

**Solved Question Paper 2018
Rajasthan Board Class 12
Subject - Biology**

Total Time: 3h 15min

Maximum Marks: 56

Section – A

1. Define apomixis.

Answer.

Apomixis is a mechanism to produce seeds without fertilization. This mechanism produces clones, hence can be considered as a form of asexual reproduction.

2. Write the name of gonadotropin hormone.

Answer.

FSH-Follicle-stimulating hormone, HCG-human chorionic gonadotropin, ICSH-Interstitial cell-stimulating hormone, LH-luteinizing hormone.

3. What is point Mutation?

Answer.

Point mutation is a change in a single base pair of DNA by substitution, deletion, or insertion of a single nitrogenous base.

4. Name the chromosomal disorder which is caused by the presence of an additional copy of the chromosome number 21.

Answer.

Down's syndrome.

5. The brain capacities of which man were between 650-800 cc in course of human evolution?

Answer.

Homo habilis.

6. Name the disease caused by the Protozoan 'Entamoeba histolytica'.

Answer.

Amebiasis is a disease caused by infection with protozoan parasite *Entamoeba histolytica*.

7. When ready-made antibodies are directly given to protect the body then the immunity is called?

Answer.

Passive immunity.

8. Define inbreeding?

Answer.

When breeding is between animals of the same breed it is called inbreeding. It generally refers to the mating of more closely related individuals within the same breed for 4-6 generations.

9. Name the first Restriction Endonuclease.

Answer.

HindII is the first Restriction Endonuclease.

10. Name the test which is based on the principle of the Antigen-Antibody interaction.

Answer.

ELISA technique is based on the principles of antigen-antibody interaction, used for diagnosis of AIDS.

11. Define Biopiracy?

Answer.

Biopiracy refers to the use of bioresources by multinational companies and other organisations without proper authorisation from people and countries concerned.

12. Write any one illeffect of deforestation.

Answer.

One major effect of deforestation is the enhanced concentration of carbon dioxide in atmosphere. Other ill effect of deforestation is loss of biodiversity due to their habitat destruction.

13. Write name of any two greenhouse gases.

Answer.

Names of green house gases are:

1. Carbon dioxide (CO₂)
2. Methane (CH₄)
3. Nitrous oxide (N₂O)
4. Chlorofluorocarbons (CFCs)

Section – B

14. Write the difference between unisexual and bisexual animal. Give one example of each.

Answer.

Unisexual organisms are organisms that have one type of sex orgAnswer. For example, human- males and females have different sex orgAnswer.

Bisexual organisms are organisms that have both the sex orgAnswer. For example, leech and earthworms.

OR

14. Define Asexual reproduction. Give name of two methods of asexual reproduction.

Answer.

Asexual reproduction is that type of reproduction in which only single parent is involved. Asexual reproduction takes place by following methods: (Any Two)

1. Spore formation
2. Fission
3. Vegetative Reproduction
4. Budding

5. Fragmentation

15. What will be effect on embryonic development if Placenta does not form after implantation. Explain.

Answer.

Placenta acts as a life support system for the developing fetus. It supplies blood and nutrition to the fetus. It also protects the fetus from harmful bacteria and infections. Problems with the placenta can affect the developing baby's growth. The baby cannot grow and develop normally in the womb if it does not get enough oxygen and nutrients. This increases the chances of complications during pregnancy and delivery.

16. What is sexually transmitted disease? What principles should be followed to free from these infections?

Answer.

Diseases or infections which are transmitted through sexual intercourse are collectively called sexually transmitted diseases (STD). Gonorrhoea, syphilis, genital herpes, genital hepatitis-B and AIDS are some of the common STDs.

Following are the principles which should be followed to free from these infections:

- Avoid sex with unknown partners/multiple partners.
- Always use condoms during coitus.

17. Write polarity of template strand and coding strand. Write three regions of transcription unit of DNA.

Answer.

DNA has a plus strand and a complementary minus strand. The plus strand is called the sense strand, or the coding strand. The minus strand is called the anti-sense strand, or the template strand. It is called the template strand because it is the strand that RNA polymerase uses as a template. The resulting mRNA is complementary to the template strand so its polarity is positive. This means the 5' is the left most nucleotide and the 3' is rightmost.

