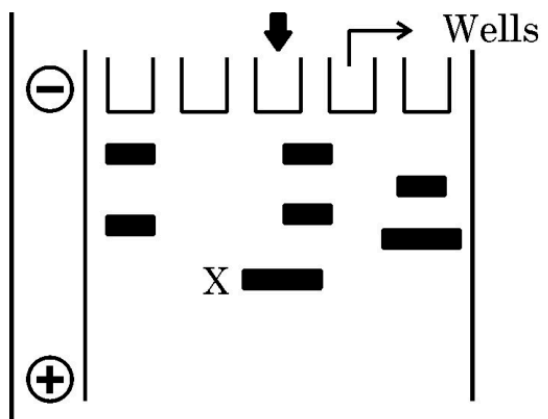


What result will be obtained in staining with ethidium bromide? Explain with reasons.

23(b). Observe the given picture carefully. A mixture of DNA with fragments ranging from 100 base pairs to 1800 base pairs were separated by electrophoresis on agarose gel with the following arrangement:



The above setup was modified as shown below and a band with 100 base pairs was obtained at X.



What changes were made to the previous design to get a band at 'X'. Why did the band appear at 'X'?

24(a). Mention the scientific name of the source plant and the part from which opioids are extracted.

24(b). How are morphine and heroin related? Mention the effect each one of them has on human body.

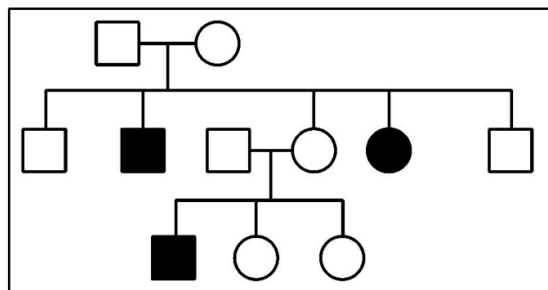
25. Give the schematic representation of oogenesis in human female. Indicate chromosome number also.

26(a). Do all pollen grains remain viable for the same length of time? Support your answer with two suitable examples.

26(b). How are pollen grains stored in pollen banks?

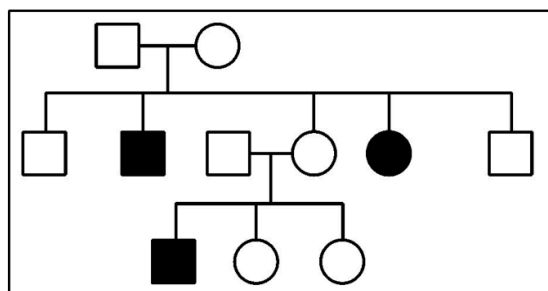
27(a). What is pedigree analysis? Mention its importance in human genetics. (2 pts.)

27(b)(i). Analyse the following pedigree and write the



Pattern of inheritance.

27(b)(ii). Analyse the following pedigree and write the



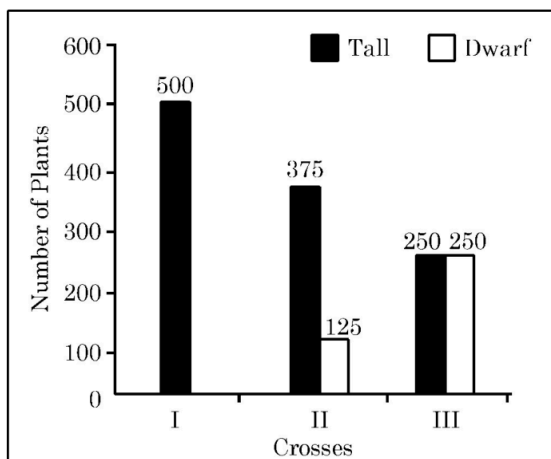
Give one example of disease showing such an inheritance pattern.

28(a). How is Hardy-Weinberg expression ($p^2 + 2pq + q^2 = 1$) derived?

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

Section D

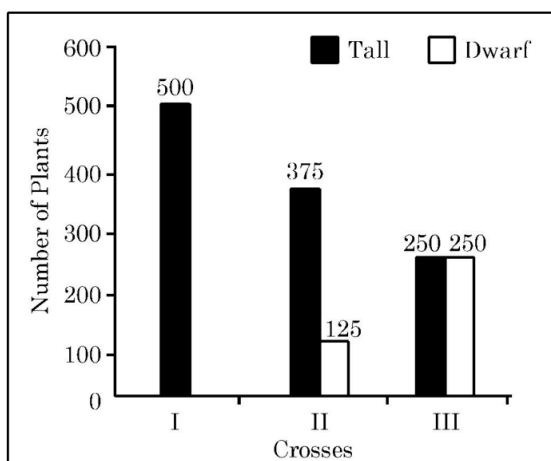
29(a). A student performed some crosses in plants and represented the result in the form of bar graphs as shown below. Each graph displays the phenotypic proportion of the progeny. Study the graphs and answer the questions:



What can you infer about the genotype of parents in crosses I and II?

