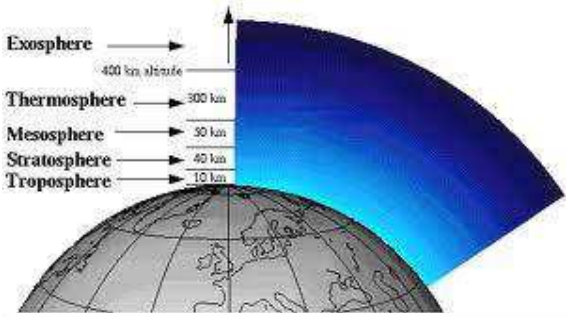
MAN & BIOSPHERE - ELEMENTARY ASPECTS

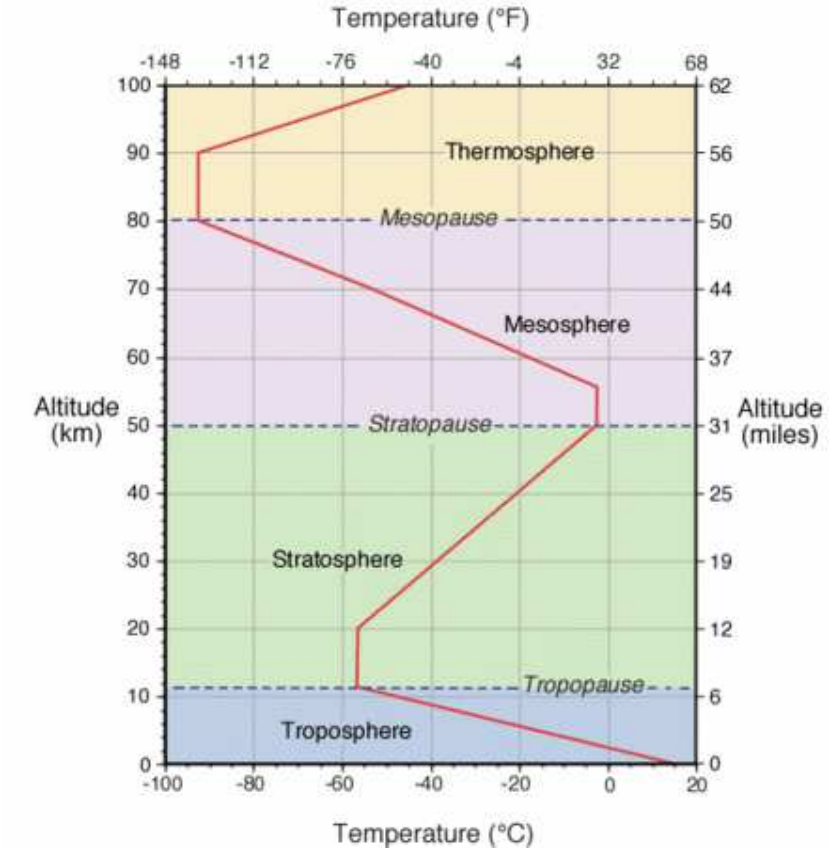
VERY SHORT ANSWER TYPE QUESTIONS:

1. Differentiate between Autecology and Synecology.?

- Autecology is species ecology which involves the staudy of interrelationships between individual organisms of the same species or population and their environment.
- Synecoogy is the study of interrelationships between different species of organisms and their environment (Ecology of communities)

2. Name any two characters of troposphere.





- Troposphere is the lowest layer of atmosphere.

- Pressure and temperature of air decrease gradually as the height increases from the earth's surface.
- It is the densest and most turbulent layer.
- Percentage composition of a gas in atmosphere is same at all altitudes, but partial pressure of gas changes with the altitude.