All the reference point while defining a transcription unit is made with coding strand. To explain the point, a hypothetical sequence from a transcription unit is represented below:

3'-ATGCATGCATGCATGCATGC-5' Template Strand

5'-TACGTACGTACGTACGTACGTACG-3' Coding Strand

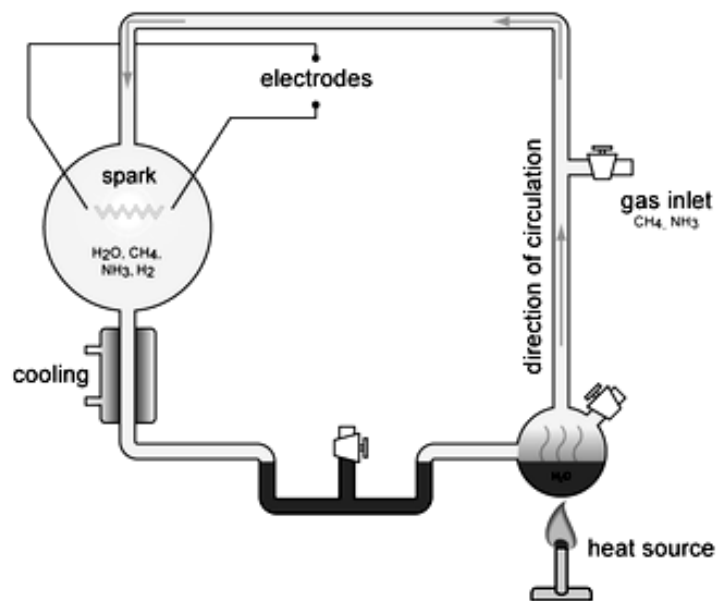
Three regions of transcription unit of DNA are:

- (i) A Promoter
- (ii) The Structural gene
- (iii) A Terminator

18. Describe the Miller's experiment related to origin of life.

Answer.

The Miller's experiment was a chemical experiment that simulated the conditions thought at the time to be present on the early Earth, and tested the chemical origin of life under those conditions. He created electric discharge in a closed flask containing CH_4 , H_2 , NH_3 and water vapour at 800°C . He observed formation of amino acids. In similar experiments others observed, formation of sugars, nitrogen bases, pigment and fats. Analysis of meteorite content also revealed similar compounds indicating that similar processes are occurring elsewhere in space. The first noncellular forms of life could have originated 3 billion years back. They would have been giant molecules (RNA, Protein, Polysaccharides, etc.).



19. Mother's milk is considered very essential for the newborn infant explain with reason.

Answer.

During the first few days after delivery, the breasts produce colostrum. It is rich in protein and antibodies that provide passive immunity to the baby (the baby's immune system is not fully developed at birth). Colostrum also helps the newborn's digestive system to grow and function properly. That is why, mother's milk is considered very essential for the newborn infant.

20. Explain the interspecific hybridization with example.

Answer.

In this method, male and female animals of two different related species are mated. In some cases, the progeny may combine desirable features of both the parents, and may be of considerable economic value. For example, mule.

21. Write any two uses of genetically modified plants.

Answer.

Plants, bacteria, fungi and animals whose genes have been altered by manipulation are called Genetically Modified Organisms (GMO). GM plants have been useful in many ways. Genetic modification has: (i) Made crops more tolerant to abiotic stresses (cold, drought, salt, heat). (ii) Reduced reliance on chemical pesticides (pest-resistant crops). (iii) Helped to reduce post-harvest losses. (iv) Increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil). (v) Enhanced nutritional value of food, e.g., Vitamin 'A' enriched rice.

22. Explain four basic process which affect the population density.

Answer.

The density of a population in a given habitat during a given period, fluctuates due to changes in four basic processes

- (i) The number of births during a given period in the population that are added to the initial density.
- (ii) Mortality rate which is the number of deaths in the population during a given period.
- (iii) The number of individuals of the same species that have come into the habitat from elsewhere during the time period under consideration.

