CBSE Class 12 Biology
Sample Paper 04 (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. 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

Oral contraceptives for the female containing non-steroidal preparation with very few side effects and high contraceptive value, “once a week pill”.

a. Mala-D
b. Loveregen
c. Femilon
d. Saheli

2. The incubation period of Hepatitis 'B' virus is

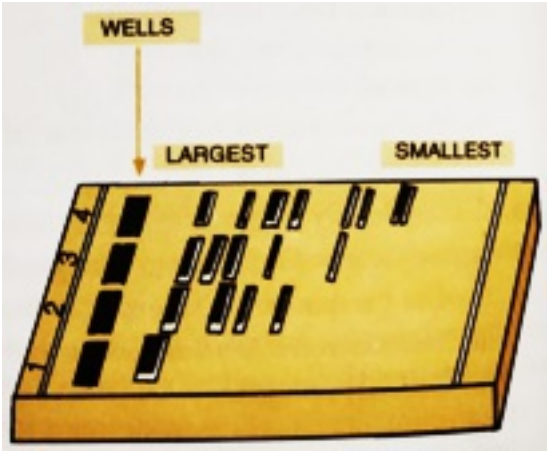
a. 30-180 days
b. 15-20 days
c. One week
d. 42-56 days

OR

If you suspect deficiency of antibodies in a person, to which of the following would you look for confirmatory evidence?

a. Serum globulins
b. Haemocytes
c. Serum albumins
d. Fibrinogen in the plasma

3. In Gel Electrophoresis, fragments are moved from:



1. Anode to Cathode
2. Cathode to Anode
3. Negative to Positive
4. Positive to Negative

a. 1, 4

b. 1, 3

c. 2, 4

d. 2, 3

4. The particles used to coat with DNA in Biolistic gun is of

   a. Helium

   b. Tungsten

   c. Quartz

   d. Zinc

5. Polyps and medusae of coelenterates (fixed and free-floating stages) are examples of polymorphism related to

   a. habitat diversity

   b. ecosystem diversity

c. genetic diversity

d. species diversity

Section B

6. What is a bisexual flower?

OR

Normally one embryo develops in one seed but when an orange seed is squeezed many embryos of different shapes and sizes are seen. Mention how it has happened?

7. Define reproductive health. How does this affect society?

8. Sex determination is based on particular chromosomes in both birds and humans. State two points of difference between their mechanisms of sex determination.

9. Write the RNA strand transcribed from the given transcription unit along with its polarity.

10. Why does a bee keeper keep beehives in crop fields during the flowering periods? State any two advantages.

11. Define **Germ line gene therapy.**

12. Pankhuri watched a TV program based on life in polar region. She observed that all the animals in polar region possess larger size and smaller animals are not found in that region. She asked about this surprising fact to her friends. Being her friend, how can you satisfy her curiosity?

Section C

13. i. Draw a labelled diagram of LS of a flower to show the growth of pollen tube reaching egg apparatus.
    ii. Pistil of a flower does not accept pollen from any plant other than its own kind. How does it happen? Explain.

iii. What is syngamy?

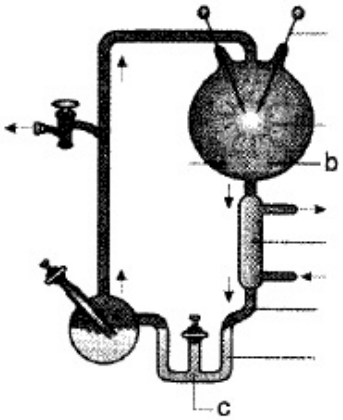
14. Why is fertilization in an angiosperm referred to as double fertilization? Mention the ploidy of the cells involved.

15. Mention any two autosomal genetic disorders with their symptoms.

OR

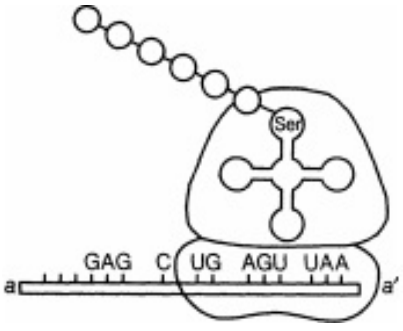
How did Mendel interpret his result to postulate the principle of Dominance?