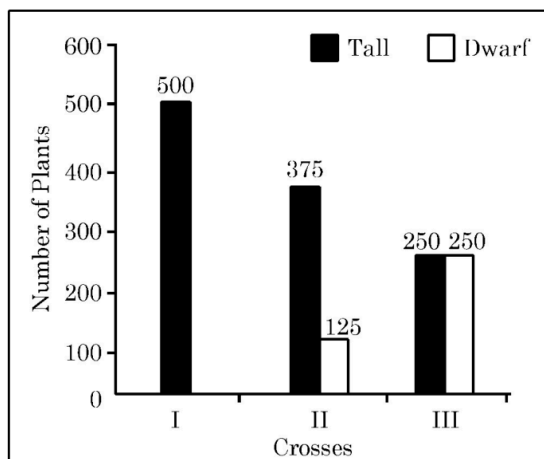
OR

29(a). A student performed some crosses in plants and represented the result in the form of bar graphs as shown below. Each graph displays the phenotypic proportion of the progeny. Study the graphs and answer the questions:



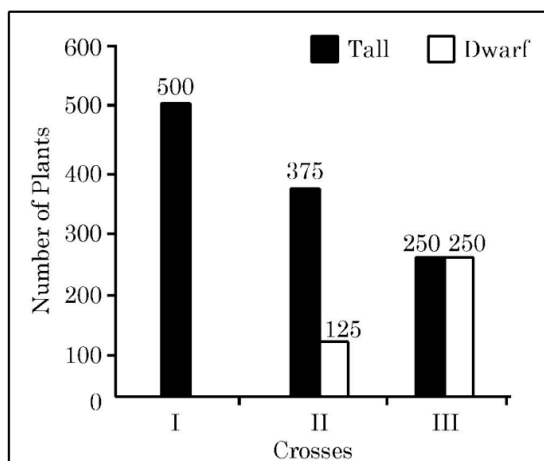
Which genetic cross is represented by these crosses?

29(b). A student performed some crosses in plants and represented the result in the form of bar graphs as shown below. Each graph displays the phenotypic proportion of the progeny. Study the graphs and answer the questions:



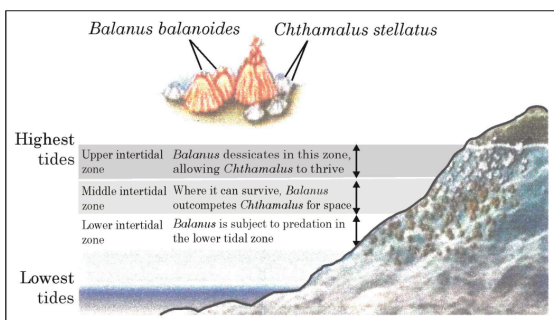
Looking at bar graph of cross III, identify the type of cross performed and its importance in genetics.

29(c). A student performed some crosses in plants and represented the result in the form of bar graphs as shown below. Each graph displays the phenotypic proportion of the progeny. Study the graphs and answer the questions:



What conclusion can you draw from the results of bar graphs of crosses I and II? Name the genetic principle illustrated.

30(a). The diagram below shows the distribution of two barnacle species, *Chthamalus* and *Balanus* on a rocky sea shore.

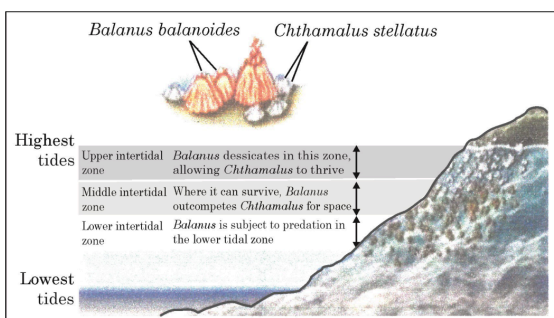


When *Balanus* is experimentally removed, *Chthamalus* expands its range in lower intertidal zone.

Identify and define the ecological phenomenon demonstrated by this observation.

