CBSE Class 12 Biology
Sample Paper 07 (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. Egg released by the Graafian follicle is surrounded by

    a. Gastrula and Vitelline membrane

    b. None of these

    c. Zonapellucida and Vitelline membrane

    d. Plasma membrane and tunica

OR

The average number of children which an average couple has or would have during

their life time is called as

a. Total fertility rate

b. National birth rate

c. Common fertility rate

d. Total birth rate

2. Electron beam therapy is a kind of radiation therapy to treat

a. Enlarged prostate gland

b. Kidney stones

c. Gall bladder stones by breaking them

d. Certain types of cancer

OR

Suspension of attenuated pathogen that stimulates antibody formation is

a. Antitoxin

b. Serum

c. Antibiotic

d. Vaccine

3. Which one of the following nucleotide sequence in DNA is recognised by ECoRI

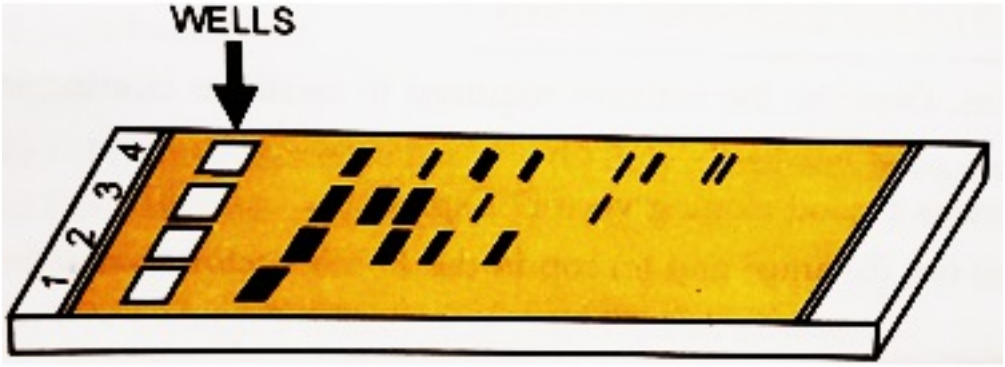
a. $5'G \overset{\downarrow}{-} A-A-T-T-C-3'$
$3'C-T-T-A-A \underset{\uparrow}{-} G-5'$

b. $5'G-A-A-T \overset{\downarrow}{-} T-C-3'$
$3'C-T \underset{\uparrow}{-} T-A-A-G-5'$

c. $\begin{matrix} 5'G-A\overset{\downarrow}{-}A-T-T-C-3' \\ 3'C-T-T-A\underset{\uparrow}{-}A-G-5' \end{matrix}$

d. $\begin{matrix} 5'G-A-A\overset{\downarrow}{-}T-T-C-3' \\ 3'C-T-T\underset{\uparrow}{-}A-A-G-5' \end{matrix}$

4. In gel Electrophoresis, DNA bands are separated on the basis of



   a. Molecular size

   b. Molecular size and Molecular weight

   c. Charge

   d. Molecular weight

5. If we say, India has about 50,000 type of rice and 1000 types of varieties of mango what level of diversity it indicates:

   a. ecosystem diversity

   b. genetic diversity

   c. community diversity

   d. species diversity

Section B

6. List any four ways by which GMOs have been useful for enhanced crop output.

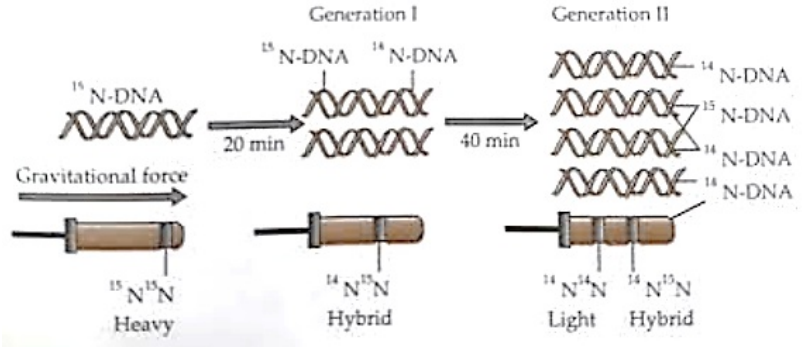
OR

Why is apple called a false fruit? Which parts of the flower forms the fruit?