16. The figure given below represents Miller's apparatus used for his experiment.



i. Name the scientist who had used the set-up shown below.
ii. Name the chemicals found in the samples drawn from 'c'.
iii. How did this experiment support evolution?

17. Study the figure and answer the following questions:



i. Identify the polarity from a to a', in the diagram below and mention how many more amino acids are expected to be added to this polypeptide chain.
ii. Mention the DNA sequence coding for serine and the anticodon of tRNA for the same amino acid.

iii. Why are some untranslated sequence of bases seen in mRNA coding for a polypeptide? Where exactly are they present on mRNA?

18. i. Name the tropical sugarcane variety grown in South India. How has it helped in improving the sugarcane quality grown in North India's.

ii. Identify A, B, and C in the following table.

Crop	Variety	Insect pests
Brassica	Pusa Gaurav	A
Flat bean	Pusa Sem 2, Pusa Sem 3	B
C	Pusa Sawani, Pusa A - 4	Shoot and fruit borer

19. What do you understand by the term biopesticide? Name and explain the mode of action of a popular bio-pesticide.

20. Differentiate between in situ and ex situ approaches of conserving biodiversity.

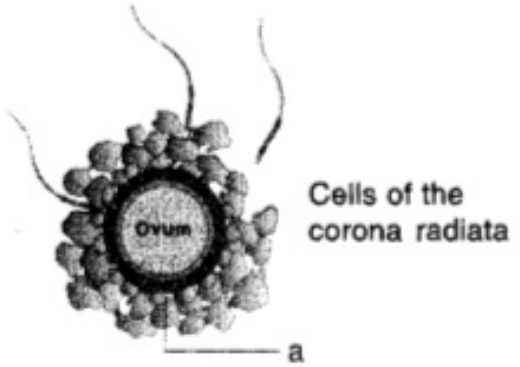
OR

What is a biosphere reserve? Name different zones of the biosphere reserve.

21. Draw a labelled sketch of sparged-stirred tank bioreactor. Write its application.

Section D

22. Given below is the diagram of the sectional view of human ovum just after ovulation:



i. Name the part labelled ‘a’.

ii. What is the function of 'a'?

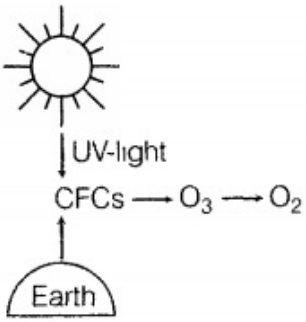
iii. Mention the site of fertilisation in the fallopian tube of the human female where the ovum and sperm meet exactly.

23. Observe the picture related to the discharge of sewage in rivers and answer the following questions:

i. Name the microorganisms involved in the secondary treatment of sewage.

ii. What would happen if a large amount of untreated sewage is discharged into a river?

24. Observe the diagram and answer the following questions:



i. Expand CFC.

ii. How does it reduce ozone to oxygen?

iii. How does CFC affect the ozone layer?

Section E

25. i. Differentiate between dominance and codominance.

ii. Explain codominance taking an example of human blood groups in the population.

OR

How are the structural genes activated in the lac operon in E. coli?

26. Briefly describe various steps involved in plant breeding.

OR

a. Differentiate between active and passive immunity.
b. Comment on the role of vaccination and immunization in keeping the human population healthy.

27. Why is the ozone layer required in the stratosphere? How does it get degraded? Explain.

OR

What is primary productivity? Give brief description of factors that affect primary productivity.

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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

   (d) Saheli
   Explanation: Saheli is oral contraceptive for the female containing non-steroidal preparation with very few side effects and high contraceptive value. It is once a week pill.
2. (a) 30-180 days
   Explanation: Incubation period is the time elapsed between exposure to a pathogenic organism, a chemical, or radiation, and when symptoms and signs are first apparent. The incubation period of the hepatitis B virus is 75 days on average, but can vary from 30 to 180 days. The virus may be detected within 30 to 60 days after infection and can persist and develop into chronic hepatitis B.

   OR

   (a) Serum globulins
   Explanation: One group of gamma globulins is the immunoglobulins, which are also known as antibodies. The serum globulin electrophoresis test measures the levels of proteins called globulins in the fluid part of a blood sample. This fluid is called serum.
3. (d) 2, 3
   Explanation: 2, 3
4. (b) Tungsten
   Explanation: DNA is coated with tungsten before used in biolistic gun for inserting the DNA directly into target cells for obtaining particular protein.
5. (c) genetic diversity

Explanation: Two or more forms of same species is called polymorphism. Coelenterates are of two kinds alternating with each other. Polys forms remain fixed with attached with substratum and medusa forms are free-floating stages.

Section B

6. Bisexual or perfect flowers have both male (androecium) and female (gynoecium) reproductive structures, including stamens and an ovary. Flowers that contain both androecium and gynoecium are called hermaphroditic. Examples. Pea, Mustard, Petunia, tomato, etc.

OR

Polyembryony: Some of the nuclear cells surrounding embryonic sac start to divide an protrude inside the embryonic sack and forms embryo. Occurrence of more than embryo in a seed is called as polyembryony, as in orange.

7. Reproductive health: It means total well-being in all aspects of reproduction i.e., physical, emotional, behavioural and social.
   A society with the people having physically and functionally normal reproductive organs and normal emotional and behavioural interaction among them in all sex-related aspects is called reproductively healthy society.

8. Birds
   (i) Female : Autosomes +ZW
   Male : Autosomes + ZZ
   (ii) Male homogametic, female heterogametic
   Human beings
   Autosomes + XX
   Autosomes + X
   Female homogametic
   Male heerogametic

9. The RNA strand transcribed from the given transcription unit along with its polarity is as follows:
   3'- U-A-C-G-U-A-C-G-U-A-U-G- 5'

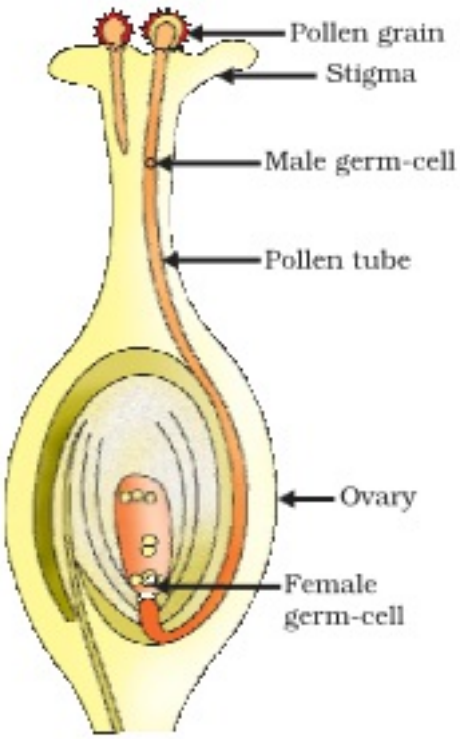
10. Bees are available during flowering periods, as they feed on the edible pollen and nectar of flowers.
    Advantages:
    (a) It increases pollination efficiency and crop yield.
    (b) It also improves honey yield.

11. It is a therapy in which germ cells i.e., sperms or eggs (even zygotes) are modified by the introduction of functional genes which are ordinarily integrated into their genomes. Therefore, the change due to therapy is heritable and passed on to later generations.

12. Because smaller animals have larger surface area relative their volume so they lose body heat very fast when it is cold outside. They have to expense lot of energy to generate body heat.
    Vales
    - Critical thinking
    - Awareness.

Section C

13. i.



ii. Pollen-pistil interaction is mediated by the interaction between chemical components secreted by pollen and those of pistil. So, if the pollen is not of its kind or compatible with stigma, it does not germinate or if germinated, pollen tube cannot grow in the style and the reaction is called pollen-pistil interaction.

iii. The fusion of a male gamete with a female gamete (egg) to form a zygote is called syngamy.

