

CBSE Class 12 Biology
Sample Paper 06 (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.
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Section A

1. Conversion of spermatid into a spermatozoan is called
 - a. Vitellogenesis
 - b. Cytokininesis
 - c. Spermiogenesis
 - d. Semenogenesis

OR

World population day is celebrated on

- a. 11th July
- b. 11th may
- c. 21th July
- d. 14th may

2. Motile zygote of Plasmodium occurs in

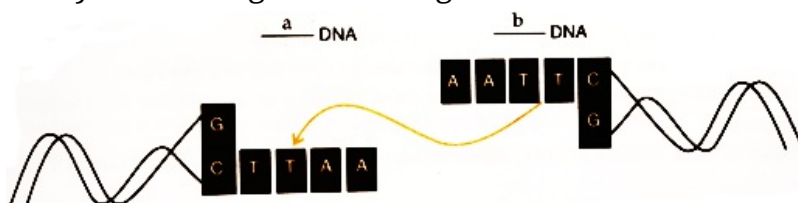
- a. Gut of female Anopheles
- b. Human RBCs
- c. Human liver
- d. Salivary glands of Anopheles

OR

An insect bite may result in inflammation of that spot. This is triggered by the alarm chemicals such as

- a. Histamine and dopamine
- b. Histamine and kinins
- c. Interferons and opsonin
- d. Interferons and histones

3. Study the linking of DNA fragments shown below and name the 'a' DNA and 'b' DNA:



- a. a - Vector DNA, b - Foreign DNA
- b. a - Foreign DNA, b - Vector DNA

-
- c. Vector DNA, b - Vector DNA
 - d. Foreign DNA, b - Foreign DNA
4. If a goi is inserted at the Bam HI site in Pbr322, the plasmid
- a. Will lose both ampicillin and tetracycline resistance
 - b. Will lose ampicillin resistance
 - c. Will not replicate
 - d. Will lose tetracycline resistance
5. If all the members of a host species die then all its unique parasites also die off, representing:
- a. biological control
 - b. extinction
 - c. conservation
 - d. co-extinction

Section B

6. a. State the difference between meiocyte and gamete with respect to chromosome number.
- b. Why is a whiptail lizard referred to as parthenogenetic?

OR

Mention the reason for difference in ploidy of zygote and primary endosperm nucleus in an angiosperm.

7. Males in whom testes fail to descend to the scrotum are generally infertile. Why?
8. State the law of independent assortment.
9. Examine the diagram of mRNA given below. Mark the 5' and 3' ends of the mRNA by giving reasons.



10. Give some examples of crop plants produced as a result of induced mutation/mutation breeding.
11. Why is the introduction of genetically engineered lymphocytes into a ADA deficiency patient not a permanent cure? Suggest a possible permanent cure.
12. Explain pyramid of numbers with the help of an example.

Section C

13. Draw L.S. of an embryo of grass and label its parts.

14. Define the terms

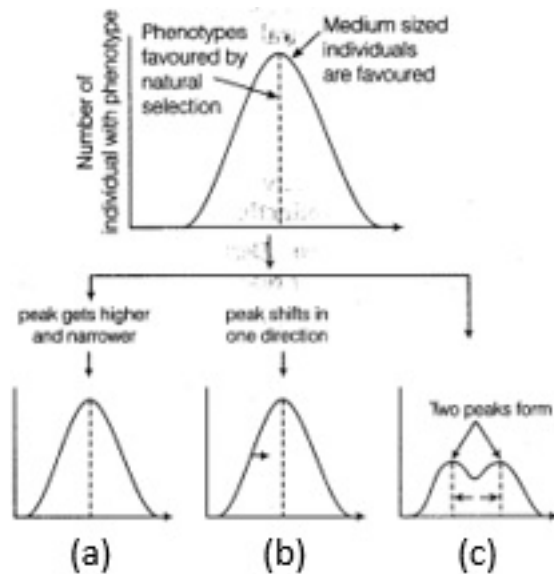
- i. Porogamy
- ii. Chalazogamy
- iii. Mesogamy
- iv. Triple fusion
- v. Siphonogamy.