(iv) The number of individuals of the population who left the habitat and gone elsewhere during the time period under consideration.

23. Explain Commensalism and Mutualism with example.

Answer.

Commensalism: It is a type of relationship where one of the organisms benefits greatly from the symbiosis. The other is not helped but is not harmed or damaged from the relationship. In other words, this is a one-sided symbiotic relationship.

Example: The relationship between cattle egrets and cattle. The cattle egret will eat insects that have been disturbed when the cattle forage.

Mutualism: Mutualism is a symbiotic relationship in which both species benefit.

Example: Relationship between fungi and the roots of higher plants. The fungi help the plant in the absorption of essential nutrients from the soil while the plant in turn provides the fungi with energy-yielding carbohydrates.

24. Explain any two reasons which causes the losses of biodiversity.

Answer.

Below are given the most prominent causes of biodiversity losses (Any Two):

(i) **Habitat loss and fragmentation:** This is the most important cause driving animals and plants to extinction. The most dramatic examples of habitat loss come from tropical rain forests. They are being destroyed fast.

(ii) **Over-exploitation:** Humans are dependent on nature for food and shelter, but the increased level of living standard and the increased population has lead to over-exploitation of natural resources. This over-exploitation has come out to be the reason of extinction of many species in the last 500 years.

(iii) **Alien species invasions:** When alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive, and cause decline or extinction of indigenous species. The Nile perch introduced into Lake Victoria in east Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake.

(iv) Co-extinctions: When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct. When a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate.

Section – C

25. Define pollination. Explain wind and water pollination with example.

Answer.

The process of transfer of the pollen from the anther to the stigma is known as pollination.

Wind pollination: In this type of pollination, pollen grains are carried by wind from anther to stigma. Wind pollination is very commonly seen in grasses. Characteristics of a plant pollinated by wind are:

- Light pollen grains
- Non-sticky pollen grains
- Well-exposed stamens
- Large, feathery stigma

Water pollination: Here pollen grains are transferred with the help of moving water. Water pollination can occur in a number of ways:

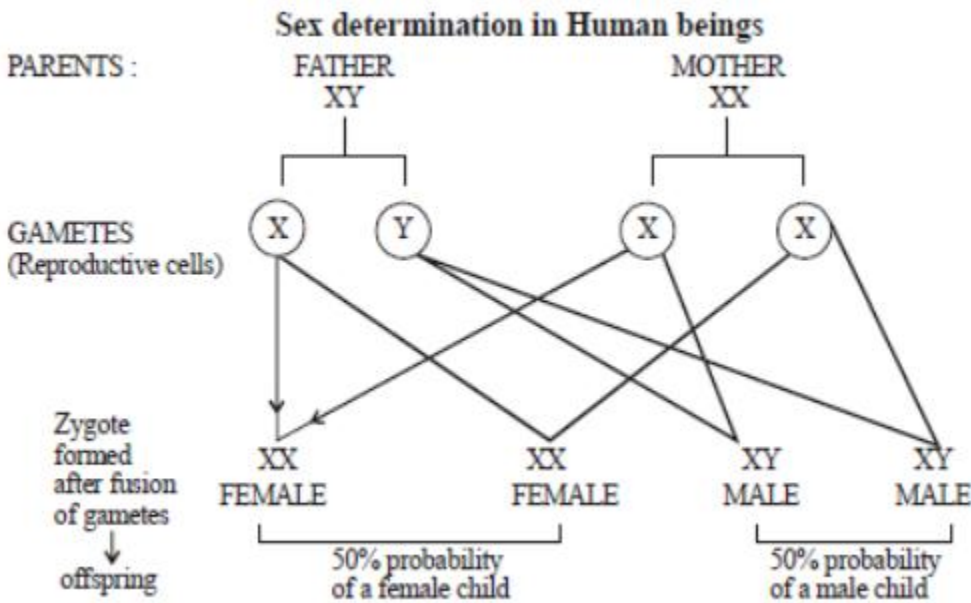
- Water acts as a medium for gamete transfer in lower plants. Example: bryophytes
- Female flowers reach the water surface by a stalk where male gametes were already released. Example: Vallisneria
- Male gametes are released inside water where flowers remain. Example: Seagrass

26. Explain sex determination in humans with line diagram.

Answer.