7. Describe the lactational amenorrhea method of birth control.

8. Which of Mendel's law of inheritance is universally acceptable and without exception? State the law.

9. Results of the famous experiment given in the figure. Answer the question:



   a. Identify the given experiment.
   b. Which property of the DNA is proved by this experiment?

10. What is the programme called that is involved in improving success rate of production of desired hybrid and herd size of cattle?

11. Write short notes on the Production of human growth hormone by E.coli.

12. Name the pioneer species:
    (i) On a bare rock
    (ii) in a water body.

Section C

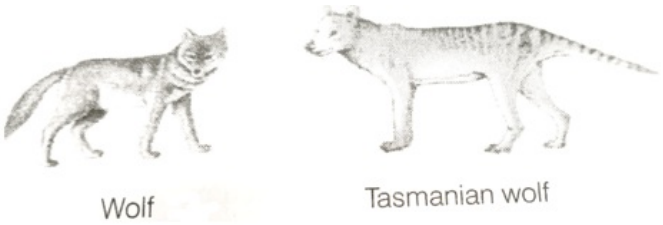
13. i. Why are seeds of some grasses called apomictic? Explain.
    ii. State two reasons to convince a farmer to use an apomictic crop.
14. i. With the help of a labelled diagram depict the organization of a typical embryo sac just after double fertilization.
    ii. How are seeds advantages to angiosperms?

15. Define point mutation? Give one example.

OR

Mention the advantages of selecting pea plant for experiment by Mendel.

16. Refer to the figure given below and answer the following questions



i. Identity the process by which Tasmanian wolf came into evolution.
ii. Define the process identify in (i).
iii. Apart from marsupials this process was also observed in which other organism?

17. Observe the diagram of Genetic code and answer the following questions:

First letter	Second letter: U	Second letter: C	Second letter: A	Second letter: G	Third letter
U	UUU, UUC } Phe UUA, UUG } Leu	UCU, UCC, UCA, UCG } Ser	UAU, UAC } Tyr **UAA Stop** **UAG Stop**	UGU, UGC } Cys **UGA Stop** UGG Trp	U C A G
C	CUU, CUC, CUA, CUG } Leu	CCU, CCC, CCA, CCG } Pro	CAU, CAC } His CAA, CAG } Gln	CGU, CGC, CGA, CGG } Arg	U C A G
A	AUU, AUC, AUA } Ile **AUG Met**	ACU, ACC, ACA, ACG } Thr	AAU, AAC } Asn AAA, AAG } Lys	AGU, AGC } Ser AGA, AGG } Arg	U C A G
G	GUU, GUC, GUA, GUG } Val	GCU, GCC, GCA, GCG } Ala	GAU, GAC } Asp GAA, GAG } Glu	GGU, GGC, GGA, GGG } Gly	U C A G

i. How many codons codes for amino acids and how many do not?
ii. Explain the following giving one example of each.
   a. Unambiguous and specific codon
   b. Degeneration codon
   c. Universal codon
   d. Initiator codon

18. Differentiate between somaclones and somatic hybrids. Give one example of each.

19. Mention any five benefits derived from transgenic animals.

20. Define wildlife. Describe its significance in the maintenance of the environment.

OR

The following graph shows the species-area relationship. Answer the following questions as directed.

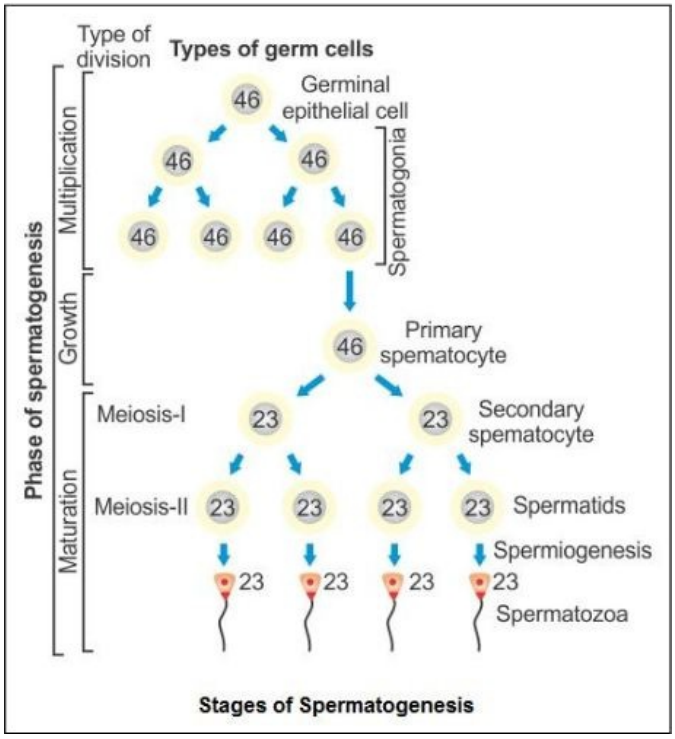
i. Name the naturalist who studied the kind of relationship shown in the graph. Write the observations made by him.
ii. Write the situations as discovered by the ecologists when the value of Z (slope of the line) lies between
    a. 0.1 and 0.2
    b. 0.6 and 1.2.

    What does Z stand for?
iii. When would the slope of the line 'B' become steeper?

21. Describe briefly the following: Downstream processing.

Section D

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



i. Spermatids 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.

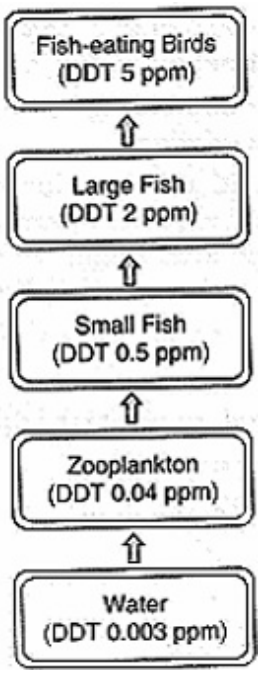
23. Observe the following picture of the biogas plant and answer the following questions:

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. Study the given aquatic food chain and answer the question that follows:



i. Given reason why there is a continuous increase in the DDT content in different trophic levels of the chain.
ii. Name the phenomenon responsible for the increase is DDT content.
iii. How does increased concentration of DDT affects the bird population?

Section E

25. i. List three different allelic forms of gene 'T' in human. Explain the different phenotypic expressions, controlled by these three forms.
ii. A woman with blood group A marries a man with blood group O. Discuss the possibilities of the inheritance of the blood group in the following starting with ‘yes’ or ‘no’ for each.
    a. They produce children with blood group A only.
    b. They produce children, some with the O blood group and some with A blood group.

OR

i. Name the stage in the cell cycle where DNA replication occurs.
ii. Explain the mechanism of DNA replication. Highlight the role of enzymes in the process.
iii. Why is DNA replication said to be semi-conservative?

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. Name the three types of T-lymphocytes.
b. What do you mean by passive immunity?
c. Why are the breast-fed babies more immune than the bottle-fed babies?
d. Which type of antibodies are present in colostrum?
e. Give term for giving preformed antibodies against snake venom.

27. What depletes Ozone in the stratosphere? How does this affect human life?

OR

Write a short note on the ecosystem structure.

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Solution

Section A

1. (c) Zonapellucida and Vitelline membrane

   Explanation: One of the two ovary release one egg by the Graafian follicle. The egg released is surrounded by two layers called zonapellucida and Vitelline membrane as protective layer.

   OR

   (a) Total fertility rate

   Explanation: Total fertility rate is the average number of children which an average couple has or would have during their life time. It is different form reproductive potential of a healthy female.