3. How is stratosphere is significant to the living organisms?

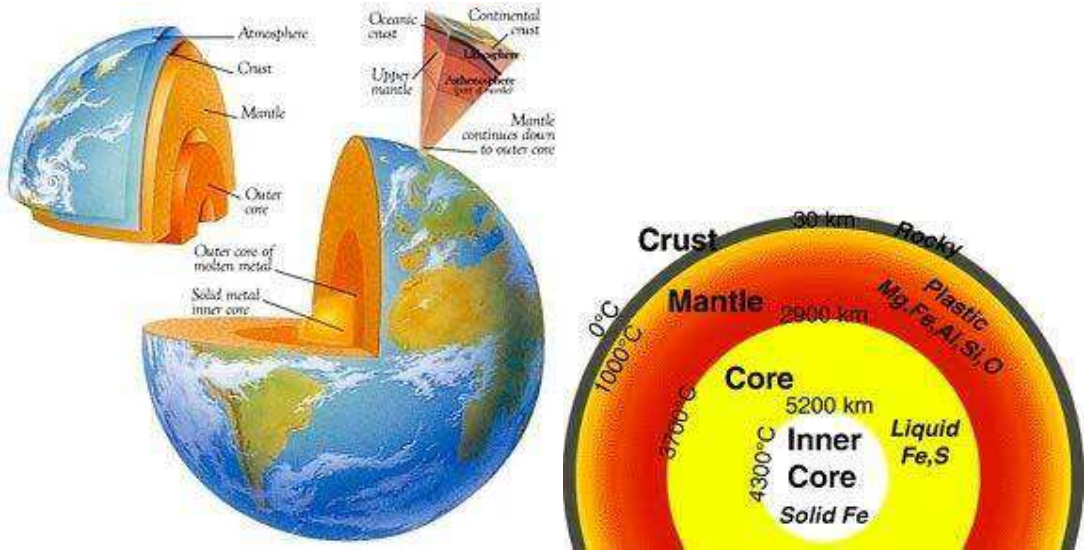
Stratosphere has ozone shield that absorbs the UV radiation and thus protects the organisms on the earth from the harmful effects of radiation.

4. Distinguish between mesosphere and thermosphere.

- Mesophere is the layer of atmosphere that is directly above the stratosphere and below the thermosphere. Temperature decreases with increasing altitude in this layer.
- Thermosphere is the layer of atmosphere directly above the mesosphere and below the exosphere. UV radiation causes ionization in this layer.

5. Write the significance of thermosphere.

- UV radiation causes ionization in this layer.
- Ionization changes Oxygen, nitrogen and nitric oxide in to ionic state in this layer.
- This layer reflects shorter radio waves making telecommunications possible over long distances.



6. What is lithosphere?

Upper most part of mantle (35 to 60 km) along with the cruse forms the lithosphere. It cools by conduction.

7. What is asthenosphere ?

- The region of mantle extending below the lithosphere (100 to 700 Km) is known as asthenosphere.
- It cools by convection.

8. Name the geological layers and their boundaries.

- Geological layers are crust, mantle and core.
- Lithosphere … 0---60 km. It has crust (0-35 km) and upper most part of mantle (3560km)
- Mantle --- 35-2900 km … It has asthenosphere (100-700km)
- Outer core ---- 2900 to 5100 km
- Inner core ---- 5100 to 6378 km

9. Define population.

- Population of a group of organisms of a single species living in particular areas.
- Eg., frogs of species *Rana tigrina*

10. What is the basic unit of ecological organization? Write its significance.

Organism is the basic unit of study in Ecology.

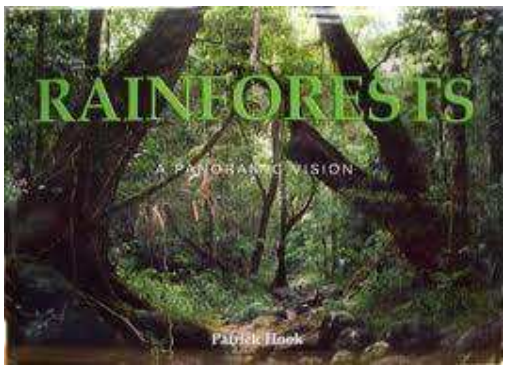
11. What is a biome? Name any two biomes.