A sex chromosome that carries the genes for male characters is called Y chromosome and one which carries the genes for female characters is called X chromosome. We have a total of 46 chromosomes. Half of them come from the mother and the rest, from the father. Out of these 46 chromosomes, 44 are autonomies and 2 are sex chromosomes. The sex chromosomes are not always a perfect pair. In females there are 44 autonomies and two X chromosomes, in males there are 44 autonomies, one X chromosome and one Y chromosome. So the chromosomes in woman are 44 + XX, while the chromosomes in man are 44 + XY.

During gamete formation, the normal diploid chromosome number is halved. This is called the haploid condition. All the eggs of a female have 22 + X chromosomes. A male produces two types of sperms—one type bears the 22 + X composition and the other, 22 + Y. In case, the ovum fertilizes with the sperm carrying X chromosomes the Zygote develops into female ('XX') and with 'Y' chromosomes the zygote results into male offspring(XY).



27. Write the types of restriction enzyme. “Synthesis of recombinant DNA molecule is possible only when the vector and source DNA is cut by the same restriction enzyme” explain reason.

Answer.

Restriction endonucleases are a class of enzyme that cut DNA molecules. Restriction enzymes belong to a larger class of enzymes called nucleases. These are of two kinds:

I. Exonucleases remove nucleotides from the ends of the DNA.

II. Endonucleases make cuts at specific positions within the DNA.

There are four classes of restriction endonucleases: Types I, II, III and IV. All types of enzymes recognize specific short DNA sequences and carry out the endonucleolytic cleavage of DNA to give specific double-stranded fragments with terminal 5'-phosphates. They differ in their recognition sequence, subunit composition, cleavage position, and cofactor requirements.

“Synthesis of recombinant DNA molecule is possible only when the vector and source DNA is cut by the same restriction enzyme”

Explanation: Restriction enzymes cut the strand of DNA a little away from the centre of the palindrome sites, but between the same two bases on the opposite strands. This leaves single stranded portions at the ends. There are overhanging stretches called sticky ends on each strand. These are named so because they form hydrogen bonds with their complementary cut counterparts. This stickiness of the ends facilitates the action of the enzyme DNA ligase. Restriction endonucleases are used in genetic engineering to form ‘recombinant’ molecules of DNA, which are composed of DNA from different sources/genomes. When cut by the same restriction enzyme, the resultant DNA fragments have the same kind of ‘sticky-ends’ and, these can be joined together (end-to-end) using DNA ligases. Normally, unless one cuts the vector and the source DNA with the same restriction enzyme, the recombinant vector molecule cannot be created.

OR

27. Define recombinant DNA. Explain any two methods of introducing alien DNA into host cell.

Answer.

Recombinant DNA is a molecule of DNA that has been modified, either through genetic recombination or through laboratory techniques.

Methods of introducing alien DNA into host cell are explained below (any two):

Electroporation: Since DNA is a hydrophilic molecule, it cannot pass through cell membranes. In order to force bacteria to take up the plasmid, the bacterial cells must first be made ‘competent’ to take up DNA. This is done by treating them with a specific concentration of a divalent cation, such as calcium, which increases the efficiency with which DNA enters the bacterium through pores in its cell wall. Recombinant DNA can then be forced into such cells by incubating the cells with recombinant DNA on ice, followed by placing them briefly at 42°C (heat shock), and then putting them back on ice. This enables the bacteria to take up the recombinant DNA.

Micro-injection: Recombinant DNA is directly injected into the nucleus of an animal cell.

Biolistics or Gene gun: In another method, suitable for plants, cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA in a method known as biolistics or

gene gun. And the last method uses 'disarmed pathogen' vectors, which when allowed infecting the cell, transferring the recombinant DNA into the host.

Section – D

28. (i) What is transcription?

(ii) Describe the structure and function of Lac operon.

(iii) Draw a labelled diagram of replicating fork.