2. (d) Certain types of cancer

   Explanation: Electron therapy or electron beam therapy (EBT) is a kind of external beam radiotherapy where electrons are directed to a tumor site.

   Cancerous cells are killed by radiation therapy to treat certain types of cancer. As cancer cells divide rapidly and can be easily killed by radiation.

   OR

   (d) Vaccine

   Explanation: Vaccine is a preparation of killed microorganisms, living attenuated organisms, or living fully virulent organisms that is administered to produce or artificially increase immunity to a particular disease.

   A vaccine is a biological preparation that provides active acquired immunity to a particular disease.

3. (a) $\begin{matrix} 5'G \overset{\downarrow}{-} A-A-T-T-C-3' \\ 3'C-T-T-A-A \underset{\uparrow}{-} G-5' \end{matrix}$

Explanation: $\begin{matrix} 5'G \overset{\downarrow}{-} A - A - T - T - C - 3' \\ 3'C - T - T - A - A \underset{\uparrow}{-} G - 5' \end{matrix}$

4. (b) Molecular size and Molecular weight
   Explanation: Molecular size and Molecular weight
5. (b) genetic diversity
   Explanation: India has about 50,000 type of rice and 1000 types of varieties of mango. This high level of diversity indicates very high genetic diversity and one of the largest in the world.

Section B

6. Following are the four ways by which GMOs have been useful for enhanced crop output -

   i. Crops which are more tolerant to abiotic stress (in the form of cold, drought, heat or salt) have helped to increase the total crop output.
   ii. Pest-resistant crops have been developed through genetic modification which has reduced reliance on chemical pesticides.
   iii. Genetic modification of crops has helped to reduce post-harvest losses.
   iv. Genetically modified plants with increased efficiency of mineral usage have helped to prevent early exhaustion of soil fertility thus maintaining the fertility of the soil for a longer duration.

OR

If the fruit is derived from the ovary alongwith other accessory floral parts, it is called false fruit. It is true in case of apple where thalamus also contributes in the formation of fruit alongwith the ovary. Thalamus of the flower is involved in fruit formation like in apple and cashew, while true fruits develop only from the ovary.

7. In this method the menstrual cycle and ovulation do not occur during intense lactation following parturition. So the chances of pregnancy are low during this period.

8. When sperm and egg unite at fertilization, each contributes its allele, restoring the paired condition in the offspring. This is called the **Law of Segregation**.

   Mendel also found that each pair of alleles segregates independently of the other pairs of alleles during gamete formation

9. a. The given diagram is representing "Messelson and Stahl's experiment". It is proven that DNA replicates semi conservatively.
   b. The strands of DNA are of intermediate density. The double-stranded DNA is $\frac{1}{2}$ Heavy and $\frac{1}{2}$ Light.

10. Multiple Ovulation Embryo Transfer (MOET), a conventional embryo flush, is the most common procedure used in advanced cattle breeding.

    It involves a 5 week superovulation program, resulting in several eggs being released from the donor cow, as opposed to one during a natural heat.

11. Human growth hormone (HGH) is very useful to children born with hypopituitarism which is a form of dwarfism caused by under secretion of HGH by the anterior pituitary gland. It also helps in the healing of injuries. The gene for HGH is introduced in the plasmid of bacterium E.coli. This recombinant *E. coli* bacterium secretes Human growth hormone which is used for treating hypopituitarism.

12. Pioneer species are hardy species which are the first to colonize previously disrupted or damaged ecosystems, beginning a chain of ecological succession that ultimately leads to a more biodiverse steady-state ecosystem.

    (i) The pioneer species on a bare rock are usually lichen, mosses and annual grass stage, and blue-green algae.
    (ii) Phytoplankton stage, Unicellular floating algal plants such as diatoms are pioneer species of a bare water body, such as a pond. Their spores are carried by air to the pond.

