

CBSE Class 12 Biology
Sample Paper 10 (2019-20)

Maximum Marks: 70

Time Allowed: 3 hours

General Instructions:

- i. There are a total of 27 questions and five sections in the question paper. All questions are compulsory.
- ii. Section A contains question numbers 1 to 5, multiple-choice questions of one mark each. Section B contains question numbers 6 to 12, short answer type I questions of two marks each. Section C contains question numbers 13 to 21, short answer type II questions of three marks each. Section D contains question number 22 to 24, case-based short answer type questions of three marks each. Section E contains question numbers 25 to 27, long answer type questions of five marks each.
- iii. There is no overall choice in the question paper. However, internal choices are provided in two questions of one mark, one question of two marks, two questions of three marks and all three questions of five marks. An examinee is to attempt any one of the questions out of the two given in the question paper with the same question number.

Section A

1. Which one is unpaired gland in male reproductive system
 - a. Seminal vesicle
 - b. Prostate gland
 - c. Lacrimal gland
 - d. Cowper's gland

OR

The method in which male partner withdraw penis from vagina just before the ejaculation is called

- a. Lactational amenorrhea

- b. Coitus interrupts
 - c. Periodic abstinence
 - d. Vasectomy
2. During organs transplantation, the organs cannot be taken from just anybody since the graft would be rejected sooner or later due to
- a. Passive immunity
 - b. Cell-mediated immune response
 - c. Innate immunity
 - d. Blood group

OR

Antigen binding site in an antibody is found between

- a. Either between two light chains or between one heavy and one light chain depending upon the nature of antigen
 - b. Two heavy chains
 - c. One heavy and one light chain
 - d. Two light chains
3. Gel electrophoresis is a technique to separate fragments of DNA from a mixture. Some of the events of electrophoresis are given below. Arrange the events in order.



1. Cut out DNA bands
 2. Expose to UV
 3. Force DNA to move through gel
 4. Stain DNA with ethidium bromide
- a. 4 - 3 - 1 - 2
 - b. 4 - 3 - 2 - 1
 - c. 1 - 2 - 3 - 4
 - d. 1 - 3 - 4 - 2

4. DNA is amplified by PCR as it can be used for
 - a. It requires primers
 - b. It requires dNTP's
 - c. To produce multiple copies of the fragment DNA
 - d. It requires Mg^{2+}
5. Which of the following is a major cause of reduction in gene pool?
 - a. Reproductive isolation
 - b. Genetic mutation
 - c. Breeding programmes
 - d. Genetic drift

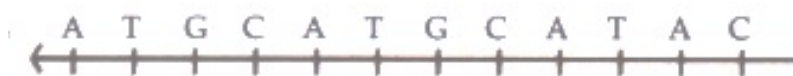
Section B

6. Explain the importance of syngamy and meiosis in the sexual life cycle of an organism.

OR

Even though each pollen grain has two male gametes, why are at least 10 pollen grains and not 5 pollen grains required to fertilize 10 ovules present in a particular carpel?

7. Mention one positive and one negative application of amniocentesis.
8. Give the salient feature of linkage theory.
9. Write the RNA strand transcribed from the given transcription unit along with its polarity.



10. How are biofortified maize and wheat considered nutritionally improved?
11. Name the source used to produce hepatitis-B vaccine using rDNA technology.
12. How is stratification represented in a forest ecosystem?

Section C

13. Name the cell that develops into the embryo sac and explain how this cell leads to the formation of embryo sac. Also, mention the role played by the various cells of the embryo sac.
14. i. Draw a schematic diagram of TS of a mature anther. Label only the layers that help in dehiscence of the anther to release pollen grains.

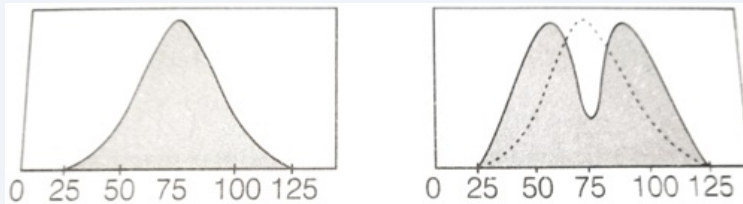
ii. Why is exine of the pollen grain, not a continuous layer?