Answer.

(i) Transcription: The process of copying genetic information from one strand of the DNA into RNA is termed as transcription.

(ii) Lac operon:- (Here lac refers to lactose), a polycistronic structural gene is regulated by a common promoter and regulatory genes. Such arrangement is very common in bacteria and is referred to as operon.

The lac operon consists of:

(a) One regulatory gene (the i gene – here the term i derived from the word inhibitor) and

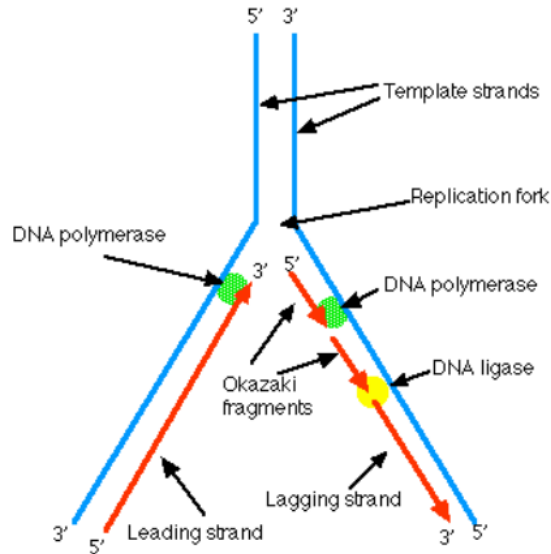
(b) Three structural genes (z, y, and a).

Functions:-

- The i gene codes for the repressor of the lac operon.
- The z gene codes for beta-galactosidase (β -gal), which is primarily responsible for the hydrolysis of the disaccharide, lactose into its monomeric units, galactose and glucose.
- The y gene codes for permease, which increases permeability of the cell to β -galactosides.
- The a gene encodes a transacetylase.

Hence, all the three gene products in lac operon are required for metabolism of lactose. In most other operons as well, the genes present in the operon are needed together to function in the same or related metabolic pathway.

(iii) Labelled Diagram of replication fork:



OR

28. (i) What is genetic code?

(ii) Write four salient features of genetic code.

(iii) Draw a labelled diagram of t-RNA-the adapter molecule.

Answer.

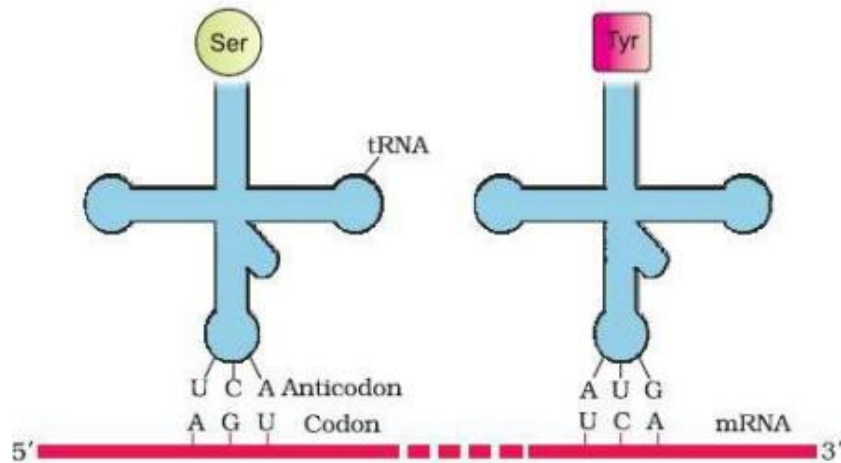
(i) Genetic code: Genetic code, the sequence of nucleotides in deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) that determines the amino acid sequence of proteins.

(ii) Salient features of genetic code are:

- Each codon is a triplet of bases. There are 64 codons in total, of which 61 code for amino acids while 3 act as stop codons during translation.
- One codon codes for only one amino acid. Therefore, it is specific and unambiguous.
- Some amino acids are coded for by more than one codon. For example, GUU, GUC, GUA, and GUG – all code for valine (Val). Therefore, the code is degenerate.
- The codons on the mRNA are read in a continuous manner, without any punctuations.

