

CBSE Class 12 Biology
Sample Paper 09 (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. Failure of testes to descend into scrotum is called
 - a. Archentronism
 - b. Testinolism
 - c. Cryptochidism
 - d. Copulation

OR

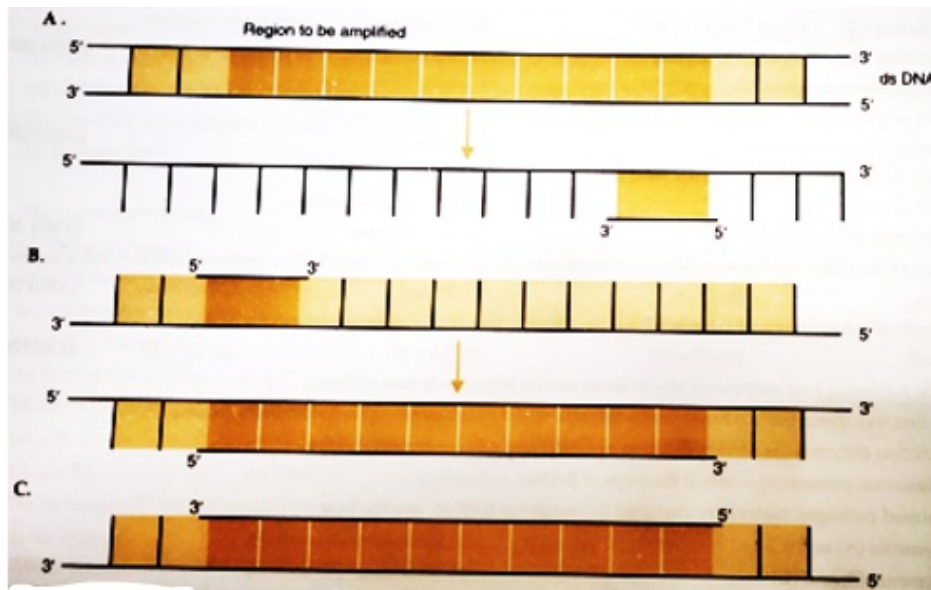
Which one is not a natural methods birth control

-
- a. Coitus interrupts
 - b. Tubectomy
 - c. To abstain
 - d. Rhythm period
2. Which of the following disease is caused by virus and transmitted by mosquito?
- a. Yellow fever
 - b. Plague
 - c. Typhus
 - d. Filariasis

OR

The primary and secondary immune response are carried out with the help of two special types of lymphocytes present in our blood called

- a. Lymphocytes and monocytes
 - b. T-lymphocytes and A-lymphocytes
 - c. B-lymphocytes and M-lymphocytes
 - d. B-lymphocytes and T-lymphocytes
3. The figure below shows three steps (A, B, C) of Polymerase Chain Reaction (PCR). Select the option giving correct identification together with what it represents?



- a. C - extension in the presence of heat stable DNA polymerase.
 - b. A - denaturation at a temperature of about 50°C.
 - c. B - denaturation at a temperature of about 98°C separating the two DNA strands.
 - d. A - annealing with two sets of primers.
4. A ladder is used in Gel electrophoresis as it helps in
 - a. It prevents the movement of DNA out of the gel
 - b. Comparing the size of the DNA fragment
 - c. it helps in denaturation of DNA
 - d. it helps in EtBr binding
 5. Rare endangered and endemic taxa can be found intact and flourishing in
 - a. Sacred grooves.
 - b. Oases
 - c. Tropical forests
 - d. Buffer zone of biosphere reserves

Section B

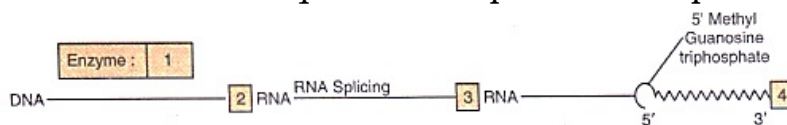
6. Mention the characteristic feature and a function of zoospore in some algae.

OR

If the chromosome number of plant species is 16, what would be the chromosome number and the ploidy level of the

- (i) microspore mother cell and
- (ii) the endosperm cells?

7. Give any four possible ill effects of contraceptives.
8. Due to chromosomal abnormalities, a male child with 47 chromosomes number was born. Name the possible genetic disorder which may be present and write two important symptoms of each.
9. Given below is a sequence of steps of transcription in a eukaryotic cell.



Fill up the blanks (1, 2, 3, 4) left in the sequence.

10. Explain what is meant by biofortification.
11. Write the functions of
- i. cry IAc gene
 - ii. RNA interference (RNAi)
12. Differentiate between a detrivore and a decomposer giving an example of each.

Section C

13. What are the advantages and disadvantages of self-pollination?
14. Describe the structure of pollen grain and the process of its germination.
15. Give any two similarities between the behaviour of genes (Mendel's factors) during inheritance and of chromosomes during cell division.

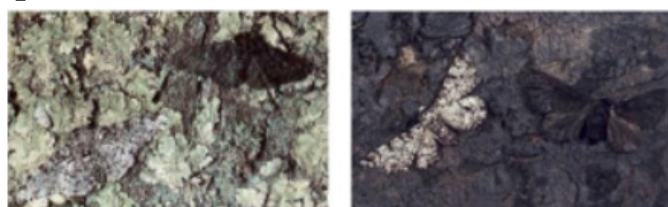
OR

A true breeding tall plant is crossed with a true breeding dwarf plant. F_1 progeny is 100% tall and F_2 has tall : dwarf in the ratio 3 : 1.

(i) Explain why F_1 shows only one type of parental phenotype.

(ii) Name the patterns of inheritance in which the ratio deviates from above. Also mention the deviated phenotypic ratio.

16. Observe the picture showing the industrial melanism and answer the following questions:

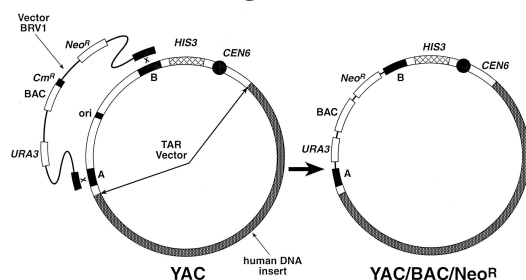


A

B

- What do these pictures A and B illustrate with reference to evolution?
- Write the scientific name of the peppered moth.
- Picture A and B is a classical example of which type of natural selection?

17. Observe the diagram for YAC and BAC vector and answer the questions that follow:



- What do 'Y' and 'B' stand for in 'YAC' and 'BAC' used in the Human Genome Project (HGP)? Mention their role in the project.
- Write the percentage of the total human genome that codes for proteins and the percentage of discovered genes whose functions are known as observed during HGP.
- Expand SNPs identified by scientists in HGP.

18. Discuss the importance of plant tissue culture in increasing food production.

19. What is transgenics?

20. Why has conservation of biodiversity become important recently?

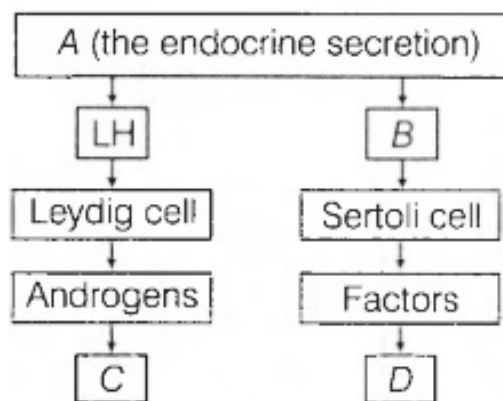
OR

Who gave the concept of hot spots? What are the major criteria for number of species conserved there?

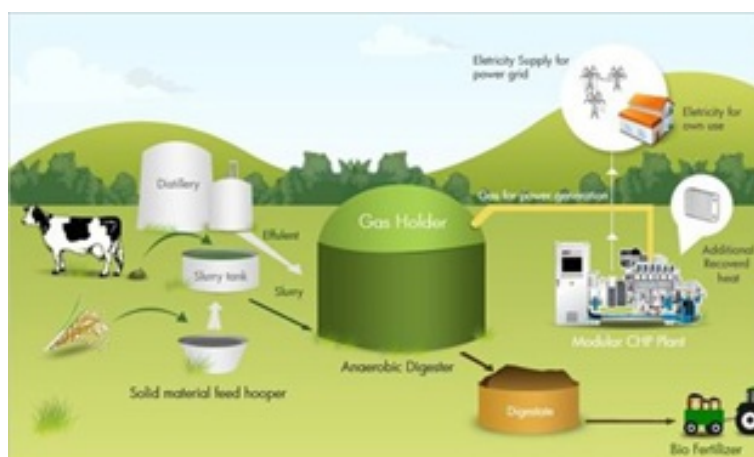
21. i. Mention the number of primers required in each cycle of Polymerase Chain Reaction (PCR). Write the role of primers and DNA polymerase in PCR.
- ii. Give the characteristic feature and source organism of the DNA polymerase used in PCR.

Section D

22. Observe the flow chart given below with reference to gametogenesis in humans and answer the following questions:

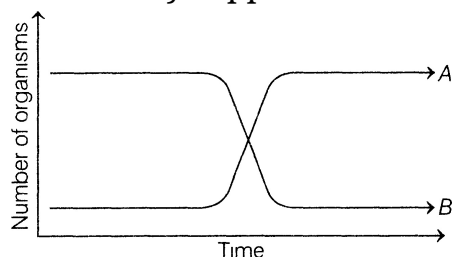


- i. Identify A, B, C and D in the above flow chart.
- ii. When and where does spermatogenesis occur in a human male?
23. Observe the following picture of the biogas plant and answer the following questions:



- 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. Two types of aquatic organisms in a lake show specific growth patterns as shown below, in a brief period of time. The lake is adjacent to an agricultural land extensively supplied with fertilisers.



Answer the questions based on the facts given above.

- i. Name the organisms depicting the patterns A and B.
- ii. State the reason for the growth pattern seen in A.
- iii. Write the effects of the growth patterns seen above.

Section E

25. a. You are given tall pea plants with yellow seeds whose genotypes are unknown. How would you find the genotype of these plants? Explain with the help of cross.
- b. Identify a, b and c in the table given below:

	Pattern of Inheritance	Monohybrid F ₁ Phenotypic expression
1	Co-dominance	a
2	b	The progeny resembled only one of the parents
3	Incomplete dominance	c

OR

Which property of DNA double helix led Watson and Crick to hypothesis semi-conservative mode of DNA replication? Explain.

26. i. What is inbreeding depression?
ii. Explain the importance of 'selection' during inbreeding in cattle.

OR

- a. Write the specific name of the genus Plasmodium that causes one of the most serious types of diseases in humans. Name the disease.
b. Describe the events in the life cycle of Plasmodium which take place in the female Anopheles.
c. Explain what happens in the RBCs of the humans when Plasmodium gains entry into them. How does the human body get affected?
27. Why does a decrease occur in BOD downstream from the point of sewage discharge?

OR

- i. Explain primary productivity and the factors that influence it.
ii. Describe, how do oxygen and chemical composition of detritus control decomposition?

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Solution
Section A

1. (c) Cryptorchidism

Explanation: Cryptorchidism is an abnormal condition in male reproductive system in which scrotum does not descend outside the abdominal condition. The males may be not able to produce fertile sperm.

OR

- (b) Tubectomy

Explanation: Tubectomy is not a natural method of birth control. In tubectomy method fallopian tube of female is cut and tied to prevent ovulation. To abstain, coitus interrupts and rhythm period is natural method of birth control.

2. (a) Yellow fever

Explanation: The Flavivirus causes yellow fever, and it's transmitted when an infected mosquito bites you. Mosquitoes become infected with the virus when they bite an infected human or monkey. The disease cannot be spread from one person to another.

OR

- (d) B-lymphocytes and T-lymphocytes

Explanation: T cells (thymus cells) and B cells (bone marrow- or bursa-derived cells) are the major cellular components of the adaptive immune response. T cells are involved in cell-mediated immunity, whereas B cells are primarily responsible for humoral immunity (relating to antibodies).

3. (c) B - denaturation at a temperature of about 98°C separating the two DNA strands.

Explanation: B - denaturation at a temperature of about 98°C separating the two DNA strands.

4. (b) Comparing the size of the DNA fragment

Explanation: A molecular-weight size marker, also referred to as a protein ladder,

DNA ladder, or RNA ladder, is a set of standards that are used to identify the approximate size of a molecule run on a gel during electrophoresis, using the principle that molecular weight is inversely proportional to migration rate through a gel matrix. Therefore, when used in gel electrophoresis, markers effectively provide a logarithmic scale by which to estimate the size of the other fragments (providing the fragment sizes of the marker are known).

5. (a) Sacred grooves.

Explanation: Sacred groves of India are forest fragments of varying sizes, which are communally protected, and which usually have a significant religious connotation for the protecting community. Hunting and logging are usually strictly prohibited within these patches.

Rare endangered and endemic taxa can be found intact and flourishing in sacred groves.

Section B

6. Zoospores are microscopic motile structures present in the aquatic algae. Three common features are shared by zoospores.

- Zoospore cells are wall-less.
- Endogenous food reserves are used for the locomotion.
- They are capable of responding to environmental signals in order to decide where to locate and where to encyst.

Functions:

- On germination give rise to new plants.
- They help in asexual reproduction.

OR

i. Microspore mother cell = 16 (Diploid)

ii. Endosperm cell = 24 (Triploid)

- 7.
- Nausea is an uneasiness of the stomach that often comes before vomiting.
 - Abdominal pain
 - Irregular menstrual bleeding

-
- Breast cancer
8. i. **Autosomal Abnormality:** Down's Syndrome: Trisomy of 21st chromosome.
- Symptoms:**
- a. Rounded face
 - b. Protruding tongue with projecting lower lip.
- ii. **Sex-Chromosomal Abnormalities:**
- a. Klinefelter's syndrome. Additional X-chromosome (44 + XXY).
- symptoms:**
- i. Mental retardation
 - ii. Female like sparse body hairs, long limbs and enlarged breasts (gynecomastia).
- b. Supermales: Additional Y-chromosome. (44 + XYY)
- Symptoms:**
- i. Abnormal height, more aggressive
 - ii. Mental retardation and criminal bent of mind.
9. 1 - RNA polymerase; 2 - hn; 3 -m; 4 - poly A tail.
10. Biofortification is the process by which the nutritional quality of food crops is improved through agronomic practices, conventional plant breeding, or modern biotechnology. Biofortification differs from conventional fortification in that biofortification aims to increase nutrient levels in crops during plant growth rather than through manual means during processing of the crops. Biofortification may therefore present a way to reach populations where supplementation and conventional fortification activities may be difficult to implement and/or limited.

Examples of biofortification projects include:

- iron-biofortification of rice, beans, sweet potato, cassava and legumes;
 - zinc-biofortification of wheat, rice, beans, sweet potato and maize;
 - provitamin a carotenoid-biofortification of sweet potato, maize and cassava; and amino acid and protein-biofortification of sorghum and cassava.
11. i. cry IAc codes for toxic insecticidal protein as inactive protoxins in *Bacillus thuringiensis*. This toxin kills the cotton bollworm.
- ii. RNA interference is associated with the silencing of specific mRNA and is a

method of cellular defense in eukaryotes.

- 12.
- Decomposers decompose substances by a chemical process while detritivores do not.
 - Detritivore is useful in making important nutrient substances.
 - Detritivore actually eat organic matter but decomposers are known to secrete enzymes for the decaying of dead organic matter.
 - Detritivore consume detritus to obtain energy.
 - Detritivore is one of the form of decomposers.
 - Decomposer breaks down substances to through a process of decomposition while detritivore consume the dead or decaying matter.
 - Most bacterias and fungi are the decomposers but detritivores are in the form of worms, crabs and many more such organisms.

Section C

13. Advantages of Self Pollination:

- i. It is a sure and economical method of pollination.
- ii. It preserves the parental characters of the race indefinitely.
- iii. Self-pollination is used to produce pure lines during hybridisation experiments.
- iv. Flowers do not spend energy to develop devices for attracting pollinators and thus does not require pollinating agencies.
- v. It ensures seed production.
- vi. The plant does not need to produce a large number of pollen grains.
- vii. Self-pollination eliminates some bad recessive characters on repeated inbreeding.
- viii. Flower does not need to produce floral rewards.

Disadvantages of Self Pollination:

- i. Variability and hence adaptability to changing environment is reduced.
- ii. Immunity to diseases decreases.
- iii. New useful characters are seldom introduced.
- iv. Vigour and vitality of the race decrease with repeated self-pollination due to inbreeding depression.
- v. Crop yield is reduced.
- vi. Pollinator does not get floral rewards and flowers need not be of brightly coloured

with fragrance thus flowers lose their aesthetic value.

14. Structure of Pollen grain:

Pollen grains are generally spherical and are about 25-50 micrometers in diameter. It has an outer layer exine and inner layer intine. Mature pollen grain contains a bigger vegetative cell and a smaller generative cell.

Germination of Pollen Grain: The process of development of pollen tube is called germination. Hydration of stigma results in elongation of tube cells into the pollen tube. Pollen tube then grows towards the ovule for further process.

15. (i) Both the chromosomes as well as genes (Mendelian factors) whether dominant or recessive are transferred from generation to generation in an unaltered form.
(ii) During S-phase each chromosome replicated to form two daughter chromatids. The two chromatids separate and pass into two daughter nuclei and cells during mitosis. Each number of allele pairs also pass similarly into daughter cells during mitosis. This maintains the similar genetic composition of all the cells of a multicellular organisms.

OR

- (i) It is due to 'Law of dominance', where allele T is dominant over allele t.
(ii) Incomplete dominance and co-dominance.

The deviated phenotypic ratio is 1 : 2 : 1

16. i. In picture A there is a melanic moth and a white-winged moth on a tree trunk in an unpolluted area that is before industrialization. In picture B there is a melanic moth and a white-winged moth on a tree trunk in a polluted area that is after industrialization.
ii. *Biston betularia*
iii. Directional or progressive selection.
17. i. Y stands for yeast in the word YAC (Yeast Artificial Chromosome) and B stands for bacteria in the word BAC (Bacterial Artificial Chromosome). These are used as vectors in the cloning of DNA.
ii. Less than 2% of the total human genome codes for protein, functions of 50 % of

discovered genes are not known.

iii. SNPs stands for single nucleotide polymorphisms.

18. Plant tissue culture plays various roles in increasing food production as:

- i. The callus culture and suspension culture is used to get cell biomass production.
- ii. It may be used for biochemical isolation.
- iii. It is used to regenerate plantlets.
- iv. It is used for the production of transgenic plants.
- v. It is used for isolation of protoplasts.

19. An organism which becomes genetically transformed by introducing a new DNA sequence into its genome is called a transgenic organism (GMO). The transgenic crops are also called genetically modified crops or GM crops. For example, Bt cotton. It is a transgenic variety of cotton which contains a foreign gene from *Bacillus thuringiensis* bacterium. Bt cotton has become insect resistant due to this modification.

20. Biodiversity refers to the totality of genes, species and ecosystems of a region. Biodiversity differs from place to place.

As there is continuous loss of biodiversity due to the increasing human population, resources consumption, industrialization, urbanization and pollution, hence, it is important to conserve it. The basic reason for concern is that biodiversity is being lost even before it attains its size. Loss of biodiversity would check the evolutionary capability of biota to cope-up with environmental loss/changes.

OR

Norman Myers gave the concept of hotspot in 1988.

The major criteria for number of species conserved there are:

- (i) Species diversity and species density found in the area
- (ii) Number of endemic plants and animal species
- (iii) Degree of threat to the biodiversity due to degradation, habitat loss
- (iv) Degree of exploitation.

21. i. Two sets of primers are required in each cycle of the polymerase chain reaction. Primers are required for the addition of nucleotides to make multiple copies of the

DNA of interest. The enzyme DNA polymerase extends the primers using the nucleotide provided.

- ii. The DNA polymerase used in PCR is Taq polymerase extracted from *Thermus aquaticus*. It is a thermostable enzyme that can withstand the high temperature used in the denaturation and separation of DNA strands. Hence, it can be used for a number of cycles of DNA amplification without being denatured.

Section D

- 22.
 - i. A-GnRH
 - B-FSH
 - C-Spermatogenesis
 - D-Spermiogenesis
- ii. Spermatogenesis occurs at the age of puberty in testes.
- 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 organisms depicting pattern A are microorganisms, while B depicts zooplanktons or fishes.
 - ii. With the increase in organic matter of lake due to influx of nutrients from agricultural land, the number of microorganisms increases which degrade the organic matter.
 - iii. From the above growth patterns, it can be concluded that
 - a. With the increase in microbes in water body the BOD increases, making it unfit for aquatic life.
 - b. Dissolved oxygen reduces drastically leading to mortality of aquatic organisms, i.e. fishes.

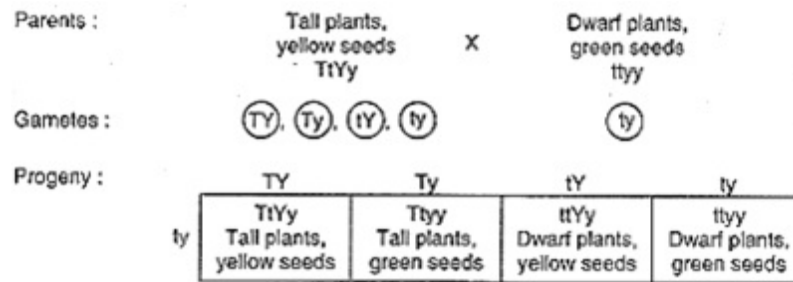
Section E

- 25. (a) The given plant has to be crossed with a dwarf plant with green seeds. Tallness and yellow seeds are dominant traits whereas dwarfness and green seeds are recessive traits. If the progeny consists of tall plants with yellow seeds, the given plant is homozygous. (Cross 1) If the progeny shows four phenotypes in the ratio of 1 : 1 : 1 : 1, the given plant is heterozygous for both the traits. (Cross 2) Cross 1 : Homozygous

Parents : Tall plants, yellow seeds (TTYY) × Dwarf plants, green seeds (ttyy)

Gametes : TY and ty

Progeny : TtYy Tall plants, yellow seeds



The Watson and Crick observed that the nitrogenous bases form complementary pair between the two polynucleotide chains of DNA. Based on the X-ray diffraction data, they proposed that DNA consisted of a double helix with two chains having sugar phosphate on the outside and nitrogen bases on the inner side. Further, they proposed that the two chains are antiparallel with 5'-3' orientation of the other. The two chains are twisted helically just as a rope ladder with rigid steps twisted into a spiral. This property of double helix model of DNA led them to hypothesize semi-conservative mode of DNA replication, where the two strands separate and act as a template for the synthesis of new complementary strand.

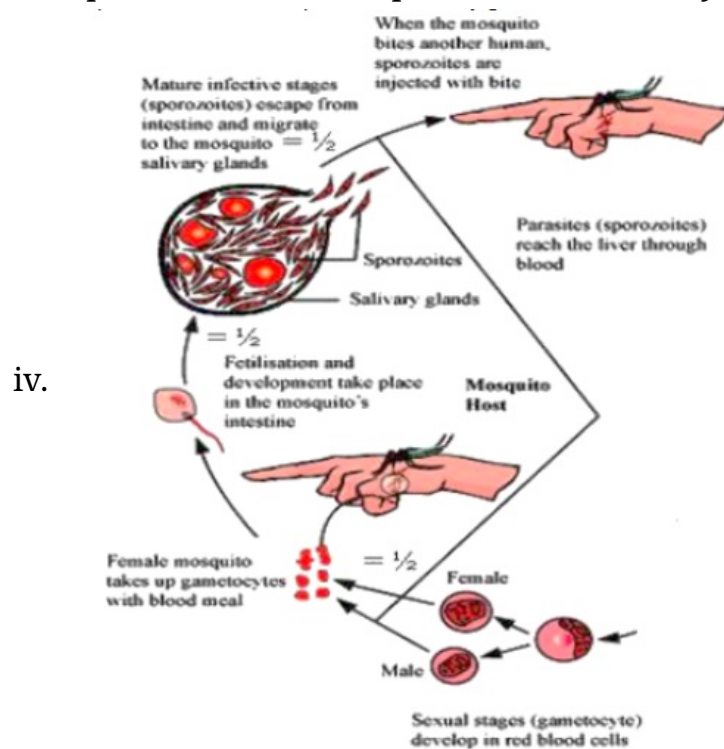
- Importance of 'selection' during inbreeding of cattle is as follows

- 16 / 19

- c. It helps in eliminating the less desirable genes from cattle population.
- d. It helps to eliminate the harmful recessive genes.

OR

- a. *Plasmodium falciparum* causes malignant malaria in humans.
- b. The events in the life cycle of Plasmodium which take place in the female Anopheles are as follows:
 - i. Gametocytes / Male and Female gametes - enter female Anopheles mosquito
 - ii. Fertilisation and development in the female mosquito gut/stomach.
 - iii. Sporozoites are transported to the salivary gland.



- c. When Plasmodium gains the entry in the human body then following events are taking place inside the body-
 - i. The parasite multiplies asexually in RBC
 - ii. RBC rupture
 - iii. Release toxic haemozoin
 - iv. Chill and fever recurring every 3 - 4 days
 - v. Parasites enter fresh RBC and repeat the cycle.

27. At the point of domestic sewage discharge, there is a large amount of biodegradable organic matter. The bacteria and other micro-organisms growing there readily

decompose the organic matter producing simple organic matter and inorganic content.

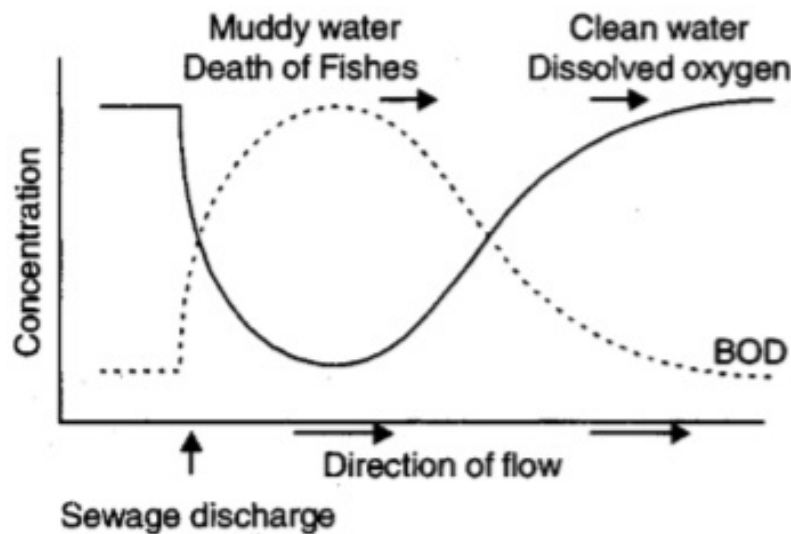


Figure: Effect of sewage discharge.

They utilize these organic matters for their growth and multiplication. In the process, they use whatever little oxygen present in the sewage and the demand for atmospheric oxygen increases. It is possible to estimate the amount of organic matter in the sewage by measuring biochemical oxygen demand (BOD). There is a relationship between BOD, micro-organisms and the amount of biodegradable matter. As a result, there is a sharp decline in dissolved oxygen downstream from the point of sewage discharge. This causes mortality of fish and other aquatic creatures.

OR

- i. Primary Productivity (PP) is the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis. It can be divided into

Gross Primary Productivity (GPP): It is the rate of production of organic matter during photosynthesis. A considerable amount of GPP is utilized by plants in respiration

Net Primary Productivity (NPP): It is the amount of energy left in the producers after the utilization of some energy for inspiration.

Factors affecting primary productivity are:

- Availability of nutrients.
- Quality and duration of sunlight.

-
- Water availability.
 - The temperature of a given place.
 - Type of plant species.
 - Photosynthetic capacity of plants.

ii. **Effect of oxygen:** The decomposition of detritus is an energy-requiring process. Most of the decomposers (bacteria and fungi) are aerobic organisms. They require oxygen for their cellular activities while acting on dead organic matter.

Effect of chemical composition: Decomposition rate is slower if detritus is rich in lignin and chitin. It is quicker if detritus is rich in nitrogen and water-soluble substances like sugars.