15. A pea plant with purple flowers was crossed with white flowers producing all plants with only purple flowers. On selfing, these plants produced 482 plants with purple flowers and 162 with white flowers. What genetic mechanism accounts for these results? Explain.

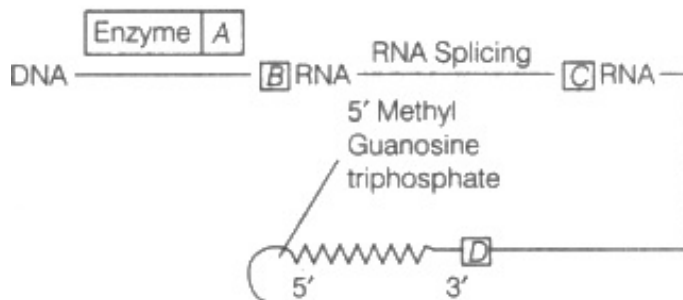
OR

In a dihybrid cross, white-eyed, yellow-bodied female *Drosophila* crossed with red-eyed, brown, bodied male *Drosophila* produced in F_2 -generation 1.3% recombinants and 98.7% progeny with parental type combinations. This observation of Morgan deviated from Mendelian F_2 -phenotypic dihybrid ratio. Explain, giving reasons for Morgan's observation.

16. Refer the graph and answer the questions that follow:



- i. The graph depicts which type of natural selection?
ii. Explain the other two effects/types of natural selection.
17. Given below is a sequence of steps of transcription in a eukaryotic cell. Answer the following questions:

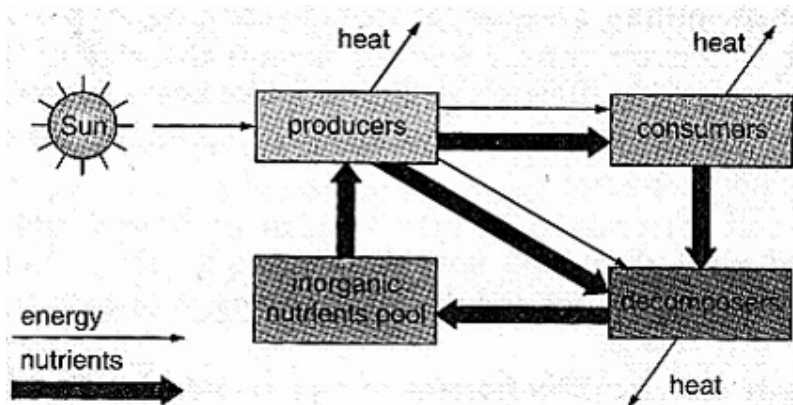


- i. Fill up the blanks (A, B, C and D) left in the sequence.
ii. Why hnRNA is required to undergo splicing?
18. Explain the process of emasculation and bagging of flowers. State their importance in breeding experiments.
19. How did Eli Lilly company go about preparing human insulin? How is the insulin thus, produced different from that produced by the functional human insulin gene?
20. Biodiversity must be conserved as it plays an important role in many ecosystem

services that nature provides. Explain any two services of the ecosystem.

OR

Study the following diagram, and answer these questions:



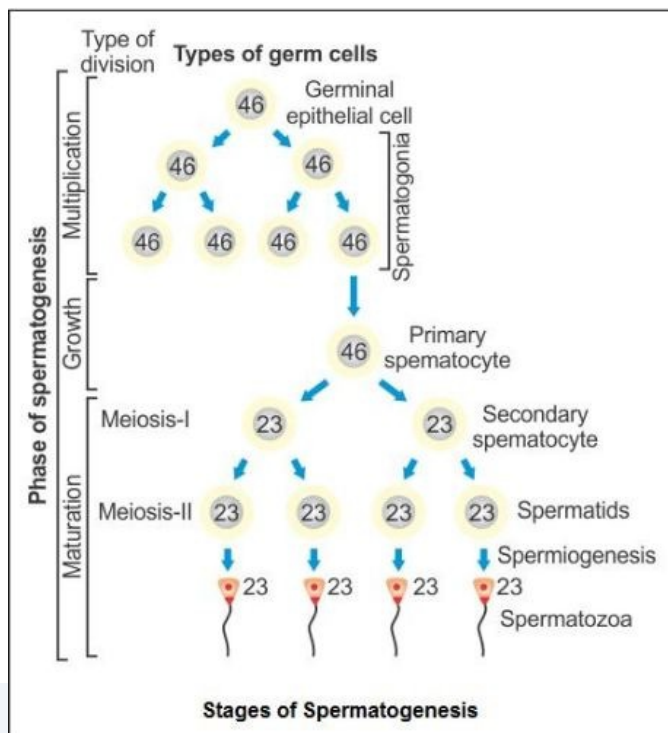
- i. Why does a wide arrow point from both producers and consumers to decomposers?
- ii. Why does a wide arrow point only from the inorganic nutrient pool to producers?
- iii. Why don't the wavy arrows point from decomposers to producers?

21. Explain the following terms:

- i. Recombinant DNA
- ii. Transgenics
- iii. Cloning vectors
- iv. Agrobacterium

Section D

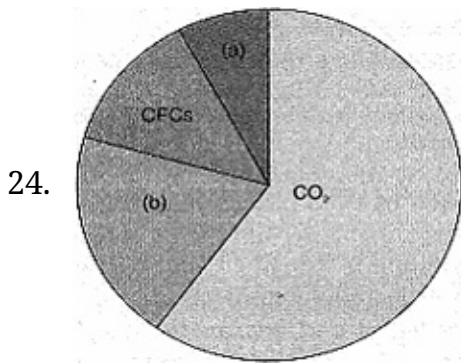
22. Observe the diagram showing the process of spermatogenesis and answer the following questions:



- i. Spermatis possess haploid chromosome number. Explain.
 - ii. On the basis of the functions mentioned below, identify each one correctly.
 - a. It helps in the movement of spermatozoan in a fluid medium.
 - b. It contains hydrolytic enzymes and is used to contact and penetrate the egg during fertilisation.
23. Observe the figure with respect to the leguminous plant and answer the following questions:



- i. Why is Rhizobium categorised as a symbiotic bacterium? How does it act as a biofertiliser?
- ii. How do plants benefit from having the mycorrhizal symbiotic association?



Observe the diagram of the relative contribution of

greenhouse gases to global warming and answer the questions which follow:

- i. Identify the gases A and C.
- ii. Why are these four gases called greenhouse gases?
- iii. What is the relationship between the greenhouse effect and global warming?

Section E

25. Give a genetic explanation for the following cross. When a tall pea plant with round seeds was crossed with a dwarf pea plant with wrinkled seeds then all the individuals of the population were tall with round seeds. However, selfing among F₁-population led to a 9 : 3 : 3 : 1 phenotypic ratio.

OR

Illustrate schematically the process of initiation, elongation and termination during transcription of a gene in a bacterium.

26. Briefly describe various steps involved in plant breeding.

OR

In your view what motivates youngsters to take to alcohol or drugs and how can this be avoided?

27. i. Why are catalytic convertors recommended for vehicles?
- ii. Why should such vehicles use only unleaded petrol?
- iii. Why is CNG preferred to diesel as a fuel in vehicles?

OR

Explain how xerarch succession progresses from xeric to mesic condition and forms a stable climax community. You may use a flow chart.

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Answer
Section A

1. (b) Prostate gland

Explanation: Only one Prostate gland is present in male reproductive gland. They release fluid medium in which sperms can move and also provide nutrition to sperms.

OR

- (b) Coitus interrupts

Explanation: The method in which male partner withdraws penis from vagina just before the ejaculation is called coitus interrupts. The meeting of ovum and sperm is avoided as sperms are not released.

2. (b) Cell-mediated immune response

Explanation: Since the body is able to differentiate self and nonself and cell-mediated immune response is responsible for graft rejection. Tissue matching and blood matching are essential before undertaking and graft or transplant.

OR

- (c) One heavy and one light chain

Explanation: The antigen-binding (Fab) fragment is a region on an antibody that binds to antigens. It is composed of one constant and one variable domain of each of the heavy and the light chain.

3. (d) 1 - 3 - 4 - 2

Explanation: 1 - 3 - 4 - 2

4. (c) To produce multiple copies of the fragment DNA

Explanation: DNA is amplified by PCR as it can be used for to produce multiples copies of fragment DNA. These copies are used to produce recombinant DNA having desired traits.

5. (d) Genetic drift

Explanation: Gene pool is the sum total of genome of different organisms of a particular species. Reduction of gene pool is mainly caused by genetic drift along with reasons like geographical isolations.

Section B

6. **Syngamy:** This is important to restore the diploid status in a sexually reproducing organism and formation of diploid zygote. Syngamy ensures continuity of species in sexually reproducing organism.

Meiosis: It is important for producing haploid gametes in sexually reproducing organism.

OR

A pollen tube carrying two male gametes, enters an ovule and releases two male gametes which fuse with two different structures in an embryo sac (the egg and two polar nuclei). Hence for fertilization of 10 ovules, 10 pollen grains are required and not 5 pollen grains.

7. Applications of amniocentesis are:

- i. **Positive application-** It can be used to diagnose any chromosomal abnormality or genetic disorder in foetus.
- ii. **Negative application-** It can be used to determine the sex of foetus and lead to female foeticide.

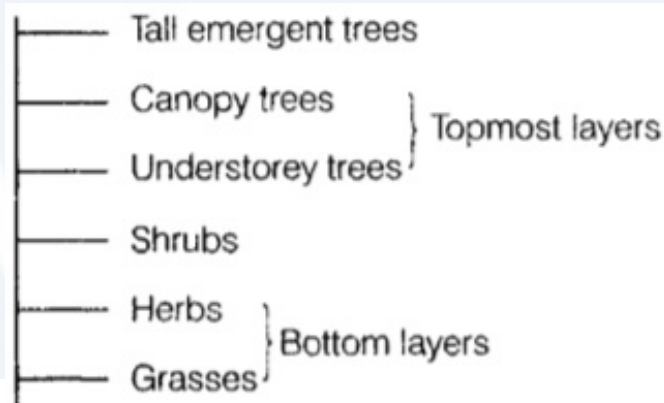
8. **Salient features of the theory of Linkage:**

- i. Genes are arranged in a linear fashion on the chromosomes.
- ii. Genes that show linkage are present on the same chromosome.
- iii. Linked genes remain in their original combination during course of inheritance.
- iv. The genes which are closely located show strong linkage while those widely separated have more chances of separation during crossing over.

9. The RNA strand transcribed from the given transcription unit along with its polarity is as follows:

3'- U-A-C-G-U-A-C-G-U-A-U-G- 5'

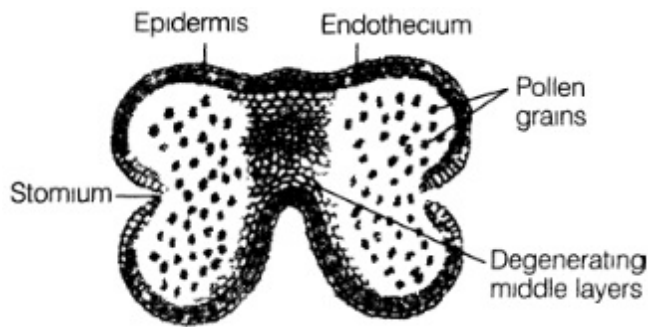
10. Biofortified maize and wheat are considered nutritionally improved, because of following reasons:
- i. Maize hybrids have twice the amount of amino acid, lysine and tryptophan as compared to existing maize hybrids.
 - ii. Atlas 66 has been used as a donor for developing wheat varieties with improved protein content.
11. Recombinant DNA technology has allowed the production of antigenic polypeptides of a pathogen in bacteria or yeast. Vaccines produced using this approach allow large scale production and hence greater availability for immunization, e.g. source of hepatitis-B vaccine is yeast.
12. The stratification, i.e the vertical distribution of species at different levels in a forest ecosystem. It can be represented as



Section C

13. Megaspore mother cell. It undergoes meiosis to form 7 celled 8-nucleate stage embryo sac. Nucleus of megaspore mother cell undergoes mitosis and two cells move to opposite poles. Two successive mitotic divisions form an 8 nucleate embryo sac cells formation takes place after nuclear divisions. Three cells group together at micropylar end, egg apparatus with an egg cell and two synergids. Three cells group at chalazal end and two nuclei move to centre. Roles of various cells:
1. Polar nuclei fuses with a male gamete to form triploid endosperm. (Triple fusion)
 2. Egg cell fuses with male gamete to form zygote.
 3. Synergids guides the pollen tube.

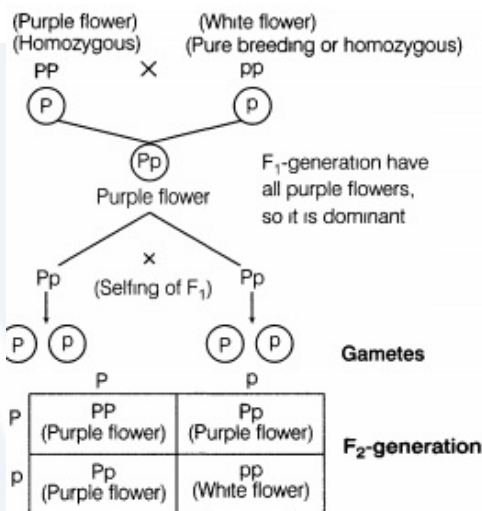
14. i.



The outer three layers (i.e., epidermis, endothecium, and middle layers) help in the dehiscence of anther.

ii. The exine is absent or very thin at regions called germ pores through which pollen tube emerges at the time of pollen grain germination on stigma.

15.



Purple flowering plants: White-flowered plants are in the ratio of 482 : 162 which is approximately equal to 3 : 1.

The genetic mechanism for these results is explained below:

OR

The results obtained were due to the phenomenon of linkage. Linkage is the phenomenon in which two or more linked genes are inherited together and their frequency of recombination in a test cross progeny is less than the expected 50%. In Morgan's experiment, the genes for eye colour and body colour show linkage and do not allow crossing over during gamete formation. Hence, parental type progeny is in a greater ratio than that of recombinants.

i. Factors segregate from each other during gamete formation that remains together

in a parent.

- ii. A homozygous parent produces all gametes that are similar, while a heterozygous parent produces two kinds of gametes in equal ratio.
16. i. The graph depicts disruptive natural selection. This type of selection tends to eliminate intermediate types.
- ii. The other two types of natural selection are
 - a. Directional selection - Large number of individuals acquire value other than mean character value.
 - b. Stabilizing selection - Large number of individuals acquire mean character value.
17. i. A - DNA polymerase, B - hnRNA, C - Spliced RNA, D - mRNA
- ii. hnRNA is required to undergo splicing because of the presence of introns in it. These need to be removed and the exons have to be joined in a specific sequence for translation to take place.

18. After evaluation and selection of the parents, artificial cross hybridisation is the next step in crop improvement programme.

If the female parent bears bisexual flowers, removal of anthers from the flower bud before the anther dehisces using a pair of forceps is called **emasculation**. The emasculated flowers are covered with a bag to prevent contamination of its stigma with unwanted pollen, is called **bagging**. When the stigma of flowers attains receptivity, the mature pollen grains of the male plant are dusted on the stigma and flowers are rebagged and the fruits allowed to develop.

There is no need of emasculating the female plant producing unisexual flowers.

19. Steps involved in insulin production by the Eli Lilly company are as follows.

- i. DNA sequences corresponding to the two polypeptide, A and B-chains of insulin were synthesized in vitro.
- ii. They were introduced into the plasmid DNA of E. coli.
- iii. This bacterium was cloned under suitable conditions.
- iv. The transgene was expressed in the form of polypeptides A and B, secreted into the medium.
- v. They were extracted and combined by creating a disulfide bridge to form human insulin.

20. (1) Ecosystem provides direct economic benefits to humans in the form of food like cereals, pulses, nuts and fruits. We also get many other products of commercial importance such as timber, fibres, firewood, construction material, industrial products like tannins, lubricants, dyes, resins, perfumes and products of medicinal importance.

(2) Forests act as 'carbon sink' and producers of huge amount of oxygen. The fast dwindling Amazon forest is producing 20 percent of the total oxygen, without which we cannot live for a moment. Thus forest ecosystem plays a crucial role in maintaining carbon-oxygen balance in nature. This keeps check on pollution and global warming.

OR

- i. When both producers and consumers die, they are decomposed by the decomposers.
 - ii. Only producers use simple inorganic nutrients to make complex organic molecules through the process of photosynthesis.
 - iii. Energy flow is unidirectional. It does not follow the cyclic path.
21. i. **Recombinant DNA:** The plasmid DNA containing foreign DNA is called recombinant DNA. It is inserted into the host cell during genetic engineering.
- ii. **Transgenics:** Any organism may be bacteria, plant or animal containing a foreign gene segment of DNA from a different species is a transgenic organism.
- iii. **Cloning vector:** Vectors carrying recombinant DNA (rDNA) divide and help in producing several copies of r-DNA, it is termed as a cloning vector.
- iv. **Agrobacterium:** A pathogenic bacterium which can transfer part of plasmid DNA during its infection into the host plant.

Section D

22. i. Spermatids are produced by meiosis during spermatogenesis. Thus, they possess haploid number of chromosomes.
- ii. a. Sperm tail
 - b. Acrosome
23. i. Rhizobium lives in the root nodules of leguminous plants and fixes the atmospheric nitrogen in the soil as nitrogenous compounds that can be utilised by the plants as nutrients. Since, both are mutually benefitted, it is called symbiotic

bacterium.

- ii.
 - The fungus absorbs phosphorus from the soil and passes it to the plant.
 - Plants with mycorrhiza show resistance to root-borne pathogens.
 - They show increased tolerance to salinity and drought.
 - These show an overall increase in plant growth and development.

24. i.

a. Nitrous oxide (N_2O)

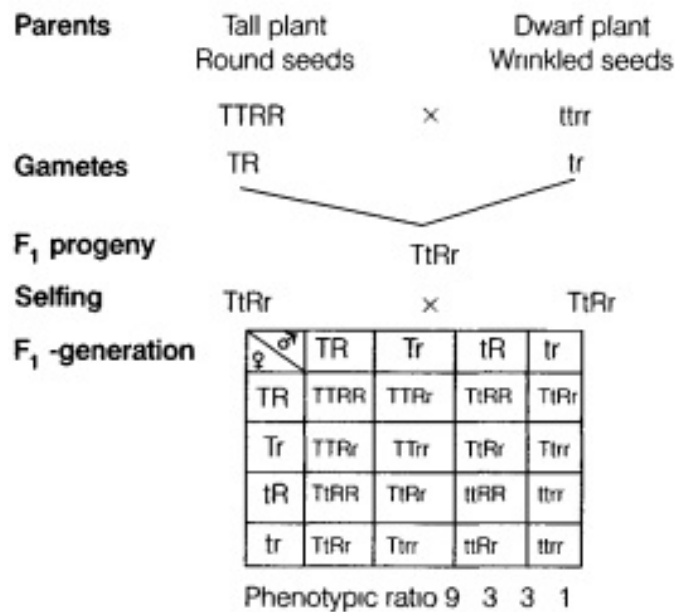
b. Methane (CH_4)

ii. These four gases (i.e. CO_2 , CH_4 , N_2O and CFCs) are called greenhouse gases, as they absorb infrared radiations emitted by the earth's surface. Greenhouse gases cause global warming (increase in the earth's temperature), which causes melting of ice caps.

iii. Global warming refers to a gradual increase in global surface temperatures and the temperature of the Earth's atmosphere. Global warming is associated with the greenhouse effect that is produced when the Earth's surface and atmosphere absorb solar energy and reradiates the energy back into space.

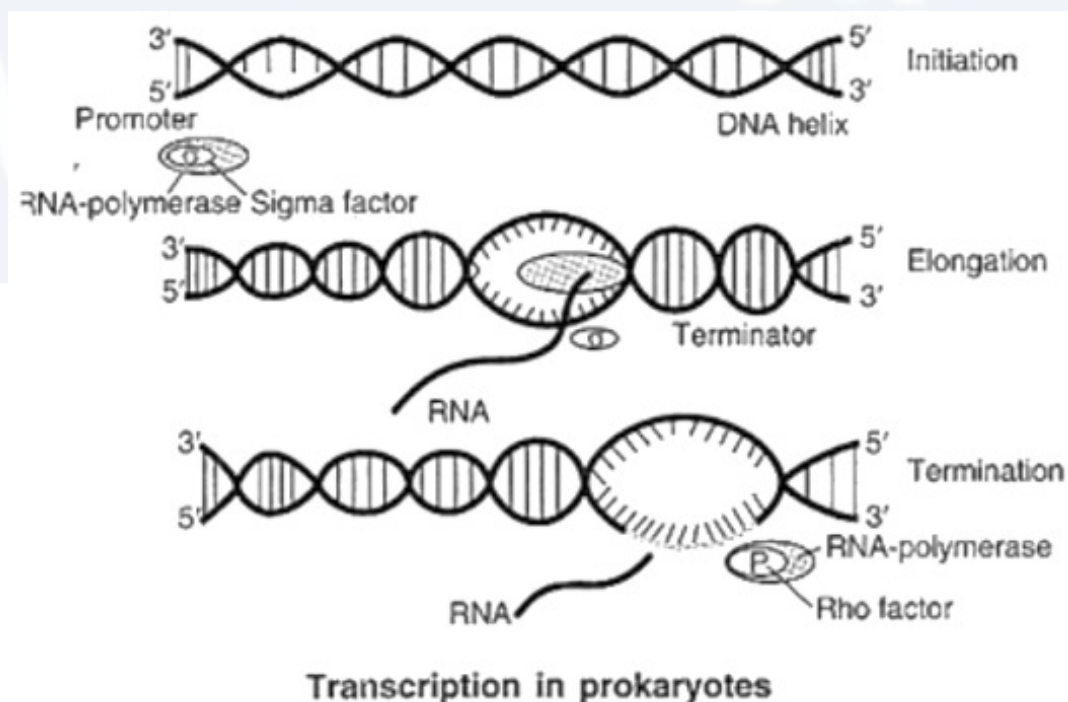
Section E

25. The cross given in the question is a dihybrid cross, which explains the third law of Mendel, i.e law of independent assortment. This was based on the results of dihybrid crosses, where inheritance of two traits was considered simultaneously. This law states that when two pairs of traits are combined in a hybrid, segregation of one pair of character is independent of the other pair of characters at the time of gamete formation. It also gets randomly rearranged in the offsprings producing both parental and new combinations of characters



This ratio was obtained because the factors of the height of the plant and those for the shape of seeds have segregated independently and each gamete has one factor for each of these two traits.

OR



26. Steps in plant breeding:

(i) Collection of variability: Collection and preservation of all the different wild varieties, species and relatives of the cultivated species is a prerequisite for effective exploitation of natural genes available

in the populations.

The entire collection (of plants/seeds) having all the diverse alleles for all genes in a given crop is called germplasm collection.

(ii) Evaluation and selection of parents: The germplasm is evaluated so as to identify plants with desirable combination of characters.

The selected plants are multiplied and used in the process of hybridization. Pure lines are created wherever desirable and possible.

(iii) Cross hybridization among the selected parents: The desired characters have very often to be combined from two different plants (parents), for example high protein quality of one parent may need to be combined with disease resistance from another parent.

This is possible by cross hybridizing the two parents to produce hybrids that genetically combine the desired characters in one plant.