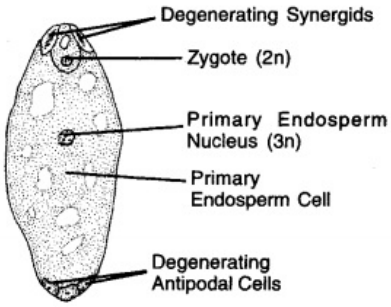
Section C

13. i. The seeds of some grasses develop without fertilization. It may be because a diploid egg cell develops into an embryo directly (without undergoing meiosis and syngamy) or some diploid cells of nucellus or integument surrounding the embryo

sac, protrude inside and develop into embryos. This phenomenon of developing embryo and seeds without fertilization is called apomixis and such seeds produced are referred to as apomictic.

ii. Two advantages of apomictic seeds to a farmer are as follows
   a. It lowers the cost of production.
   b. Apomictic seeds do not have to be produced every year.

14. i. Diagram showing Embryo sac after Double fertilization



ii. Seed formation in angiosperms offers many advantages such as:
   a. Helps to perennate during unfavourable conditions.
   b. Remains viable for several years by reducing their rate of metabolic activities this is known as dormancy.
   c. Seeds (in fruits) possess special structures for dispersal, thus helping in introducing the species into new areas.
   d. Due to low water contents, seeds can be stored for consumption by animals and man.
   e. Seed banks have been established for genetic conservation of plants.
   f. Their formation is independent of water.
   g. During their production there is scope of variation.

15. Mutations are new sudden, inheritable, discontinuous variations which appear in the organisms due to a permanent change in their genotype.
Point mutations are a type of gene mutations which involve the substitution, deletion or insertion of a single nucleotide or nitrogen base of the cistron e.g., Sickle Cell anaemia, an autosomal hereditary disorder is caused by the formation of abnormal haemoglobin called Hb^S. Hb^S differs from normal haemoglobin Hb^A in only one amino acid-6th amino acid of β-chain of glutamic acid is replaced by valine. Thus, disorder is due to the change of one nitrogen base in the cistron.

OR

Pea is a annual plant which gives result within a year. Large number of seeds are produced by pea plant in one generation. Pea plant has short life cycle. A large number of true breeding varieties with observable alternative forms for a trait were available.

16. i. Adaptive radiation
    ii. It is an example of convergent evolution. Despite the temporal and geographical separation, marsupials in Australia and placental mammals in North America have produced varieties of species living in similar habitat with similar ways of living.
    iii. Darwin Finches.
17. i. Out of 64 codons 61 code for amino acids and rest 3 codons do not code for any amino acids. These function as stop codons.
    ii.
        a. **Unambiguous and specific codon** These code for only one amino acid, thus, making the genetic code unambiguous and specific e.g. UUU.
        b. Some amino acids are coded by more than one codon, so the code is **degenerate**, e.g. serine is coded by 6 codons.
        c. The codon is nearly **universal**. Some exceptions to the rule are mitochondrial codon and in some protozoans, e.g. UUU.
        d. **Initiator codon** AUG has a dual function. It codes for methionine and also acts as an initiator.

18. The plants, which are genetically similar to the parent plant are called somaclones, e.g. banana, sugarcane, etc.
    The process of fusion of protoplast of somatic cells obtained from different varieties or species of a plant on a suitable nutrient medium in vitro to develop a hybrid is known as somatic hybridization.
    The hybrids so produced are called somatic hybrids, e.g. Pomato is a somatic hybrid produced by the fusion of tomato and potato protoplasts.

19. Benefits derived from transgenic animals are as follows:

i. They are specially made to serve as models for studying human diseases.
ii. They produce useful biological products that can be created by the introduction of a portion of a gene, which codes for a particular product such as human protein, α-1-antitrypsin is used to treat emphysema.
iii. Transgenic mice are being developed for testing the safety of the vaccine before they are used in humans.
iv. They can be used to study the effects of certain toxic substances.
v. They are more productive than regular animals.

20. The wildlife refers to the naturally occurring species of animal, plants, and microorganisms which are not domesticated or cultivated.
Significance of wildlife in the maintenance of the environment are as follows:

i. Wildlife provides links in food chains operating in nature. These food chains are extremely beneficial to us.
ii. Wildlife maintains a balance in nature, e.g., snakes control rodent population which destroy our crops.
iii. Wildlife also performs the role of biological control. These help in the recycling of matter in nature
iv. Green plants purify the air, they give us oxygen that sustains life and also helps to maintain atmospheric temperature,
v. Plants add water vapour by transpiration and influence the humidity and rainfall.

OR

i. Alexander von Humboldt studied the relationship shown in the graph. He observed that species richness increased within an explored area, but only up to a limit.
ii. a. Value of Z lies between 0.1-0.2 when the area is small to normal.
b. Value of Z lies between 0.6-1.2 when an area is very large. Z is slope of the line which is regression coefficient.
iii. The slope of the line 'B' becomes steeper when an area is very large like continents.

21. After completion of the biosynthetic stage, the product has to be subjected through a

series of processes before it is ready for marketing as a finished product. The processes include separation and purification, which are collectively referred to as downstream processing. The product has to be formulated with suitable preservatives. Such formulation has to undergo thorough clinical trials as in case of drugs. Strict quality control testing for each product is also required. The downstream processing and quality control testing very from product to product

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. 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. There is a continuous increase in DDT content in different trophic levels of the chain, this is known as biological magnification in the aquatic food chain. This happens because a toxic substance accumulated by an organism cannot be metabolized or excreted and is thus passed on to the next higher trophic
    ii. Biomagnification.
    iii. High DDT level alters the bird's calcium metabolism that ultimately results in the thinning of eggshell. Hence, results in the declined bird population.

Section E

25. i. In humans, the ABO blood groups are controlled by a gene called 'I'. It has three alleles. These are I^A, I^B, and i.

Allele from parent 1	Allele from parent 2	Genotypes of offsprings	Blood types of offsprings
I^A	I^A	I^AI^A	A
I^A	I^B	I^AI^B	AB
I^A	i	I^Ai	A

I^B	IA	I^AI^B	AB
I^B	I^B	I^BI^B	B
I^B	i	I^Bi	B
I	i	ii	O

ii. a. No, it's not necessary as a mother could have a genotype I^A I^A or I^Ai. If the genotype is I^A I^A, all the offsprings would have A blood group, but in the second case, offsprings can have either 'A' or 'O' blood group as then the father has 'O' blood group.

b. Yes, if the mother is of genotype l^Ai and father is 'O' (genotype ii), blood group of some children can be'O' and some can be 'A'.

OR

i. During the synthetic phase of interphase of cell cycle DNA duplicate its content or replicates.

ii. **Process of DNA Replication**

Replication is an energy expensive process, deoxyribonucleoside triphosphate serves the dual purpose of

a. acting as a substrate
b. providing energy (from two terminal phosphates)

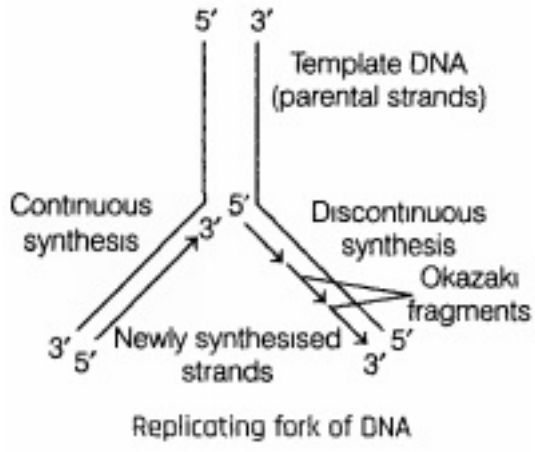
In a long DNA molecule, replication takes place within a small opening of the DNA helix, known as replication fork because whole DNA does not open in one stretch due to high energy requirement. **DNA dependent DNA polymerases** catalyse polymerisation only in one direction, i.e. 5'$\rightarrow$3'. This brings additional complications at the replication fork.

On one strand (template with polarity 3'$\rightarrow$5'), replication is continuous, while on the 5'$\rightarrow$3' strand, replication is discontinuous.

Thus, the fragments synthesised are discontinuous and later joined by the enzyme DNA ligase.

The DNA polymerases cannot initiate the replication process on their own. And replication does not initiate randomly anywhere in DNA.

It begins at definite regions in a DNA molecule known as the origin of replication (On).



Replicating fork of DNA

Enzymes for DNA Replication

The process of replication requires a set of catalysts (enzymes) as given below

a. **DNA-Dependent DNA Polymerase**
   It is the main enzyme which uses a DNA template to catalyse the polymerisation of deoxynucleotides.
   The average rate of polymerisation is 2000 bp (base pairs) per second approximately. These enzymes are highly efficient as they have to catalyse the polymerisation of a large number of nucleotides in a very short time.
   These polymerases act very fast, catalyse the replication process with a high degree of accuracy as any mistake would result in mutations.
b. **Helicase** It unwinds the DNA strand, i.e. separates the two strands from one point for the formation of a replication fork.
c. **DNA Ligase** It facilitates the joining of DNA strands together by catalysing the formation of a phosphodiester bond. It plays a role in repairing single-strand breaks in duplex DNA.

iii. It is said to be semi-conservative because in newly synthesised DNA, one strand is parental and one is new, so it conserves the one strand. DNA replication is followed by cell division. In case, the latter fails to occur, polyploidy may occur.

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. Killer-T cells, Helper-T cells and Suppressor-T cells are the three types of T lymphocytes.
b. Passive immunity is that in which, readymade antibodies are injected in the human body to develop immunity.
c. Breast-fed babies receive some antibodies along with mother's milk that's why they are more immune than the bottle-fed babies.
d. Immunoglobulins-A antibody is present in colostrum.
e. Passive immunization.

27. There should be a balance between production and degradation of ozone in the stratosphere.

Balance has been disrupted due to the enhancement of ozone degradation by chlorofluorocarbons (CFCs). CFCs are used in refrigerants and released as emissions from jet aeroplanes. CFCs discharged in the lower part of the atmosphere move upwards and reach the stratosphere. They are persistent, permanent and have continuing effects on ozone.

In the stratosphere, UV rays act on CFCs release Cl^- atoms. Cl^- atoms degrade ozone releasing molecular oxygen, with these atoms acting merely as a catalyst. Cl- atoms are not consumed in the reaction. A single chlorine atom can convert 1 Lakh molecules of ozone into oxygen. Depletion of ozone is particularly marked over the Antarctic region. It has resulted in the formation of the thinned ozone layer,

commonly called an **Ozone hole**.
UV radiations of wavelength shorter than UV-B are completely absorbed by earth atmosphere if the ozone layer is intact. Thinning of the ozone layer increases the amount of UV-B radiations reaching the earth. UV-B damages DNA and may cause mutation. It causes ageing of the skin, damage to skin cells and various types of skin cancer. In the human eye, cornea absorbs UV-B radiation and a high dose of UV-B causes inflammation of cornea called snow-blindness, cataract, etc Such exposure may permanently damage the cornea.

OR

Ecosystem structure is as follows:

i. **Species composition:** Number and type of species differ from one ecosystem to another depending upon geography, topography and climate. Maximum species composition occurs in tropical rain forests and coral reefs. Minimum species diversity occurs in deserts and arctic regions.
ii. **Stratification:** It is the formation of well defined vertical layers of tall, medium and of small trees, bushes and herbs where vegetation is dense, e.g., 5-7 strata in tropical rain forests. Stratification is absent or rare in deserts.
iii. **Trophic structure:** Each ecosystem has specific food chains and food webs, e.g., grazing food chain m grassland.
iv. **Standing crop:** It is the total amount of living biomass present in an ecosystem. Dry weight preferred over fresh weight because the latter is liable to be influenced by seasonal moist differences.
v. **Standing state:** The amount of inorganic nutrients present any time in the soil/water of the ecosystem. It tends to vary from season to season and ecosystem to ecosystem.