14. Double Fertilisation: - The pollen tube pierces one of the two synergids and releases the two male gametes into the cytoplasm of synergid.
- One of the male gametes moves towards the egg cell and fuses with its nucleus to perform syngamy or true fertilization. It gives rise to a diploid zygote.
- The other male gamete move towards the two polar nuclei of the central cell and fuses with them to produce a triploid primary endosperm nucleus (PEN).
- In flowering plants, two types of fusions occur in the same embryo sac, syngamy and triple fusion. Thus the phenomenon is called double fertilization.
- The central cell after triple fusion becomes the primary endosperm cell (PEC) and develops into the endosperm.

15. Sickle cell anaemia and Down's syndrome Symptoms of Sickle cell anaemia: the RBCs of the sufferer become elongated (sickle shaped) and curved under low O_2 tension.

The sickled RBCs are destroyed more rapidly than the normal ones leading to anaemia. Symptoms of Downs Syndrome: The affected individual is short stature with small round head, furrowed tongue and partially open mouth. Physical and mental development is retarded.

OR

Mendel observed that the alternate forms of a character (trait) could retain their identity in the hybrid, (F_1) reappear and unchanged in the subsequent generations (F_2). Mendel concluded that the factors were transmitted from parents to the offsprings through the gametes. Each factor contained full information about the form of a trait. The factor associated with the trait which is expressed in the hybrid offspring is dominant. The factor associated with the trait which remained unexpressed/hidden in the F_1 but reappears in F_2 is recessive.

16. i. Name of the scientist: Stanley Miller
    ii. Chemicals found in the samples drawn from 'c' - Amino acids, sugars, bases pigments, and fats.
    iii. Miller experiment supports chemical evolution theory i.e. the formation of organic molecules from inorganic constituents. Hence, it helps to solve a major part of the mystery of evolution.
17. i. a to a' is 5' $\rightarrow$ 3'. No more amino acid will be added to this polypeptide chain because of the encounter of stop codon, UAA.
    ii. TCA codes for serine. Anticodon of tRNA for serine is UCA.
    iii. The untranslated regions are required for efficient translation process. They are present before the initiation codon at the 5' end and after the stop/termination codon, at the 3' end.
18. i. 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:
        a. High-yield
        b. Thick stems
        c. High sugar content
        d. Ability to grow in North Indian sugarcane fields.
    ii. A - Aphids
    B - Jassids, aphids and fruit borer
    C - Okra

19. Biopesticide is a pesticide which is

    i. Not chemical in nature.
    ii. More specific in action against the pest.
    iii. Safer for the environment than chemical pesticides.
    A popularly known bio-pesticide is Bt toxin, which is produced by a bacterium called Bacillus thuringiensis. Bt toxin gene has been cloned from this bacterium and expressed in plants. Bt-toxin protein when ingested by the insect,

gets converted to its active form due to the alkaline pH of the gut. The activated toxin binds to the surface of midgut epithelial cells and creates pores that cause cell swelling and lysis and eventually kills the insect.

20.

In situ conservation	Ex situ conservation
1. It means conservation on site. An endangered species is protected in its natural habitat by maintaining the habitat itself and defending the species from predators and poachers.	1. It means off site conservation. An endangered species is protected by removing it from the threatened habitat and placing it under the care of humans.
2. This approach emphasizes on the protection of total ecosystem.	2. This approach restricts to the protection of genetic resources at population and species level.
3. This approach includes methods of protection like establishing hot spots, national parks, wildlife sanctuaries and biosphere reserves.	3. It is done through live collections of animals and plants in zoos, botanical gardens, seed banks, etc.

OR

The biosphere reserve is a special category of a protected area of land and/or coastal environment, wherein people are an integral component of the system. Biosphere reserves are representative examples of natural biomes and contain unique biological communities. They have three zones:

i. Transition zone
ii. Buffer zone
iii. Core area.

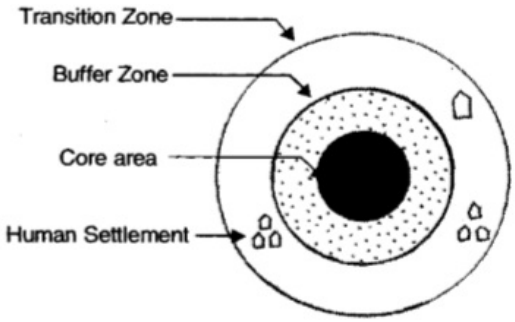
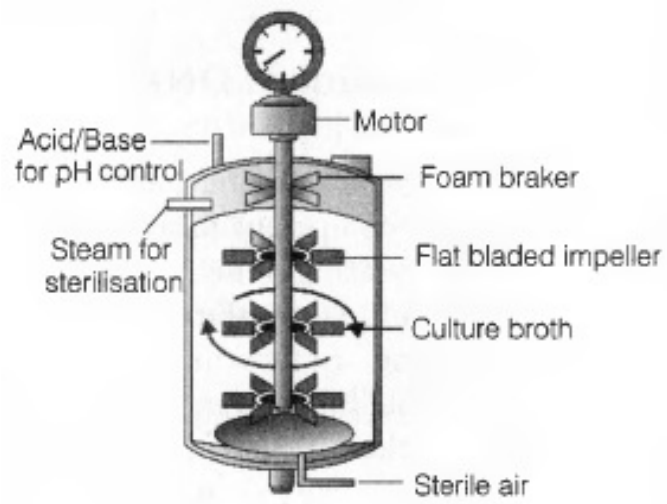


Figure: Different zones of Biosphere Reserve

21.



Application:- sparged-stirred tank bioreactors are used to produce large quantities of products enzymes, etc., using microbial, plant, animal or human cells.

Section D

22. i. The part labelled 'a' is **Zona Pellucida.**
    ii. **The function of 'a':** It is an inner, thick and non-cellular layer, which gets digested by acrosin secreted by sperm, to help its entry inside the egg. After penetration of sperm, Zona pellucida becomes harden due to cortical reaction, to prevent the entry of additional sperms.
    iii. The fertilization takes place mostly in the ampullary-isthmic junction of the fallopian tube (oviduct).
23. i. *Micrococcus*, *Coliform*, *Pseudomonas*, *Closteridium*, etc.
    ii. Untreated sewage contains large amounts of organic matter and microbes, many of which are pathogenic. So the consumption of such water by humans and useful animals increases the chances of spread of a number of water-borne diseases like cholera, diarrhoeal diseases, typhoid etc.
    Presence of high amounts of organic wastes in water increases the Biochemical

Oxygen Demand (BOD) while decreases the Dissolved Oxygen (DO) which causes the death of aquatic animals like fishes.

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. i. Difference between dominance and codominance is as follows

Dominance	Codominance
Out of the two contrasting alleles of a gene, only one can produce an effect in heterozygous condition, e.g. a trait of tallness in pea plants.	Both the alternative forms of a gene can produce an effect in heterozygous condition, e.g. ABO blood grouping in humans.

ii. Codominance is the inheritance of a trait where two different dominant alleles of a trait express themselves simultaneously in the progeny. For example, ABO blood groups in the human population

a. Gene 'T' for blood group exhibits three allelic forms, l e. I^A, I^B and i.

b. I^A and I^B produce RBC surface antigen A and B respectively, whereas 'i' does not produce any antigen.

c. I^A and I^B are codominant alleles, and they both are dominant over 'i' which is a recessive allele.

d. In case I^A and I^B are present together, both express themselves equally and produce both surface antigen A and B. The resultant offspring is of 'AB' blood type.

OR

In the lac-operon in E.coli, three structural genes z, y and a are present. These genes

code for different polypeptides, z-gene codes for beta-galactosidase to break lactose into galactose and glucose, y-zene codes for permease which facilitates entry of lactose and the a-gene codes or transacetylase. Presence or absence of lactose in the cell regulates switch on or off operon and is termed **inducer**. The lactose in the cell combines with the repressor protein synthesised by i-gene to form inactive repressor which does not bind to operator gene and the RNA polymerase from promoter gene moves to the structural genes to help in transcription. In the absence of lactose, the repressor binds to the operator gene and RNA polymerase cannot move from promoter gene, and thus there is no transcription.

26. **Steps in plant breeding:**
(i) Collection of variability: Collection and preservation of all the different wild varieties, species and relatives of the
cultivated species is a prerequisite for effective exploitation of natural genes available in the populations.
The entire collection (of plants / seeds) having all the diverse alleles for all genes in a given crop is called germplasm collection.
(ii) Evaluation and selection of parents: The germplasm is evaluated so as to identify plants with desirable combination of characters.
The selected plants are multiplied and used in the process of hybridization. Pure lines are created wherever desirable and possible.
(iii) Cross hybridization among the selected parents: The desired characters have very often to be combined from two
different plants (parents), for example high protein quality of one parent may need to be combined with disease resistance from another parent.
This is possible by cross hybridizing the two parents to produce hybrids that genetically combine the desired characters in one plant.
(iv) Selection and testing of superior recombinants : This step consists of selecting, among the progeny of the hybrids, those plants
that have the desired character combination. The selection process is crucial to the success of the breeding objective and requires careful
scientific evaluation of the progeny. This step yields plants that are superior to both of the parents (very often more than one superior progeny plant may become available). These are self pollinated for several generations till they reach a state of uniformity

(homozygosity), so that the characters will not segregate in the progeny.

(v) Testing, release and commercialization of new cultivars: The newly selected lines are evaluated for their yield and other agronomic traits of quality, disease resistance, etc. This evaluation is done by growing these in the research fields and recording their performance under ideal fertilizer application irrigation, and other crop management practices. The evaluation in research fields is followed by testing the materials in farmers' fields, for at least three growing seasons at several locations in the country, representing all the agroclimatic zones where the crop is usually grown. The material is evaluated in comparison to the best available local crop cultivar - a check or reference cultivar.

OR

a.

Active immunity	Passive immunity
Production of antibodies on exposure to antigen in the host body	Introduction of readymade antibodies to protect against the pathogen
Slow process and takes time to give a fully effective response	T lymphocyte production is fast and responds quickly by checking the growth of the pathogen
Natural infection induces active immunity	Inoculation of a pathogen in other organisms synthesizes antibodies which are isolated and used for vaccination

b. Vaccination and immunization keep the human population healthy as it helps in neutralizing the effect of pathogenic agents by producing a massive response against the particular pathogen. They do so because-
- Vaccines generate memory cell (B and T cells) that recognize quickly on subsequent exposure and controls growth of pathogen with massive production of antibodies.
- Preformed antibodies/ antitoxin protect our body from deadly microbes like tetanus and against snake venom.

27. Ozone formed in the troposphere is bad ozone' as it acts as an air pollutant and harms plants and animals. Ozone formed in the upper part of the atmosphere called stratosphere is 'good ozone'.
It acts as a shield absorbing UV radiations from the sun.
Ozone gas is continuously formed by the degrade it into nascent oxygen and the two combine to form ozone in the stratosphere.

$$O_2 \xrightarrow{UV} \underset{\text{Nascent oxygen}}{[O] + [O]}$$

$$O_2 + O \longrightarrow O_3$$

UV rays further cause photodissociation of ozone into O_2 and [O] but the two combine to produce O_3 again.

$$O_3 \xrightarrow{UV} O_2 + [O]$$

$$O_2 + [O] \xrightarrow{UV\ radiations} O_3$$

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).

OR

Primary production is the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis.
Factors: Primary productivity depends upon sunlight, temperature, moisture, nutrients and photosynthetic efficiency of producers.
(1) Sunlight: Maximum sunlight is available in tropics. There is a progressive reduction of its availability towards the poles. Therefore more photosynthesis and high productivity occurs in tropics. It decreases progressively towards the poles.
(2) Temperature: Temperate forests have lesser productivity as compared to tropical forests due to cold climate during winter.
(3) Nutrients: A regular availability of nutrients is required for sustaining plant growth and productivity of an ecosystem.