- The genetic code is universal i.e. from bacteria to humans, the code UUU refers to phenylalanine (Phe). However, there are some exceptions to this rule, such as mitochondrial codons.

(iii) Labelled diagram of t-RNA (the adapter molecule):-



29. (i) Define antibiotic.

(ii) Name the fungus which are treated by antibiotics.

(iii) Name the two disease which treated by antibiotics.

(iv) Draw a labelled diagram of bacteriophage.

Answer.

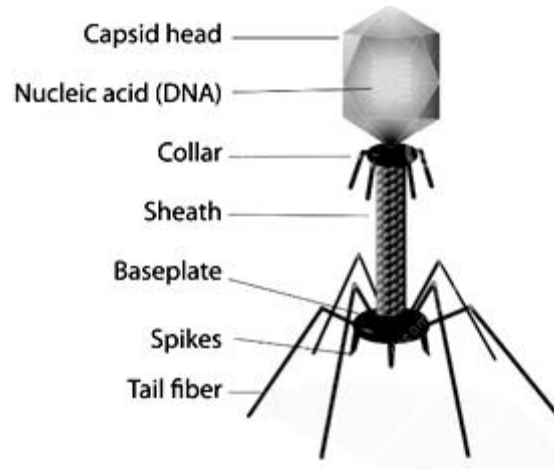
(i) Antibiotics are chemical substances, which are produced by some microbes the growth of other (disease-causing) microbes.

(ii) Fungus which are treated by antibiotics are *Penicilliumnotatum*.

(iii) Following diseases are treated by antibiotics (any two):

- Plague
- Whooping cough (kali khansi)
- Diphtheria (gal ghotu) and
- Leprosy (kushtrug)

(iv) Labelled diagram of bacteriophage:



OR

29. (i) What is fermentor?

(ii) Which microbes is used for commercial production of lactic acid.

(iii) Name two bacteria which are used as biofertilizer.

(iv) Draw a labelled diagram of typical biogas plant.

Answer.

(i) Fermentors: These are the vessels in which raw materials are biologically converted into specific products, using microbial, plant, animal or human cells or individual enzymes. Role. A fermentor provides the optimal conditions for achieving the desired product by providing optimum growth conditions like temperature, pH, substrate, salts, vitamins, oxygen.

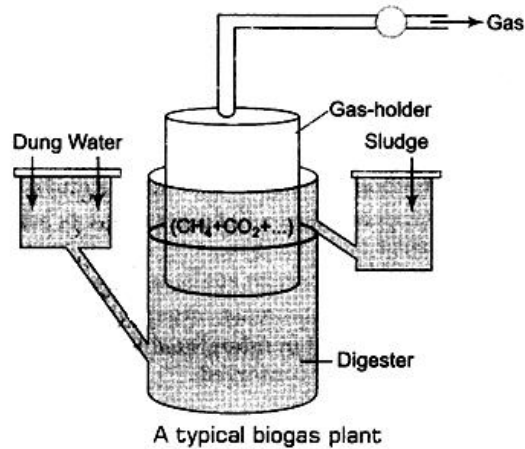
(ii) Lactobacillus (a bacterium) is used for commercial production of lactic acid.

(iii) Bacteria used as biofertilizers are:

(a) Rhizobium

(b) Azotobacter

(iv) Labelled diagram of typical biogas plant:



30. (i) Define ecosystem.

(ii) Describe different components of ecosystem in brief.

(iii) Give a diagrammatic representation of trophic levels in an ecosystem.

Answer.