(iv) Selection and testing of superior recombinants: This step consists of selecting, among the progeny of the hybrids, those plants that have the desired character combination. The selection process is crucial to the success of the breeding objective and requires careful scientific evaluation of the progeny. This step yields plants that are superior to both of the parents (very often more than one superior progeny plant may become available). These are self pollinated for several generations till they reach a state of uniformity (homozygosity), so that the characters will not segregate in the progeny.

(v) Testing, release and commercialization of new cultivars: The newly selected lines are evaluated for their yield and other agronomic traits of quality, disease resistance, etc.

This evaluation is done by growing these in the research fields and recording their performance under ideal fertilizer application irrigation, and other crop management practices.

The evaluation in research fields is followed by testing the materials in farmers' fields, for at least three growing seasons at several locations in the country, representing all the agroclimatic zones where the crop is usually grown. The material is evaluated in comparison to the best available local crop cultivar - a check or reference cultivar.

OR

There are many factors which motivate youngsters to take to alcohol or drugs such as All the victims of alcohol/drug abuse are sick persons. They need the attention of family members and friends to give up the habit. This is possible under proper medical supervision.

- i. Pleasure or for fun sake
- ii. Curiosity
- iii. Desire to do more work
- iv. The gesture of defiance to elders, partners and friends
- v. Social pressure
- vi. Feeling of independence
- vii. Liking of taste
- viii. Desire for excitement
- ix. Desire to escape from such realities of life as disappointments, frustrations and failures
- x. Unhappy married life and
- xi. Desire to offset the effect of hardships and monotonous daily life.
- xii. The physician should prescribe the habituating drugs only to a genuine person.
- xiii. Pharmacists should not sell these drugs without a physician's prescription.
- xiv. Parents should keep a watch on children and should check them from using drugs as soon as they find signs of addiction in them.
- xv. Social workers/policemen, if they find a drug abuser should inform the parents or de-addiction centre.
- xvi. The addict may have psychological problems at home, at work or with society. The help of family members, social workers and employers may be taken in this work.
- xvii. Attempts should be made to help the alcoholics achieve and maintain a high level of motivation towards abstinence.

27.

- i. The metals used in a catalytic converter are platinum, palladium, and rhodium. The catalytic converters fitted in automobiles reduce the emission of poisonous gases by converting the unburnt hydrocarbons into CO₂ and water, carbon monoxide to CO₂ and nitric oxide (NO) to nitrogen, while the exhaust is passed

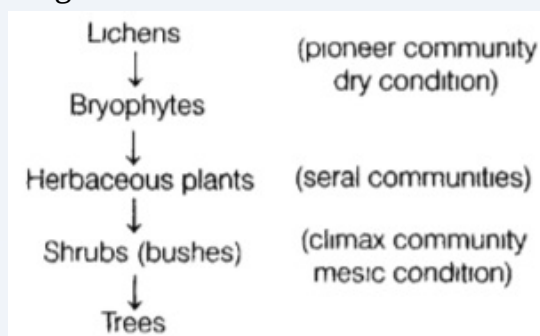
through them.

- ii. Such vehicles (with catalytic converter) should use unleaded petrol as leaded petrol inactivates the catalyst.
- iii. CNG, i.e. compressed natural gas is a better fuel than petrol or diesel, because it is cheaper, burns more efficiently, does not pollute the environment. It cannot be siphoned off by thieves. In addition to this, it cannot be adulterated like petrol and diesel.

OR

Xerarch succession occurs in dry areas and the series progresses from xeric to mesic condition. The climax community remains stable as long as environment remains unchanged. With time, the xerophytic habitat gets converted into a mesophytic one.

Stages of xerarch succession are



Primary Succession on Rocks (Xerarch succession)

- i. Lichens are the pioneer species on a bare rock.
- ii. Lichens secrete acids to dissolve rock, help in weathering and soil formation
- iii. Later, small plants like bryophytes appear, which hold a small amount of soil
- iv. Bryophytes are succeeded by bigger plants
- v. After several more stages of succession, ultimately a stable climax forest community is formed
- vi. In this way, xerophytic habitat gets converted into a mesophytic climax community. All successions whether taking place in water or on land, proceed to form a similar mesic climax community.