OR

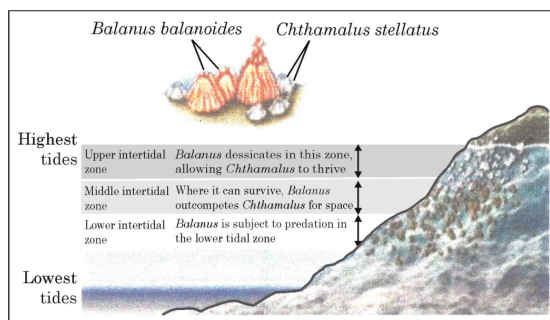
30(a). The diagram below shows the distribution of two barnacle species, *Chthamalus* and *Balanus* on a rocky sea shore.



When *Balanus* is experimentally removed, *Chthamalus* expands its range in lower intertidal zone.

State the principle that explains the elimination of one species.

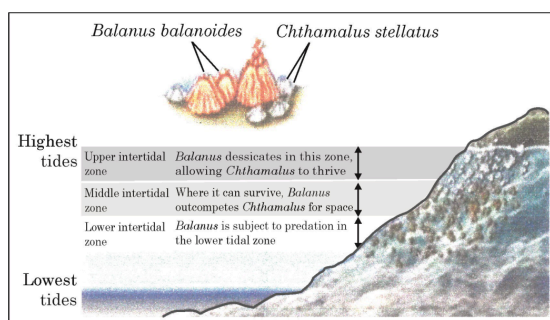
30(b). The diagram below shows the distribution of two barnacle species, *Chthamalus* and *Balanus* on a rocky sea shore.



When *Balanus* is experimentally removed, *Chthamalus* expands its range in lower intertidal zone.

Two different species can compete for the same resource. Give another example of it.

30(c). The diagram below shows the distribution of two barnacle species, *Chthamalus* and *Balanus* on a rocky sea shore.



When *Balanus* is experimentally removed, *Chthamalus* expands its range in lower intertidal zone.

How do species avoid competition in nature? Explain with an example.

Section E

31(a)(i). In angiosperms, the female gametophyte develops from a single cell of megasporangium.

Name that cell of megasporangium and describe the sequential changes it undergoes to form a mature female gametophyte.

31(a)(ii). In angiosperms, the female gametophyte develops from a single cell of megasporangium.

Draw a well labelled diagram of mature female gametophyte. Label any four parts.

OR

31(b). Given below are certain situations related to birth control. Analyse each situation carefully and suggest appropriate contraceptive method that could be used. Also explain its mode of action.

Situation 1 - To prevent entry of sperm into cervix.

Situation 2 - Devices that are inserted by doctors or expert nurses in the vagina.

Situation 3 - Effective emergency contraceptive.

Situation 4 - Permanent method for male partner.

Situation 5 - Surgical method in female to prevent pregnancy.

32(a)(i). Name the protozoan species that is responsible for causing the most serious and even fatal malarial disease.

32(a)(ii). Name the host in which the parasite completes its sexual stages and explain the changes taking place.

32(a)(iii). How does the parasite damage the human body after entering the blood stream?

32(a)(iv). Suggest two effective preventive measures to control the spread of this disease in endemic regions.

OR

32(b)(i). What are bio-fertilizers?

OR

32(b)(ii). Name the different types of microorganisms used as bio-fertilizers in organic farming and explain how each contributes to soil fertility.

OR

32(b)(iii). Write two advantages of using bio-fertilizers over chemical fertilizers.

33(a)(i). Watson and Crick's discovery of double helical structure was based on which two findings. Also mention the name of the scientists associated with these findings.

33(a)(ii). Write down the salient features of double helix structure of DNA (any three points).

OR

33(b)(i). Given below is a stretch of DNA showing the coding strand of structural gene of transcription unit.

5'- ATG ACC GTA TTT TCT GTA GTG CCC GTA
CTT CAG GCA TTA 3'

Write the corresponding template strand and mRNA strand that will be transcribed along with its polarity.

OR

33(b)(ii). Given below is a stretch of DNA showing the coding strand of structural gene of transcription unit.

5'- ATG ACC GTA TTT TCT GTA GTG CCC GTA
CTT CAG GCA TTA 3'

If GUA of transcribed mRNA is an intron, then depict the sequence involved in formation of mRNA / mature / processed hnRNA strand:

(1) In a bacterium

(2) In humans

OR

33(b)(iii). Given below is a stretch of DNA showing the coding strand of structural gene of transcription unit.

5'- ATG ACC GTA TTT TCT GTA GTG CCC GTA
CTT CAG GCA TTA 3'

How many amino acids the resulting polypeptide will have after the process of translation in humans?

- End of Question Paper -