(i) Ecosystem: An ecosystem can be visualised as a functional unit of nature, where living organisms interact among themselves and also with the surrounding physical environment. Ecosystem varies greatly in size from a small pond to a large forest or a sea

(ii) The structural component of an ecosystem may be classified under two main types:

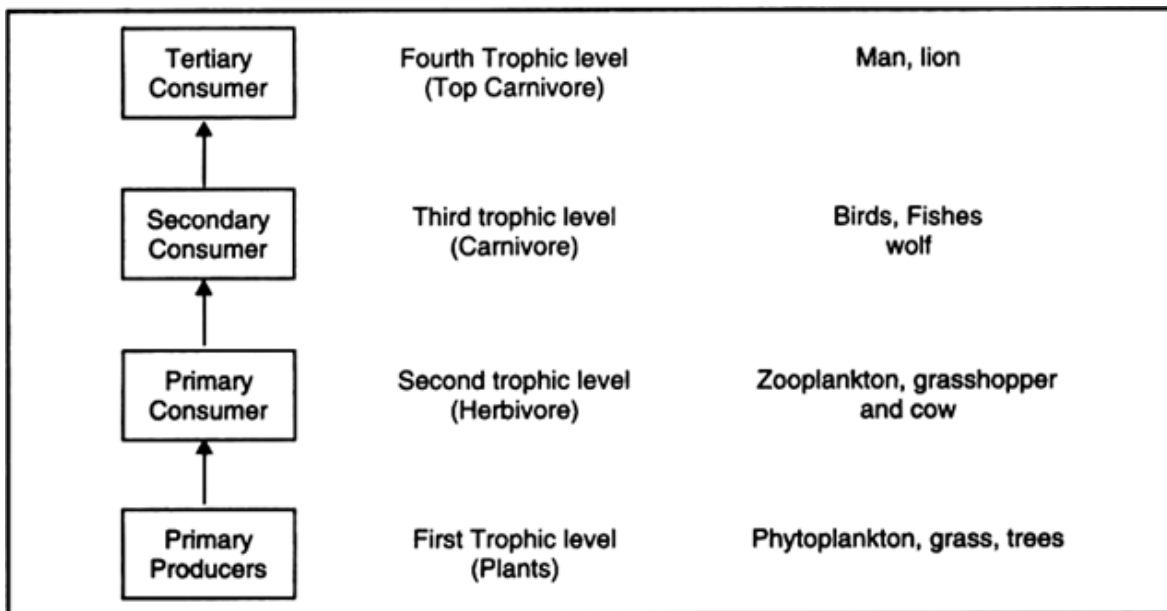
- Biotic components
- Abiotic components

Biotic components comprise the living organisms present in an ecosystem. These include plants, animals and micro-organisms (bacteria and fungi). The biotic component of an ecosystem has been classified into three groups:

1. Producers (Green plants)
2. Macro consumers (Usually animals)
3. Micro consumers or decomposers (organisms like bacteria and fungi).

Abiotic components consist of the non-living components like light, temperature, water, oxygen, carbon, nitrogen and minerals. Various important abiotic factors have been classified as follows:

1. Climatic factors. These include light, temperature, precipitation, atmospheric humidity and wind.
 2. Topographic factors. These include altitude, surface slope and exposure, etc.
 3. Edaphic factors. These include soil and substratum.
- (iii) Diagrammatic representation of trophic levels in an ecosystem:



OR

30. (i) What is primary production?
- (ii) Explain energy flow in ecosystem.
- (iii) Give a diagrammatic representation of energy flow through different trophic levels.

Answer.

(i) Primary production: Primary production is defined as the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis. It is expressed in terms of $\text{gm}^{-2}\text{yr}^{-1}$ or $\text{kcal m}^{-2} \text{yr}^{-1}$.

(ii) Energy flow in ecosystem:

- We know that plants and photosynthetic bacteria (autotrophs), fix suns' radiant energy to make food from simple inorganic materials. Plants capture only 2-10 per cent of the PAR and this small amount of energy sustains the entire living world.
- All organisms are dependent for their food on producers, either directly or indirectly. So we find unidirectional flow of energy from the sun to producers and then to consumers.
- The green plants in the ecosystem terminology are called producers.

When the light energy falls on the green surfaces of plants, a part of it is transformed into chemical energy which is stored in various organic products in the plants as food and converts chemical energy accumulated in plant products into kinetic energy, degradation of energy will occur through its conversion into heat. When herbivores are consumed by carnivores of the first order further degradation will occur. Similarly, when primary carnivores are consumed by top carnivores, again energy will be degraded.

(iii) Diagrammatic representation of energy flow through different trophic levels:

