



QUESTIONS & ANSWER-KEY

SUBJECT: - BIOLOGY

PAPER CODE- SS-42-BIO

SECTION-A

Q.1 Define apomixis.

Ans. A few flowering plants such as some species of Asteraceae and grasses, have evolved a special mechanism, to produce seeds without fertilisation, called apomixis. Apomixis is a form of asexual reproduction that mimics sexual reproduction. There are several ways of development of apomictic seeds. In some species, the diploid egg cell is formed without reduction division and develops into the embryo without fertilisation.

Q.2 Write the name of gonadotropin hormone.

Ans. **Gonadotrophic hormone** - hormone secreted by the anterior pituitary gland and placenta; stimulates the gonads and controls reproductive activity
FSH-Follicle-stimulating hormone
HCG-human chorionic gonadotropin, human chorionic gonadotropin
ICSH-Interstitial cell-stimulating hormone, LH-luteinizing hormone
Lactogenic hormone, prolactin

Q.3 What is point Mutation?

Ans. **Point mutation**, change within a gene in which one base pair in the DNA sequence is altered. Point mutations are frequently the result of mistakes made during DNA replication, although modification of DNA, such as through exposure to X-rays or to ultraviolet radiation, also can induce point mutations.

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

Ans. Down's syndrome

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

Ans. Homo habilis

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

Ans. Amoebiasis, also known as amoebic dysentery, is caused by Entamoeba histolytica.

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

Ans. Passive immunity.

Q.8 Define inbreeding?

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

Q.9 Name the first Restriction Endonuclease.

Ans. HIND II.

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

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

Q.11 Define Biopiracy?

Ans. The commercial development of naturally occurring biological materials, such as plant substances by a technologically advanced organization without fair compensation to the peoples or nations in whose territory the materials were originally discovered.

Q.12 Write any one illeffect of deforestation.

Ans. One of the major effects is enhanced carbon dioxide concentration in the atmosphere because trees that could hold a lot of carbon in their biomass are lost with deforestation. Deforestation also causes loss of biodiversity due to habitat destruction, disturbs hydrologic cycle, causes soil erosion, and may lead to desertification in extreme cases.

Q.13 Write name of any two greenhouse gases.

Ans. Greenhouse gases are those that absorb and emit infrared radiation in the wavelength range emitted by Earth. Most abundant greenhouse gases in Earth's atmosphere are:

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

SECTION-B

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

OR

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

Ans. Unisexual: - Species either having male or female reproductive organs. Ex- Cockroach

Bisexual: - Species which possess both the reproductive organs. Ex- Earthworms, Sponge, leech

OR

In this method, a single individual (parent) is capable of producing offspring. As a result, the offspring that are produced are not only identical to one another but are also exact copies of their parent.

Methods: - (Any Two)

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

Q.15 What will be effect on embryonic development if Placenta does not formed after implantation explain.

Ans. The placenta is a highly complex biological organ. It allows blood to flow from mother to baby, and back again. The mother's blood and the baby's blood are filtered through the placenta, but they never actually mix. The placenta has an important role in hormone production as well. 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.

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

Ans. Diseases or infections which are transmitted through sexual intercourse are collectively called sexually transmitted diseases (STD) or venereal diseases (VD) or reproductive tract infections (RTI). Gonorrhoea, syphilis, genital herpes, chlamydia, genital warts, trichomoniasis, hepatitis-B and of course, the most discussed infection in the recent years, HIV leading to AIDS are some of the common STDs:

One could be free of these infections by following the simple principles given below:

(i) Avoid sex with unknown partners/multiple partners.

(ii) Always use condoms during coitus.

(iii) In case of doubt, one should go to a qualified doctor for early detection and get complete treatment if diagnosed with disease.

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

Ans. There is a convention in defining the two strands of the DNA in the structural gene of a transcription unit. Since the two strands have opposite polarity and the DNA-dependent RNA polymerase also catalyse the polymerisation in only one direction, that is, 5' to 3',

The strand that has the polarity 3' to 5' acts as a template, and is also referred to as **template strand**. The other strand which has the polarity (5' to 3') and the sequence same as RNA (except thymine at the place of uracil), is displaced during transcription. Strangely, this strand (which does not code for anything) is referred to as **coding strand**.

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'-TACGTACGTACGTACGTACG-3' **Coding Strand**

A transcription unit in DNA is defined primarily by the three regions in the DNA:

(i) A Promoter

(ii) The Structural gene

(iii) A Terminator

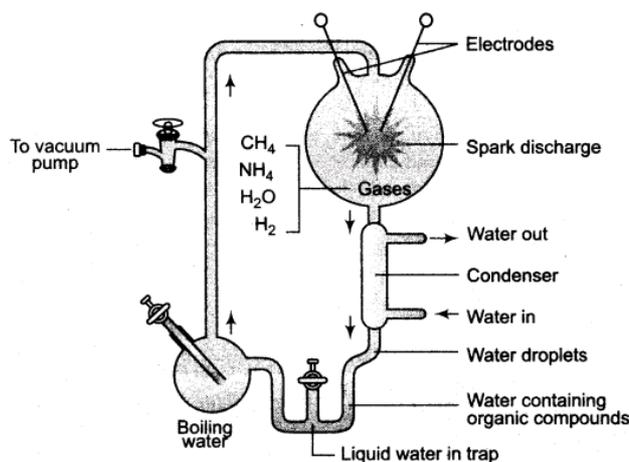
Q.18 Describe the Miller's experiment related to origin of life.

Ans. Miller's experiment related to origin of life:

In 1953, S.L. Miller, an American scientist created similar conditions in a laboratory scale.

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. With this limited evidence, the first part of the conjectured story, i.e., chemical evolution was more or less accepted.

We have no idea about how the first self-replicating metabolic capsule of life arose. The first non-cellular forms of life could have originated 3 billion years back. They would have been giant molecules (RNA, Protein, Polysaccharides, etc.).



Diagrammatic representation of Miller-Urey experiment

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

Ans. The mammary glands of the female undergo differentiation during pregnancy and starts producing milk towards the end of pregnancy by the process called lactation. This helps the mother in feeding the newborn.

The milk produced during the initial few days of lactation is called colostrum which contains several antibodies absolutely essential to develop resistance for the new-born babies. Breast-feeding during the initial period of infant growth is recommended by doctors for bringing up a healthy baby.

Q.20 Explain the interspecific hybridization with example.

Ans. Interspecific hybridisation: 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, e.g., mule

Q.21 Write any two uses of genetically modified plants.

Ans. 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.

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

Ans. The density of a population in a given habitat during a given period, fluctuates due to changes in four basic processes, two of which (natality and immigration) contribute to an increase in population density and two (mortality and emigration) to a decrease.

(i) **Natality** refers to the number of births during a given period in the population that are added to the initial density.

(ii) **Mortality** is the number of deaths in the population during a given period.

(iii) **Immigration** is the number of individuals of the same species that have come into the habitat from elsewhere during the time period under consideration.

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

Q.23 Explain Commensalism and Mutualism with example.

Ans. Commensalism: This is the interaction in which one species benefits and the other is neither harmed nor benefited. An orchid growing as an epiphyte on a mango branch, and barnacles growing on the back of a whale benefit while neither the mango tree nor the whale derives any apparent benefit.

Mutualism: This interaction confers benefits on both the interacting species. Lichens represent an intimate mutualistic relationship between a fungus and photosynthesising algae or cyanobacteria. Similarly, the mycorrhizae are associations 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.

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

Ans. Causes of biodiversity losses (Any Two): The accelerated rates of species extinctions that the world is facing now are largely due to human activities.

There are four major causes:

[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. The Amazon rain forest (it is so huge that it is called the 'lungs of the planet') harbouring probably millions of species is being cut and cleared for cultivating *soya beans* or for conversion to grasslands for raising beef cattle. Besides total loss, the degradation of many habitats by pollution also threatens the survival of many species.

[ii] Over-exploitation: Humans have always depended on nature for food and shelter, but when 'need' turns to 'greed', it leads to over-exploitation of natural resources. Many species extinctions in the last 500 years (Steller's sea cow, passenger pigeon) were due to overexploitation by humans. Presently many marine fish populations around the world are over harvested, endangering the continued existence of some commercially important species.

[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. We must be familiar with the environmental damage caused and threat posed to our native species by invasive weed species like carrot grass (*Parthenium*), *Lantana* and water hyacinth (*Eicchornia*). The recent illegal introduction of the African catfish *Clarias gariepinus* for aquaculture purposes is posing a threat to the indigenous catfishes in our rivers.

[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. Another example is the case of a coevolved plant-pollinator mutualism where extinction of one invariably leads to the extinction of the other.

SECTION-C

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

Ans. The process of transfer of the pollen from the anther to the stigma is known as **pollination**. **Anemophily** or **wind pollination** is a form of pollination whereby pollen is distributed by wind. Almost all gymnosperms are anemophilous, as are many plants in the order Poales, including grasses, sedges and rushes. Other common anemophilous plants are oaks, sweet chestnuts, alders and members of the family Juglandaceae (hickory or walnut family).

1. Have brightly coloured petals to attract insects
2. Have a strong smell to attract insects
3. Usually contain nectar to attract insects

Water pollination is also termed as hydrophily and mode of pollination is water. It is quite rare in flowering plants and is limited to about 30 genera, mostly monocotyledons.

Example: *Vallisneria*, *Hydrilla*

Q.26 Explain sex determination in humans with line diagram.

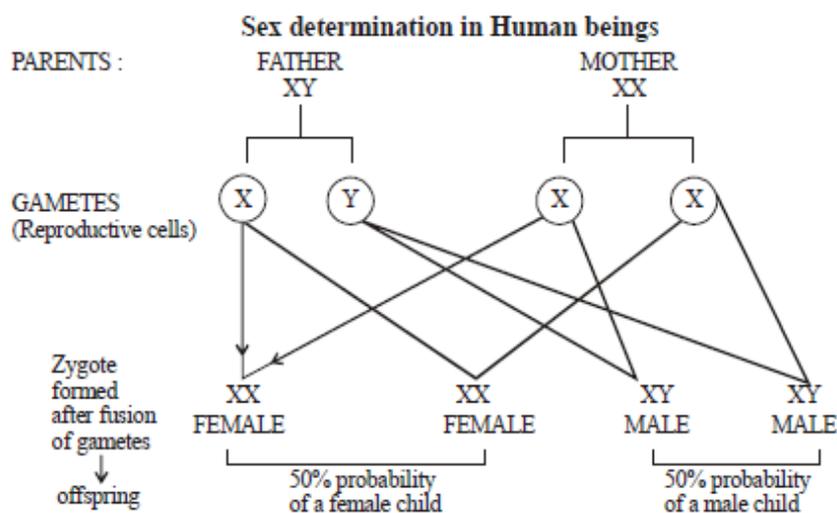
Ans. A sex chromosome that carries the genes for male characters is called Y chromosome and one which carries the genes for female characters is called X chromosome.

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 autosomes and 2 are sex chromosomes. The sex chromosomes are not always a perfect pair.

In females there are 44 autosomes and two X chromosomes, in males there are 44 autosomes, one X chromosome and one Y chromosome. So the chromosomes

In woman are 44 + XX, while the chromosomes in man are 44 + XY. Let us see the inheritance pattern of X and Y chromosomes.

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. Therefore, in every 100 sperms, 50 have Y chromosomes and 50 have X chromosomes.



Q.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.

OR

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

Ans. 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 (Figure 11.1). 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

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:

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

- Q.28 [i] what is transcription?**
[ii] Describe the structure and function of Lac operon.
[iii] Draw a labelled diagram of replicating fork.

OR

- [i] What is genetic code?**
[ii] Write four salient features of genetic code.
[iii] Draw a labelled diagram of t-RNA-the adapter molecule.

Ans. [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:

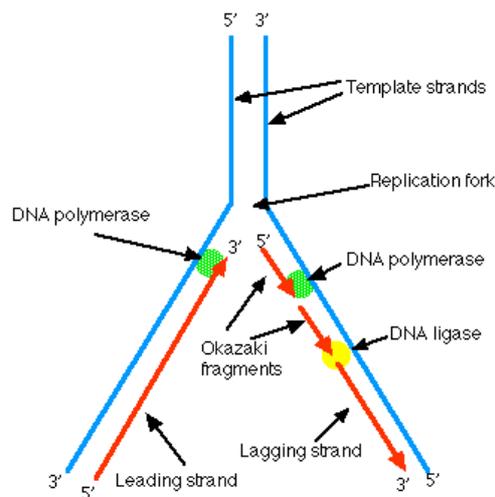
- I. One regulatory gene (the i gene – here the term i derived from the word inhibitor) and
- II. Three structural genes (z, y, and a).

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

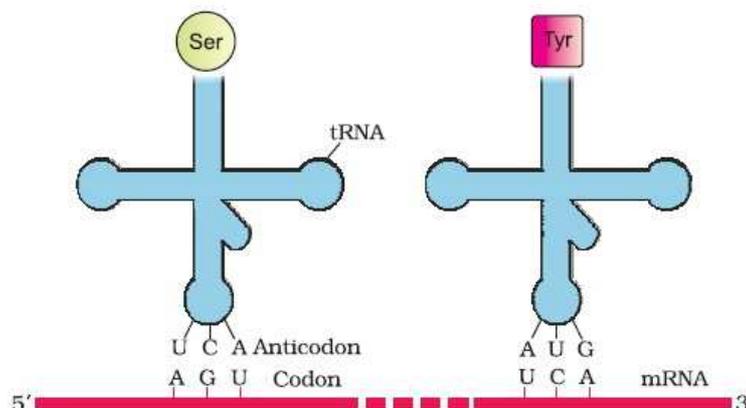
[i] Genetic code:-

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:- (Any four)

1. The codon is triplet. 61 codons code for amino acids and 3 codons do not code for any amino acids, hence they function as stop codons.
2. One codon codes for only one amino acid, hence, it is unambiguous and specific.
3. Some amino acids are coded by more than one codon, hence the code is degenerate.
4. The codon is read in mRNA in a contiguous fashion. There are no punctuations.
5. The code is nearly universal: for example, from bacteria to human UUU would code for Phenylalanine (phe). Some exceptions to this rule have been found in mitochondrial codons, and in some protozoans.
6. AUG has dual functions. It codes for Methionine (met), and it also act as initiator codon.

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



- Q.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.

OR

- [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.

Ans. [i] **Antibiotic:-**

Antibiotics are chemical substances, which are produced by some microbes and can kill or retard the growth of other (disease-causing) microbes.

[ii] **Name of the fungus:-**

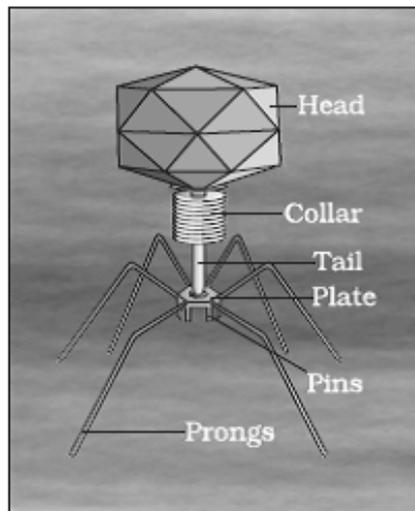
Penicilliumnotatum

[iii] **Two Disease:-**

Antibiotics have greatly improved our capacity to treat deadly diseases such as

1. Plague
2. Whooping cough (kali khansi)
3. Diphtheria (gal ghotu) and
4. Leprosy (kushtrog)

[iv] **Labelled diagram of bacteriophage:-**



OR

[i] **Fermentors:-**

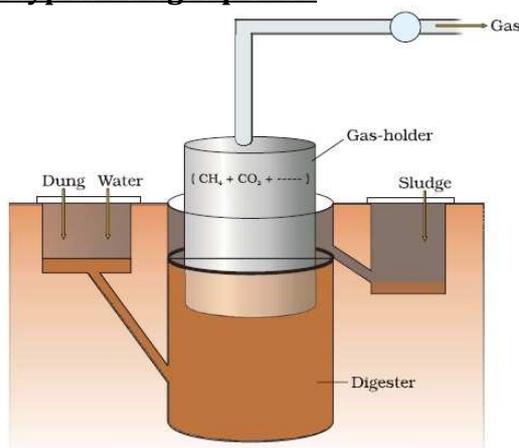
In industry, microbes are used to synthesize a number of products valuable to human beings. Beverages and antibiotics are some examples. Production on an industrial scale, requires growing microbes in very large vessels called fermentors.

[ii] **Lactobacillus(a bacterium)**

[iii] Bacteria used as biofertilizers:-

1. Rhizobium
2. Azotobacter

[iv] Labelled diagram of typical biogas plant:-



- Q.30 [i] Define ecosystem.**
[ii] Describe different components of ecosystem in brief.
[iii] Give a diagrammatic representation of trophic levels in an ecosystem.

OR

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

Ans. [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

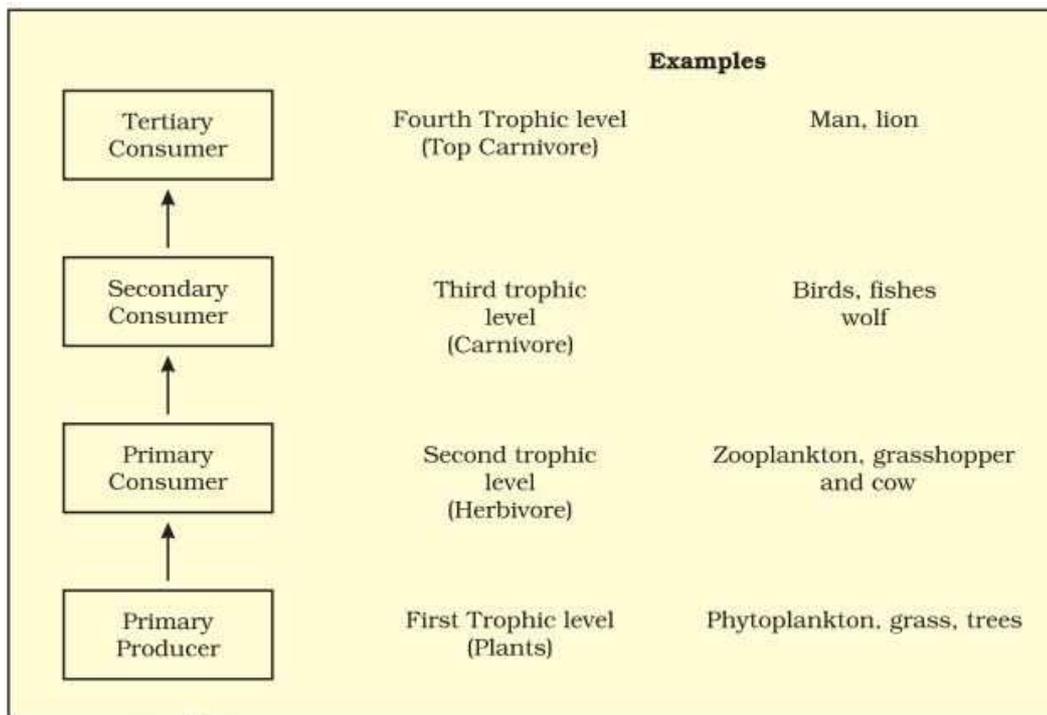
Biotic components comprise the living organisms present in an ecosystem. These include plants, animals and micro-organisms (bacteria and fungi). The biotic component of an ecosystem has been classified into three groups:

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:-



Diagrammatic representation of trophic levels in an ecosystem

OR

[i] Primary production:-

Primary production is defined as the amount of 2015-16 243 ECOSYSTEM biomass or organic matter produced per unit area over a time period by plants during photosynthesis. It is expressed in terms of weight ($g\ m^{-2}$) or energy ($kcal\ m^{-2}$).

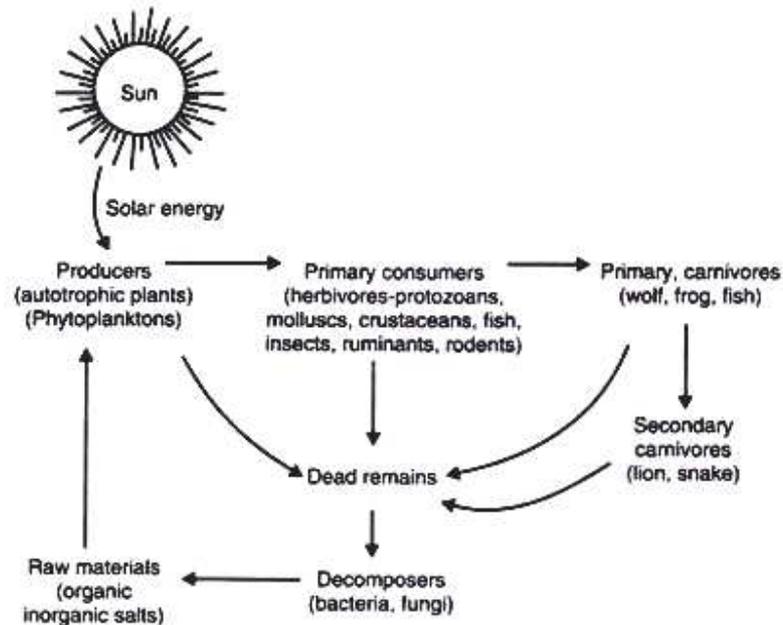
[ii] Energy flow in ecosystem:-

- We know that plants and photosynthetic bacteria (autotrophs), fix sun's 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.

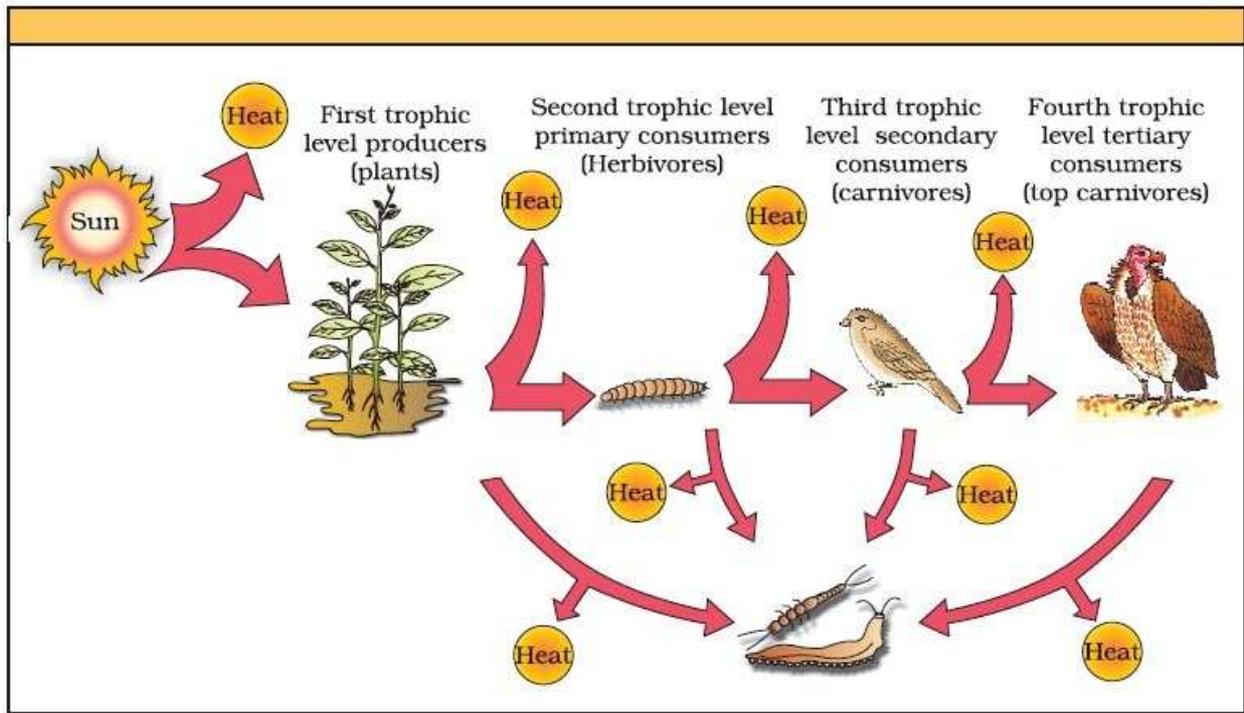
No energy that is trapped into an organism remains in it for ever. The energy trapped by the producer, hence, is either passed on to a consumer

If they feed on the producers, the plants, they are called primary consumers, and if the animals eat other animals which in turn eat the plants (or their produce) they are called secondary consumers.



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. When the herbivores consume plants as food and convert 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 (secondary consumers) 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:-



Energy flow through different trophic levels