

CBSE Class 12 Biology
Sample Paper 02(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. The secretory phase of in the human menstrual cycle is called as
 - a. Ovulation phase
 - b. Proliferative phase
 - c. Luteal phase
 - d. Follicular phase

OR

In India, there is rapid decline in infant mortality rate and MMR due to

- a. Cheap infant medicine
- b. More attention on RCH programme
- c. More educated parents
- d. Free medical facilities

2. Antibodies in our body are complex

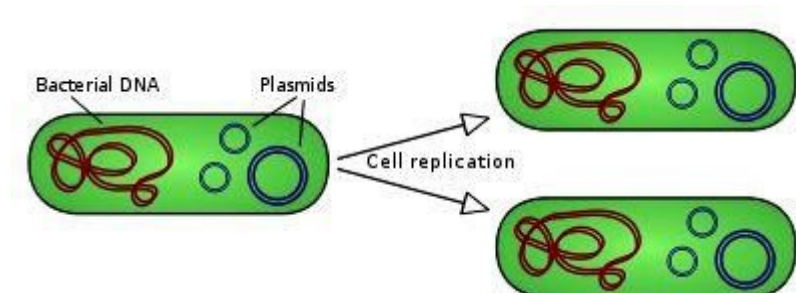
- a. Steroids
- b. Prostaglandins
- c. Glycoproteins
- d. Lipoproteins

OR

Which of the following is used in treatment of thyroid cancer?

- a. C-14
- b. I-131
- c. U-238
- d. rA-240

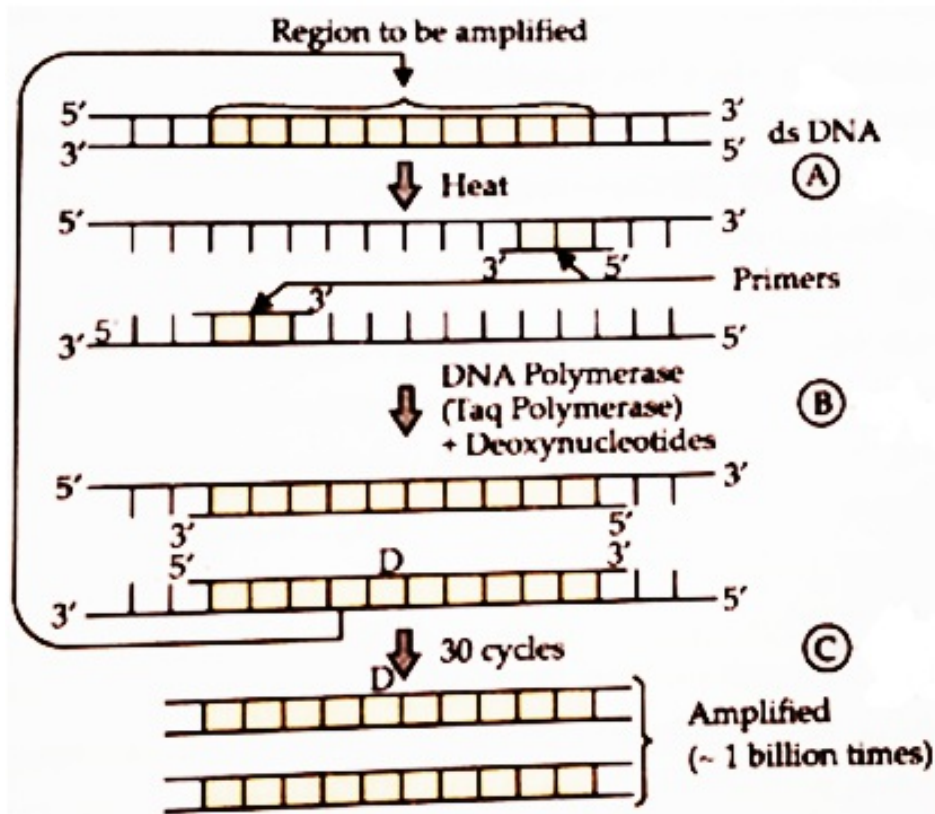
3. Which of the following is true for a Plasmid -



- a. It can be replicate independently

- b. It cannot replicate
- c. It lies together with chromosomes
- d. It shows independent assortment

4. Figure given below represents the reactions associated with Polymer Chain Reaction (PCR). Name the steps A, B, C in the process.



- a. A - Primer Extension, B - Annealing, C - Denaturation
- b. A - Denaturation, B - Annealing, C - Primer Extension
- c. A - Annealing, B - Primer Extension, C - Denaturation
- d. A - Annealing, B - Denaturation, C - Primer Extension

5. Evolutionary potential will be determined by:

- a. amount of somatic variation
- b. amount of genetic variation

- c. amount of species richness
- d. amount of species evenness

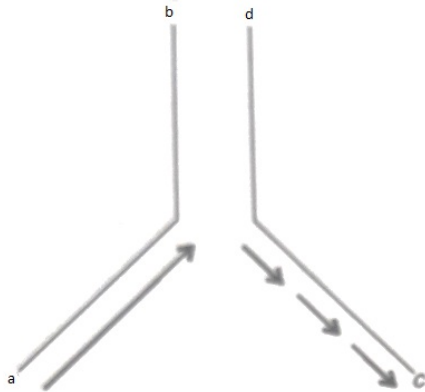
Section B

6. (a) The eggs of reptiles and birds are covered by calcareous shell. What is the technical term for that types of eggs?
(b) Give any one example of monoecious and one example of dioecious plant.

OR

Explain the function of Coleorhiza.

7. Do you think that reproductive health in our country has improved in the past 50 years? If yes, mention some such areas of improvement
8. Who proposed the chromosomal theory of inheritance? Point out any two similarities in the behaviour of chromosomes and genes.
9. Mention the polarity of the DNA strands a - b and c - d shown in the replicating fork given below:

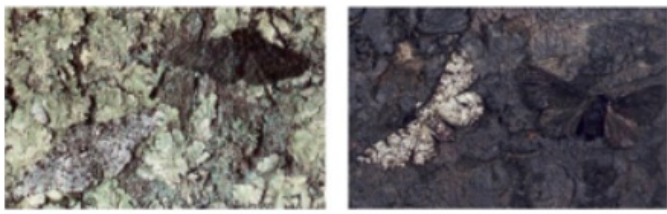


10. Honey collection improves when beehives are kept in crop fields during flowering seasons. Explain.
11. Name the source used to produce hepatitis-B vaccine using rDNA technology.
12. Differentiate between a detrivore and a decomposer giving an example of each.

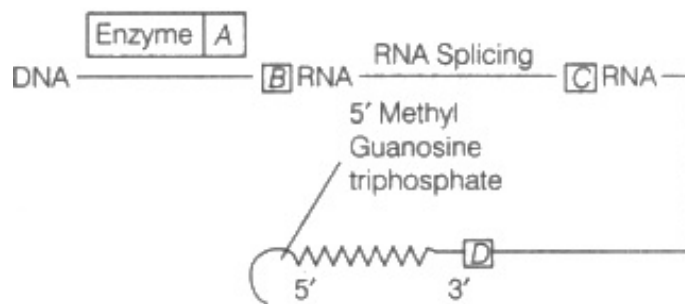
Section C

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13. i. Draw a labelled diagram of LS of an embryo of grass (any six labels).
ii. Give reason for each of the following.
a. Anthers of angiosperm flowers are described as dithecous.
b. Hybrid seeds have to be produced year after year.
14. Explain the following giving reasons:
(i) Pollen grains are well preserved as fossils.
(ii) Pollen tablets are in use by people these days.
15. In one family, each of the four children has a different blood group. Their mother is group A and the father is group B. Explain this pattern of inheritance with the help of a cross along with genotypes.

OR

- i. Mention the property that enables the explants to regenerate into a new plant.
ii. A banana herb is virus-infected. Describe the method that will help in obtaining healthy banana plants from this diseased plant.
16. Observe the picture showing the industrial melanism and answer the following questions:
- 

A B
- i. What do these pictures A and B illustrate with reference to evolution?
ii. Write the scientific name of the peppered moth.
iii. Picture A and B is a classical example of which type of natural selection?
17. Given below is a sequence of steps of transcription in a eukaryotic cell. Answer the following questions:

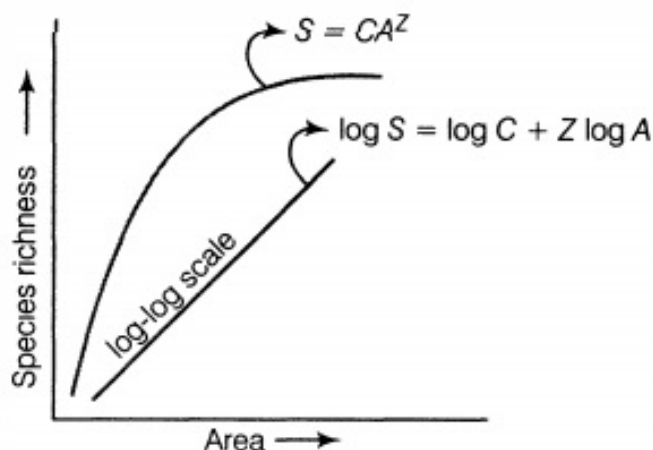


- i. Fill up the blanks (A, B, C and D) left in the sequence.
- ii. Why hnRNA is required to undergo splicing?

18. Explain the advantage of cross-breeding of two species of sugarcane in India.
19. List the disadvantages of insulin obtained from the pancreas of slaughtered cows and pigs.
20. Among the ecosystem services are control of floods and soil erosion. How is this achieved by the biotic components of the ecosystem?

OR

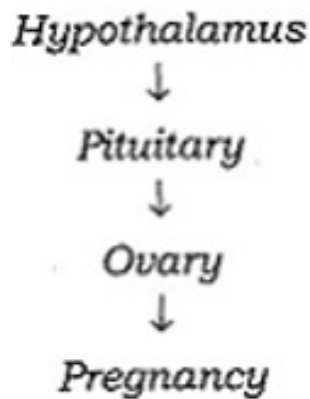
- i. Explain the species-area relationship using the graphical representation given below.



- ii. Explain giving reasons why there is greater biodiversity in tropical regions of the earth.
21. Why has a bacterium to first become competent to be able to take up DNA? Explain how it becomes competent and takes in the recombinant DNA.

Section D

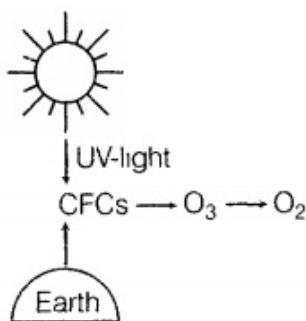
22. Study the following flow chart and answer the following question:



- Name the hormones involved in each state.
 - Explain the functions of hormones involved in each state.
 - Write the name of the placental hormone.
23. Observe the picture showing the utilization of microbes as a household product and answer the following questions:



- Write the name of bacteria used to produce swiss cheese?
 - Why does Swiss Cheese have big holes?
 - Propionibacterium* consume which acid during the late stage of cheese production?
24. Observe the diagram and answer the following questions:



- Expand CFC.

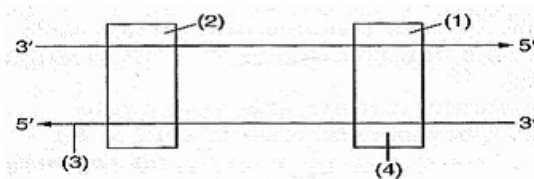
- ii. How does it reduce ozone to oxygen?
- iii. How does CFC affect the ozone layer?

Section E

25. Recently a girl baby has been reported to suffer from haemophilia. How is it possible? Explain with the help of a cross.

OR

In the following diagram, the two DNA strands represented are ready for transcription.



- i. Label the parts marked 1 to 4 and state their functions in transcription.
 - ii. Which one of the two strands of DNA has nucleotide sequence similar to the mRNA that will be transcribed and why?
26. Write a short note on artificial insemination.

OR

- a. Expand the term SCID.
 - b. Why is SCID called primary immunodeficiency?
 - c. Why is AIDS called secondary immunodeficiency?
 - d. Where was AIDS-virus first reported in India?
 - e. What is the rate of growth of AIDS infection in India?
27. Describe the process of natural aging of a lake.

OR

Write a note on Solar energy and show diagrammatically the fate of solar radiation incident on plant canopy.

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Solution
Section A

1. (c) Luteal phase

Explanation: Menstrual cycle is divided into three phases menstruation phase, follicular phase or proliferative phase and luteal phase or secretory phase.

OR

- (b) More attention on RCH programme

Explanation: The rapid decline in IMR and MMR is due to more attention on RCH program that provide proper immunization before and after the birth of baby providing assistance in delivery and child care, all these together result into decline in dearth of infants and mother during pregnancy.

2. (c) Glycoproteins

Explanation: Antibodies in our body are present in the blood in form of glycoproteins. They produce antigens in response to foreign particles to provide immunity against the pathogen.

OR

- (b) I-131

Explanation: Radioactive iodine (I-131), an isotope of iodine that emits radiation, is used for medical purposes. When a small dose of I-131 is swallowed, it is absorbed into the bloodstream in the gastrointestinal (GI) tract and concentrated from the blood by the thyroid gland, where it begins destroying the gland's cells. Iodine is essential for production of thyroxine hormone.

3. (d) It shows independent assortment

Explanation: It shows independent assortment

4. (b) A - Denaturation, B - Annealing, C - Primer Extension

Explanation: A - Denaturation, B - Annealing, C - Primer Extension

5. (b) amount of genetic variation

Explanation: Evolution is the gradual change in the traits of a species over the time to adopt in a particular habitat. Amount of evolution or evolutionary potential will be determined by amount of genetic variation because traits are determined by genes.

Section B

6. (a) Cleidoic eggs are enclosed in a relatively impervious shell which reduces free exchange with the environment
- (b)
- Plants that have both staminate and pistillate flowers. Examples of monoecious plants are birch, hazelnut, oak, pine, spruce, corn, squashes and Coconut
 - A few examples of common dioecious landscape plants: yew, poplar, willow, ash, mulberry, holly, juniper, pepper trees, Pistache, pistachio, red maple, box elder, Podocarpus, aspen, currant, sumac, carob, Osage orange, sassafras, bay laurel and Date, palm

OR

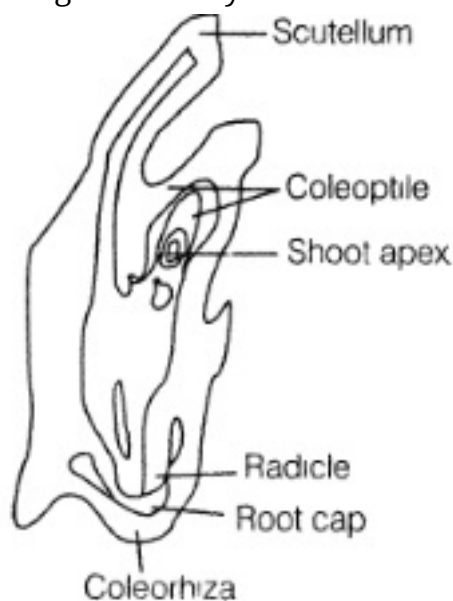
Coleorrhiza is a cap-like structure present over the radicle in monocot seeds which protects the enclosed growing radicle, in early stages of root development .E.g. maize

7. Yes, the programmes like family planning and reproductive and child health care have been successfully launched. Now more people are aware about the advantages of small family and are accepting two children norm. Some such areas of improvement are massive child immunization, increasing use of contraceptives, family planning etc.
8. Sutton and Boveri
- (i) Both factors / genes and chromosomes occur in pairs in normal diploid cells.
 - (ii) Both of them segregate / separate during gametogenesis and enter different gametes, i.e. one member of an allelic pair enters one gamete and the other enters another gamete.
9. a - b : $3' \rightarrow 5'$ polarity, c - d : $5' \rightarrow 3'$ polarity

10. Bees are the pollinators of many crops. Keeping beehives in crop fields during flowering period increases pollination and improve the honey yield. It is beneficial both for crop yield and honey yield.
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.
- 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. i. LS of grass embryo



- ii. a. A typical angiosperm anther is bilobed with each lobe having two thecae. So,

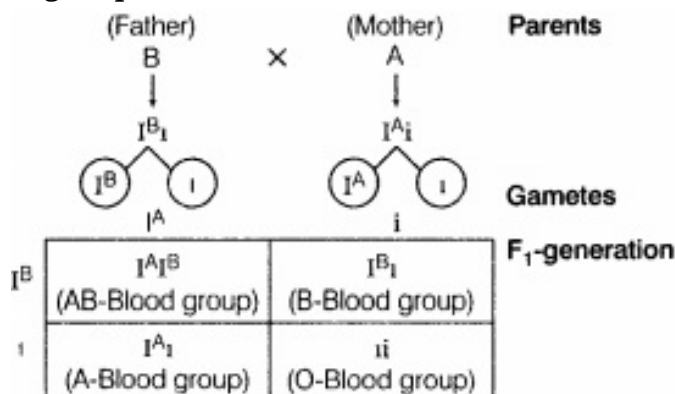
anther is called dithecous.

- b. Hybrid seeds show segregation of traits and do not maintain the hybrid character in plants. So, they need to be produced every year and cannot be stored.

14. (i) The exine of pollen grains is made up of sporopollenin which is biologically the most resistant substance and can withstand high temperature and strong acids and alkali. It is not affected by enzymes also. It is because of this reason the pollen grains are well preserved as fossils.

(ii) Pollen grains are rich in nutrients and consumption of them has been expected to increase the performance of athletes, hence these are used in the form of tablets by people.

15. In this family, both the parents are heterozygous—father for B-group and mother for A-group



- i. All the blood groups have appeared in F_1 -generation.
- ii. ABO blood group is controlled by a single gene, existing in three allelic forms, i.e. I^A , I^B and i showing multiple allelism.
- iii. Six genotypes are possible with three alleles and they produce four phenotypes, i.e. blood groups A, B, AB, and O.

OR

- i. Plant cell has a property called 'totipotency' by which each plant cell or an explant can grow into a new plant under in vitro conditions.
- ii. Healthy banana plants can be obtained from diseased plants by meristem culture.

In infected plants, meristems are free from viruses. It is excised and grown in test tubes or petri plate under sterile conditions, on suitable growth medium.

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. 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. Sugarcane is grown in North India, i.e. *Saccharum Barberi* had poor sugar content and low yield, while the sugarcane is grown in South India, i.e. *Saccharum officinarum* had thicker stems and higher content of sugar, but it could not be grown in North Indian climatic conditions. The hybrid produced by cross-breeding of these two species have the following desirable traits-
 - i. High-yield
 - ii. Thick stems
 - iii. High sugar content
 - iv. Ability to grow in North Indian sugarcane fields.
19.
 - i. Insulin is a hormone is produced in very little amounts in the body. Hence, a large number of animals need to be sacrificed for obtaining small quantities of This makes the cost of insulin very high- Demand being many folds higher than supply.
 - ii. Slaughtering of animals is also not ethical.
 - iii. There is the potential of the immune response in humans against the administered insulin which is derived from animals.
 - iv. There is a possibility of slaughtered animals being infested with some infectious microorganism which may contaminate the insulin.
20. The biotic components of an ecosystem include plants and

animals. Plants play following important role in the control of flood and soil erosion:

- The roots of the plants bind the soil particles firmly and prevent soil erosion. In absence of plants, rainwater washes away the top layer of soil which finally gets deposited in the river beds leading to decrease in depth of river. This causes flood.
- Roots of the plants and the humus make the soil porous. This helps in percolation of the water into the soil and reduces the speed of the water flow.

OR

- 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.

21. For receiving recombinant DNA the bacterial cells are made competent.

The bacterium is incompetent to take up hydrophilic DNA through its cell membrane. The bacterium is made competent by treating them with a specific concentration of divalent cation such as calcium which increases the efficiency with which DNA - plasmid enters the bacterium through pores in the cell wall. Recombinant DNA is forced into bacteria by incubating the cells with recombinant DNA on ice followed by placing them briefly at 42°C (heat shock) and then pulling them back on ice. Thus, the bacteria take up recombinant DNA.

Section D

22. i. The hormones involved in each stage are as follows:

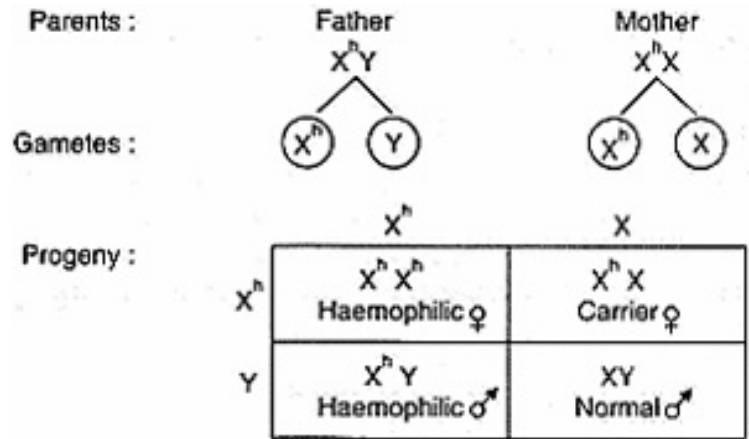
- a. **Hypothalamus-** Gonadotropin-releasing hormone (GnRH)
- b. **Pituitary-** FSH and LH

-
- c. **Ovary- LH**
 - d. **Pregnancy-** Progesterone and Human chorionic gonadotropin (hCG)
 - ii. The functions of the hormone involved in each stage are as follows:
 - a. **Hypothalamus:** It releases gonadotropin-releasing hormone (GnRH), which stimulates pituitary.
 - b. **Pituitary:** After stimulation, it secretes FSH and LH. FSH regulates the functioning of the ovary during follicular phase by stimulating the growth of an ovarian follicle into mature Graafian follicle and secretion of oestrogens from the follicle cells. LH stimulates the mature follicle to rupture and release the ovum(ovulation).
 - c. **Ovary:** After ovulation LH stimulates the formation of corpus luteum inside the ruptured follicle.
 - d. **Pregnancy:** Corpus luteum starts the secretion of progesterone and hCG is secreted from the placenta which is essential for the maintenance of pregnancy.
 - iii. Human chorionic gonadotropin (hCG) hormone is secreted from the placenta.
23. i. *Propionibacterium sharmanii*
- ii. Swiss cheese is ripened by *Propionibacterium sharmanii* which produces a large quantity of CO₂ which causes big holes during its escape.
 - iii. *Propionibacterium* consumes Lactic acid during the late stage of cheese production.
24. i. CFC- Chlorofluorocarbon.
- ii. The concept of JFM was introduced by the Government of India. In this program, support of local communities was taken for conservation of forests and in return, the local people were made to use the products obtained from the forest free of cost. In this program, local people protect the forest, which helps in the conservation of the forest and its biodiversity.
 - iii. Once in the atmosphere, CFCs drift slowly upward to the stratosphere, where they are broken up by ultraviolet radiation, releasing chlorine atoms, which are able to destroy ozone molecules.

Section E

25. Haemophilia is a sex-linked disease that occurs due to the presence of a recessive sex-

linked gene h carried by X-chromosome. For a daughter to be a haemophilic mother should be a carrier (X^hX) and father should be haemophilic. (X^hY) A female becomes haemophilic only when both its X-chromosomes carry the gene (X^hX^h) The cross is as follows:



	X^h	X
X^h	X^hX^h Haemophilic ♀	X^hX Carrier ♀
Y	X^hY Haemophilic ♂	XY Normal ♂

OR

- i.
 - a. Template strand - It functions as a template to synthesise m-RNA
 - b. Promoter - It is a DNA sequence that provides a binding site for RNA polymerase
 - c. Coding strand - It does not code for any region of RNA
 - d. Terminator - It provides DNA sequence which stops transcription.
- ii. The coding strand will have a sequence similar to mRNA strand as this possesses complementary sequence to the template strand.

26. **Artificial Insemination (AI):** It is the method for controlled breeding in which the semen of superior male of exotic or indigenous (local or native) breeds is inseminated into the native female. The inseminating pipette is carefully inserted deep into the

reproductive tract of the female. When a bull inseminates a cow naturally, approximately 5 to 10 billion spermatozoa are deposited in the reproductive tract of female. However, when semen is deposited artificially into the reproductive tract, then considerably fewer sperms are required to achieve the conception.

Therefore, artificial insemination is very economical. Some of the reasons justifying this statement are:

- i. Semen collected from a single superior male can be used for fertilizing many females.
- ii. Semen from the desired male located at distant places can be transported and used to inseminate the females.
- iii. The semen can be used immediately or can be frozen and used at a later date.
- iv. The spread of certain diseases can be controlled by this method.

Artificial insemination was first introduced in India at Indian Veterinary Research Institute (Izatnagar), near Bareilly, Uttar Pradesh.

OR

- a. Severe Combined Immuno-Deficiency.
- b. SCID is called primary immunodeficiency because it is a congenital immuno-deficiency.
- c. AIDS is called secondary immunodeficiency as it is developed after the birth during an individual's own life span.
- d. AIDS-virus was first reported among the prostitutes in Chennai in India.
- e. The rate of growth of AIDS infection in India is 1 per cent (10 persons per 1000 persons).

27. **Eutrophication:** It refers to the natural ageing of a lake by biological enrichment of its water. There is excessive growth of algae, plants, and animals in water bodies due to nutrient enrichment, particularly with nitrogen and phosphorus. Eutrophication is both natural and accelerated. Natural eutrophication occurs slowly at a rate which may not be detectable in human life. It occurs in the following steps:

- i. A young lake has cold and clear water. without significant life.

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- ii. Streams draining into lake introduce nutrients such as nitrogen and phosphorus.
 - iii. These nutrients encourage/favour the growth of aquatic organisms-planktonic algae.
 - iv. The lake's fertility increases.
 - v. Plants and animals grow and develop rapidly.
 - vi. Death of Plants and animals increase the organic remains to be deposited on the lake bottom. Over the centuries, silt and organic debris pile up.
 - vii. lakes give way to large masses of floating plants (bog), and
 - viii. Finally, converting the lake into a land.

Depending on the climate, the size of the lake and other factors, natural ageing of a lake may take thousands of years. However, pollutants from industries and homes can radically accelerate the ageing process. This phenomenon is called Cultural or Accelerated Eutrophication. During the past century, lakes in many parts of the earth have been atrophied by sewage, agricultural and industrial wastes.

OR

Solar Energy: Energy from sun is the ultimate source of energy in all the living systems of earth.

Enormous energy is released at every moment from the sun and it is spread out in the space. Just 1% of total sun's energy reach on the earth. It is near about of 12.3×10^{24} cal each year. But it is also true that all of this quantity does not reach on the earth's surface and the reason behind is the components of atmosphere like clouds, smoke and dust particles which change the nature of solar radiations. Some of the amounts of energy of the sun which reach on the earth go back to nature, just a small quantity falls on the plants. Thus it is estimated that only the tenth part of 1% of the energy of the sun reaching on the earth's surface is used by the plants in photosynthesis and this energy is 4×10^{14} cal per second.