15. Work out a cross between true-breeding red and white flowered dog flower plants (snapdragon) up to F_2 progeny. Explain the results of F_1 and F_2 -generation.

OR

Linkage and crossing over of genes are alternatives of each other. Justify with the help of an example.

16. Observe the diagram given below for the operation of natural selection on different traits and answer the following questions:

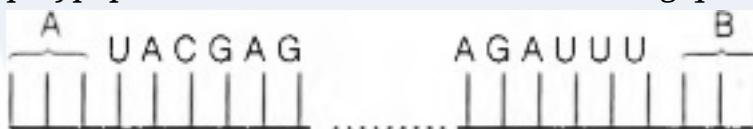


i. Name A, B, and C mentioned in the above diagram.

ii. Give one example of directional selection.

iii. Write the name of factors affecting the Hardy-Weinberg Equilibrium.

17. Study the mRNA segment given below, which is complete and to be translated into a polypeptide chain and answer the following questions:



i. Write codons 'A' and 'B'.

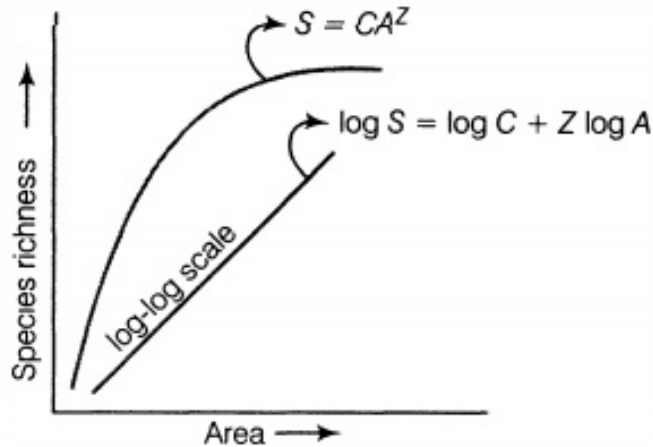
ii. What do they code for?

iii. How is the peptide bond formed between two amino acids in the ribosome?

18. Give the sequence of events followed in **Multiple Ovulation Embryo Transfer Technology Programme** for increasing the herd size in cattle.

19. How is a transgenic tobacco plant made resistant to nematode using biotechnology?

20. i. Explain the species-area relationship using the graphical representation given below.



- ii. Explain giving reasons why there is greater biodiversity in tropical regions of the earth.

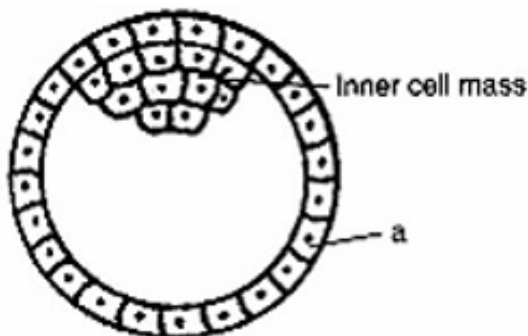
OR

Where are the main centres of biodiversity in Western Ghats? Mention two significance of conservation of biodiversity.

21. i. A recombinant vector with a gene of interest inserted within the gene of α -galactosidase enzyme, is introduced into a bacterium. Explain the method that would help in selection of recombinant colonies from non-recombinant ones.
 ii. Why is this method of selection referred to as insertional inactivation?

Section D

22. Study the below figure and answer the question that follows:



- i. Identify 'a' and which part of the placenta is formed by 'a'?
 ii. Mention the fate of the inner cell mass after implantation in the uterus.
 iii. Where are the stem cells located in this embryo?
23. Observe the following picture of the biogas plant and answer the following questions:



- i. Why are biogas plants mainly located in rural areas?
- ii. Which microbes are employed to produce biogas?
- iii. Who developed the technology of biogas production in India?

24. Observe the picture that depicts the air pollution in Delhi and answer the questions that follow:



- i. A decade back, the enormous vehicular traffic in Delhi had made Delhi rank 4th among polluted cities of the world. Two measures are taken by the Delhi Govt. brought marked improvement in air quality by 2005. What were these two measures and how did they reduce air pollution?
- ii. What is the norm set by Euro II for petrol and diesel vehicles?
- iii. Define PPM.

Section E

25. A particular garden pea plant produces only violet flowers.

- i. Is it homogenous dominant for the trait or heterozygous?

ii. How would you ensure its genotype? Explain with the help of crosses.

OR

i. Draw a schematic representation of the structure of a transcription unit and show the following in it

- a. The direction in which the transcription occurs
- b. The polarity of the two strands involved
- c. Template strand
- d. Terminator gene

ii. Mention the function of promoter gene in transcription.

26. i. State the objective of animal breeding.

ii. List the importance and limitations of inbreeding. How can the limitations be overcome?

iii. Give an example of a new breed each of cattle and poultry.

OR

- a. Does the person suffering from typhoid is able to spread this disease?
- b. How is pneumonia transmitted from infected person to healthy person?
- c. Why is DPT called triple antigen?
- d. Why is tetanus also called lockjaw disease?
- e. For which disease Mantoux test is employed for its diagnosis?

27. Explain, biomagnification of DDT in an aquatic food chain. How does it affect the bird population?

OR

i. With suitable examples, explain the energy flow through different trophic levels. What does each bar in this pyramid represent?

ii. Write any two limitations of ecological pyramids.

12 Biology Sample Paper 06
Class 12 - Biology

Solution

Section A

1. (c) Spermiogenesis

Explanation: Each spermatid undergoes metamorphosis to develop into spermatozoa or sperms having head, neck and tail. Acrosome is present at the tip of head that contain enzyme for hydrolysis of wall of ovum during fertilisation.

OR

- (a) 11th July

Explanation: World population day is celebrated on 11th July every year world over to create awareness about the ill effect of unchecked population explosion.

2. (a) Gut of female Anopheles

Explanation: Plasmodium completes their life cycle in two hosts, female anopheles and human beings. The motile zygote of plasmodium occurs in gut of female anopheles, which get transferred to human being during mosquito bite.

OR

- (b) Histamine and kinins

Explanation: Inflammation at the spot of insect bit is result of chemical released by the body such as histamine and kinins in response to chemical released by insect in the body.

Histamine is a chemical present in many cells of the body especially in mast cells in connective tissue, circulating basophils and blood platelets. Histamine is released in direct response to the injury of cells that contain it and by complement system.

Kinins are another group of substances that cause vasodilation and increase the permeability of blood vessels. Kinins are present in blood plasma.

3. (a) a - Vector DNA, b - Foreign DNA

Explanation: a - Vector DNA, b - Foreign DNA

4. (d) Will lose tetracycline resistance

Explanation: If the gene of interest (goi) is inserted at the Bam HI site in the PBr322, the plasmid will lose tetracycline resistance which is necessary for successful hybridization of vector gene and foreign gene.

5. (d) co-extinction

Explanation: Coextinction and co-threatened refer to the phenomena of the loss or decline of a host species resulting in the loss or endangerment of other species that depend on it, potentially leading to cascading effects across trophic levels.

Section B

6. a. The meiocytes are the germ mother cells which have a diploid number of chromosomes (two-sets), undergo meiosis to form gametes (germ cells) which possess haploid (single sets) number of chromosomes.
- b. Whiptail lizard is referred to as parthenogenetic because it develops from an egg (female gamete) without the process of fertilization.

OR

Zygote is developed as a result of syngamy between male gamete and egg cell since male gamete and egg cell both are haploid, diploid zygote is formed.

- Primary endosperm nucleus is formed by triple fusion between secondary nucleus ($n + n$) and male gamete (n) so triploid endosperm is formed.

7. If the testes fail to descend to the scrotum, gametogenesis could be inhibited, the process of spermatogenesis requires a marginally lesser ambient temperature than that in the abdominal cavity.
8. This principle states that if we consider the inheritance of two or more genes, their distribution in the gametes is independent of each other.
9. The presence of adenine bases from the poly-A tail which denotes the 3' end of the mRNA.

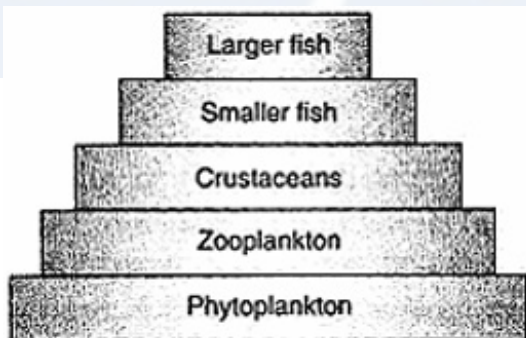


10. Some examples of induced mutations are as follows:

- i. Mung bean resistance to yellow mosaic virus and powdery mildew
 - ii. Groundnut var. Carolina.
 - iii. Sharbati Sonora from Sonora-64, Mexican wheat.
 - iv. Pusa Lerma from Lerma Rojo 64, a Mexican Wheat.
 - v. Alomita-2 from Pelita-I rice lines in Indonesia-resistant to brown planthopper.
11. These genetically engineered lymphocytes are not immortal, the patient requires periodic infusion of such genetically engineered lymphocytes.

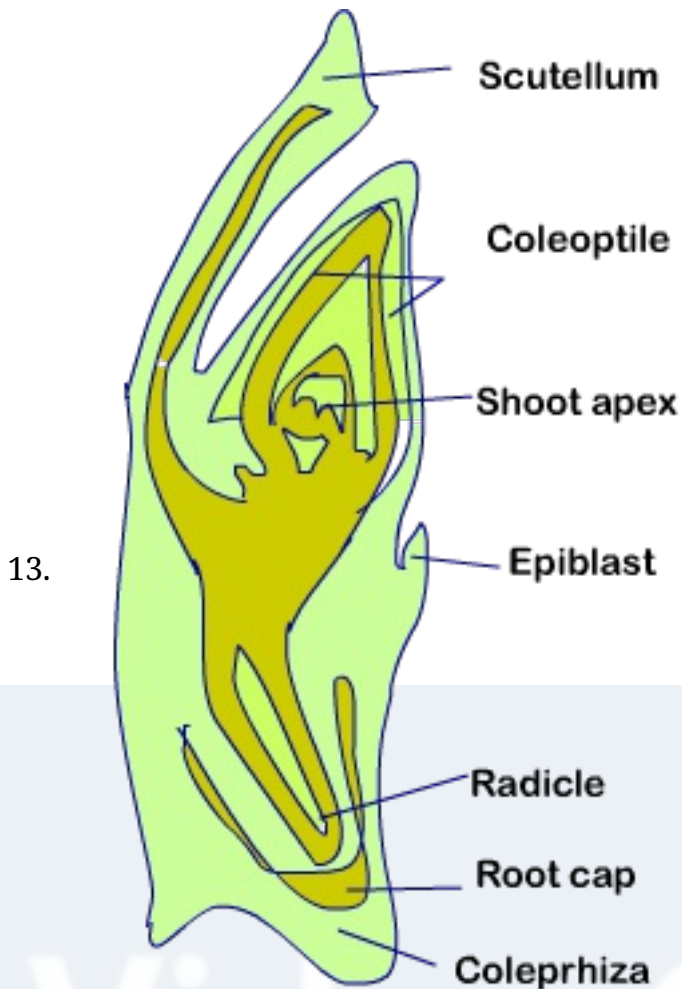
If the gene isolate from marrow cells producing ADA is introduced into cells at early embryonic stages, it could be a permanent cure.

12. **Pyramid of numbers:** It is a graphical representation of the number of individuals present at each trophic level in a food chain of an ecosystem. The pyramid of numbers can be upright or inverted depending on the number of producers. For example, in a grassland ecosystem, the pyramid of numbers is upright. In this type of a food chain, the number of producers (plants) is followed by the number of herbivores (mice), which in turn is followed by the number of secondary consumers (snakes) and tertiary carnivores (eagles). Hence, the number of individuals at the producer level will be the maximum, while the number of individuals present at the top carnivores will be least.



It is a graphic presentation of the aquatic food chain in terms of numbers of producers and consumers at each level.

Section C



Embryo in Monocot Seed

14. i. Porogamy: It is the phenomenon of the entry of the pollen tube into the ovule through micropile.
ii. Chalazogamy: It is the phenomenon of the entry of the pollen-tube in the ovule through the chalazal end.
iii. Mesogamy: It is the phenomenon in which the pollen tube enters the ovule through the integuments.
iv. Triple fusion: It involves the fusion of a diploid secondary nucleus (formed by the fusion of two polar nuclei)with one of the two male gametes to form triploid primary endosperm nucleus.
v. Siphonogamy: It is a type of fertilisation in angiosperms in which the male gametes are brought near the egg with the help of pollen tube.
15. In F_1 -generation -Pink flowered plants obtained. It is due to incomplete dominance.

In F₂-generation -Alleles of the hybrid (F₁) segregate during gamete formation and the parental characters reappear without any change. So, the phenotypic and genotypic ratios of F₂-generation are the same.

RR : Rr : rr

1 : 2 : 1

OR

Linkage is the tendency of certain loci or alleles (genes) to be inherited together while crossing over is the segregation of genes. For example, the genes on a chromosome either follow the linkage path or crossing over to form the gametes during gametogenesis in human. Therefore, linkage and crossing over of genes are alternatives of each other.

16. i. (a) - Stabilizing, (b) - Directional and (c) - Disruptive selection.
ii. Peppered moths.
iii. Following are the factors affecting the Hardy-Weinberg Equilibrium
- Gene migration or gene flow
 - Genetic drift
 - Mutation
 - Genetic recombination
 - Natural selection
17. i. A-AUG, B-UAA/UAG/UGA
ii. AUG codes for methionine. UAA/UAG/UGA does not code for any amino acid, but brings about termination of polypeptide synthesis.
iii. In the large subunit of ribosome, there are two sites in which subsequent amino acids bind to and come close enough for the formation of peptide bond. It is catalysed by the enzyme called peptidyl transferase.
18. The sequence of events in MOET, are as follow:
- A cow is administered FSH hormone to induce follicular maturation and superovulation i.e., production of 6 - 8 ova in one cycle,
 - The cow mated with the selected superior bull or artificially inseminated.
 - The fertilised eggs at 8 - 32 celled stages are recovered and transferred to the

surrogate mothers.

iv. High milk yielding breeds of females and high-quality meat-yielding bulls have been bred successfully to increase the herd size in a short time.

19. RNAi takes place in all eukaryotic organisms as a method of cellular defence. This method involves silencing of a specific mRNA due to a complementary dsRNA molecule that binds to and prevents translation of the mRNA.

Using *Agrobacterium* vectors, nematode-specific genes were introduced into the host plant. The introduction of DNA was such that it produces both sense and anti-sense RNA in the host cells. These two RNAs being complementary to each other formed a double-stranded RNA that initiated RNAi and thus silences the specific mRNA of the nematode. As a consequence the parasite could not survive in a transgenic host expressing specific interfering RNA.

20. i. Alexander von Humboldt studied species-area relationship. He observed that within a region, the species richness increased with increasing the area up to a certain limit.
- ii. Ecologists have discovered that the value of Z lies in the range of 0.1-0.2 regardless of taxonomic group or region. When species-area the relationship is considered for a large area like a whole continent, regression coefficient Z or slope of the line becomes steeper with Z -values in the range of 0.6-1.2. For example, for fruit-eating birds and mammals in tropical forests of a different continent, the slope is found to be 1.15.

OR

Main centres of biodiversity in Western Ghats are:

- Agasthyamali hills, Silent Valley
- Amambalam Reserve.

Significance of biodiversity conservation

(i) Conservation of biodiversity helps to prevent many species from becoming extinct. Conserved species can be used to restore degraded land, restock depleted populations and reintroduce species into wild to maintain healthy ecological balance.

(ii) It provides breeders and genetic engineers with a ready source of genetic material. This aids in research and cross-breeding program to produce new varieties of species or to fight against diseases.

21. i. The insertion of recombinant DNA within the coding sequence of enzyme α -galactosidase results in the inactivation of the enzyme called insertional inactivation. The colonies do not produce a blue colour in the presence of chromogenic substrate and are identified as recombinant colonies whereas non-recombinant colonies produce blue colour from the chromogenic substrate, due to the presence of the activated enzyme.
- ii. The method is referred as "insertional inactivation" because the enzyme α -galactosidase produced is inactivated due to insertion of alien DNA within the coding sequence of the enzyme, which acts as a selectable marker to differentiate recombinant colonies from non-recombinant one.

Section D

22. i. 'a' is Trophoblast. It forms chorionic villi and foetal part of the placenta.
- ii. It gets differentiated into ectoderm and endoderm.
- iii. In the inner cell mass.
23. i. Because the cattle dung is available in plenty in the rural areas that's why biogas plants mainly located in rural areas.
- ii. Methanogens.
- iii. Khadi and Village Industries Commission (KVIC) and Indian Agricultural Research Institute (IARI) developed the technology of biogas production in India.
24. i. The two measures against air pollution are:
- a. Switching over the entire fleet of public transport (buses) from diesel to compressed natural gas (CNG). CNG burns most efficiently and very little of it is left unburnt and hence reduction in pollution.
- b. **Phasing out of old vehicles:** Phasing out of old vehicles and application of stringent pollution level norms for vehicles reduced vehicular pollution as the old vehicles are not efficient in the burning of fuel and liberated smoke and unburnt components.
- ii. The **EURO-II norms** emphasis to control the use of sulphur at 350 ppm in diesel but 150 ppm in petrol oil. The aromatic HC's due to be controlled at 42% in the fuel.

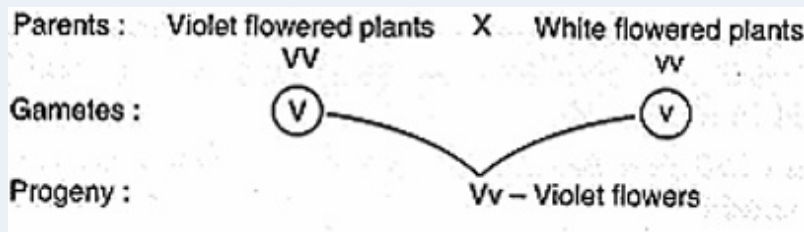
Further engines in vehicles must be upgraded and all vehicles and automobiles would observe **Bharat Stage II** from 1st April 2004 to improve air quality in our country.

- iii. Parts per million (PPM) is a unit of measurement used when expressing a very dilute concentration level of pollutants in the air, water and other fluids.

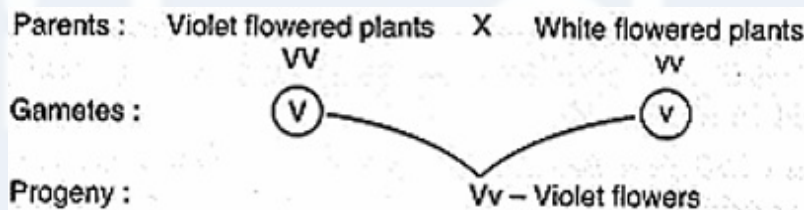
Section E

25. i. It must be homozygous dominant since it produces only violet flowers.
 ii. The plant must be crossed with a plant bearing white (recessive) flowers. If the progeny consists of plants, are producing violet flowers, the plant is homozygous dominant. (Cross 1) If the progeny contains violet flowered plants as well as white flowers plants. The given plant is heterozygous. (Cross 2)

a. Cross 1: ozygous dominant

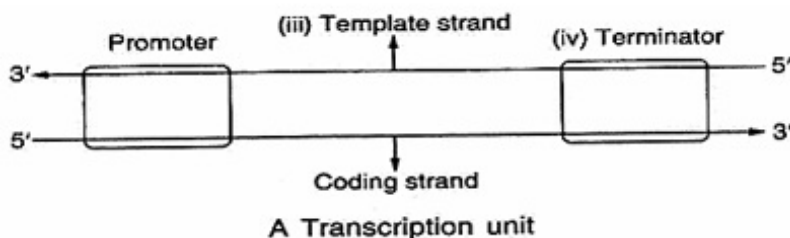


b. Cross 2: Heterozygous



OR

i.



(i) 5' → 3' for (ii), (iii) and (iv) see figure.

- ii. Promoter provides the site for the binding of RNA polymerase for transcription, it also defines the coding and template of DNA.

26. i. The main objective of animal breeding is to increase the yield of animals and

improve the desirable and superior qualities in both the animals and their products.

ii. **Importance of Inbreeding:**

- a. It increases homozygosity and evolves a pure line.
- b. Accumulation of superior genes and the elimination of less desirable genes by selection.

Limitations of Inbreeding: The continued inbreeding in animals for subsequent generations reduces their fertility and productivity, resulting in a condition called inbreeding depression.

The inbreeding depression can be overcome by a single outcross, i.e. mating between animals of the same breed have no common ancestors up to 4-6 generations.

- iii. An example, of a new breed of cattle, is Hisardale and that of poultry is New Hampshire.

OR

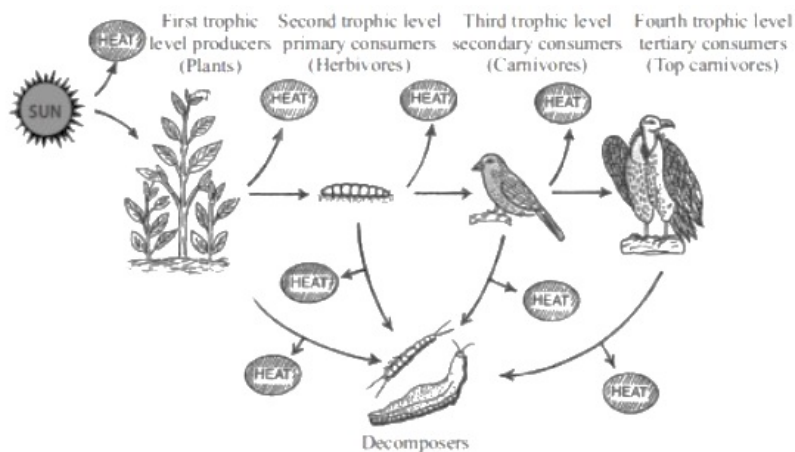
- a. Yes, the person who has recovered from typhoid is able to continue to spread the bacteria of this disease.
- b. Through air or droplets or aerosols pneumonia is transmitted from an infected person to healthy person.
- c. It provides resistance against three diseases: Diphtheria, pertussis and tetanus.
- d. Bacterial toxins cause degeneration of motor neurons and spasmodic contraction of jaw muscles so it is difficult to open the jaws, that is why tetanus is also called lockjaw disease.
- e. Mantoux test is employed for the diagnosis of Tuberculosis.

27. Biomagnification is a continuous increase in the concentration of chemicals in successive trophic levels in a food chain. For example, regular DDT sprays for a few years results in a drastic decline in the population of fish-eating birds. There was 1000 times increase in the concentration of DDT in phytoplankton as compared to water, in zooplankton as compared to phytoplankton, in different fish as compared to zooplankton and more FDT in fish-eating birds as compared to fish. Higher amounts of pesticide disturb calcium metabolism of birds resulting in thinning of eggshells and their premature breaking that kills the embryos. Thus, causing a

decline in the population.

OR

- i. The energy flows unidirectionally from the first trophic level (producers) to last trophic level (consumers) and as the energy flows from one trophic level to another, some energy is always lost as heat into the surrounding environment. So, the amount of energy flowing decreases at each successive trophic level. This can be explained with the help of a diagram of a grazing food chain.



The pyramid of energy is always upright and each bar in the pyramid indicates the amount of energy present at each trophic level in a given time or per unit area.

- ii. The limitations of ecological pyramids are
- It does not consider the same single species operating at two or more trophic levels.
 - It assumes simple food chains that do not exist in nature and do not accommodate food web.
 - Saprophytes, detritivores and decomposers are not given any place in pyramids, despite their vital role in ecosystem (any two).