Biome is a biotic community in a large area living in particular climatic condition.
Biome includes biotic community and developmental stags of community.
Biomes are ---- a) Tundra (treeless ground) at arctic region
b) Taiga or confiferous froests - in temperate regions
c) Rain forests -- tropical regions



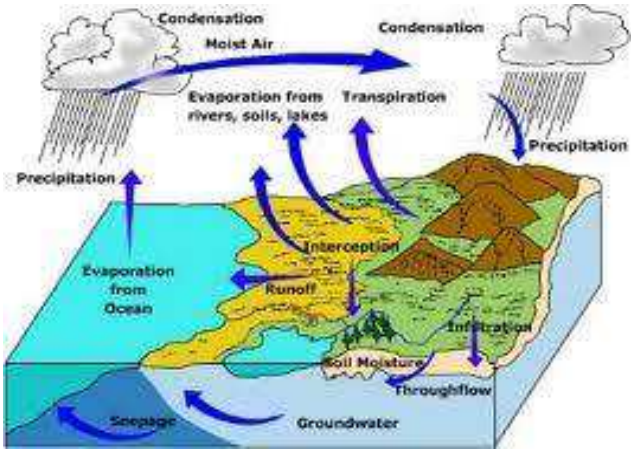


TUNDRA **TAIGA (CONIFEROUS FORESTS)**



12. What is biosphere? How doe it differ from physical components of the earth?

- `Biosphere is the total life supporting environment.
- It extends to few meters above and few meters below the surface of earth.



BIOSPHERE

13. Distinguish between weather and regional climate.

- Weather is the temperature, pressure, humidity, rainfall, sunshine, cloud cover, and wind at a given place and time.
- Regional climate is the average weather of an area over a long period.

14. Define microclimate. Compare microclimate and regional climate.

- Microclimate that prevails in the immediate surroundings of plants and animals.
- Regional climate is the average weather of an area over a long period.

15. Define Ecosystem.

- An ecosystem is composed of living organisms and nonliving components which influence each other.
- The term ecosystem was coined by Tansley.

16. What do you mean by habitat of an organism?

Habitat is a place where organism lies. It equals to address of organisms.

17. Define the ecological niche of an organism.

- Ecological niche is the functional role of an organism in an ecosystem.
- It explains the role of organism and its interaction with the other organism in a biotic community.

18. A population has more genetically similar organism than a biotic community. Why?

- Population is a group of organism of a single species living in a particular area.
- Biotic community is an assemble of the many populations of different species of microorganisms, plants and animals present in a give habitat.
- Thus population has more genetically similar organisms.

19. Why are components of inner core in crystal stage even though Temperature is very high?
A) Inner core is composed of iron and some nickel in the form a crystal. Even the temperature is very high, the reason for the appearance of crystals in that area because of high pressure in that area. It result the tighter packing of atoms.

20. How do biotic organisms influence the abiotic components in an ecosystem?
A) Biotic and abiotic components of an ecosystem are linked by flow of energy and cycling of nutrients.

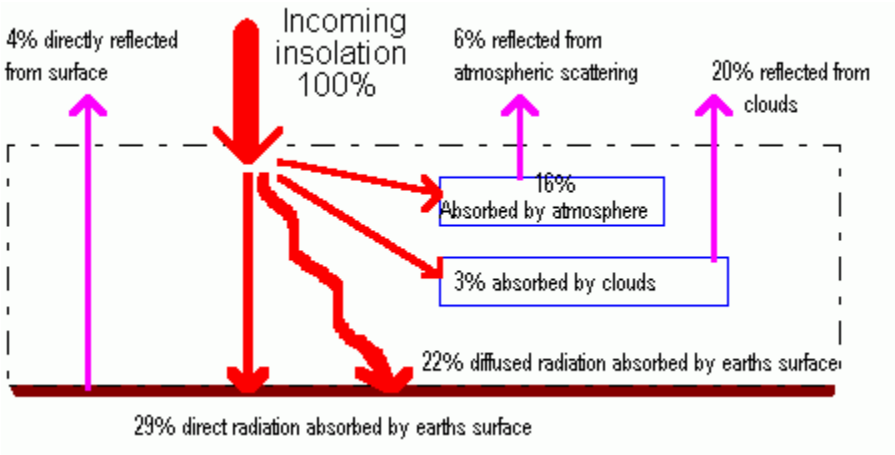
21. What is the meaning of Ecology? Who coined the term Ecology?
Ecology means study of habitat or home. The term ‘Ecology’ was introduced by Ernst Haeckel.

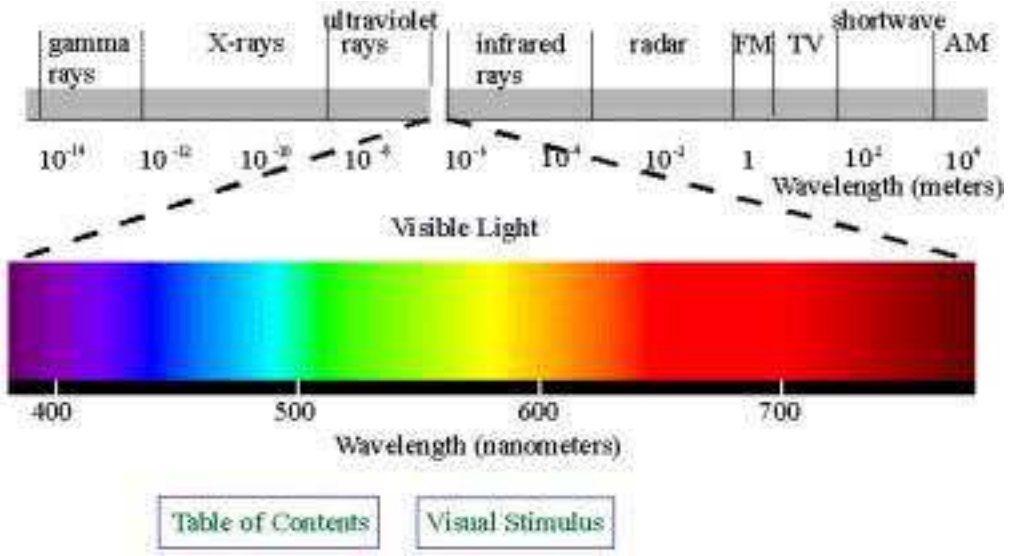
ECOSYSTEM - ABIOTIC FACTORS

VERY SHORT ANSWER TYPE QUESTIONS:

1. Differentite between insolation and albedo.

- Insolation is the incoming solar radiation that reaches earth's surface.
- Albedo of the earth is the radiation reflected.





2. Which factors influence the insolation?

- Insolatiion depends on the angle of incidence length of the day and absorption of light rays by the layers of atmosphere.

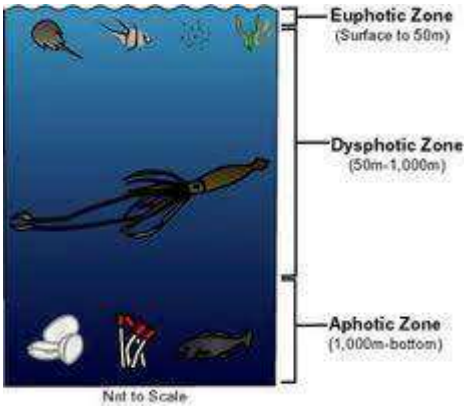
3. How is the solar radiation used on the earth surface?

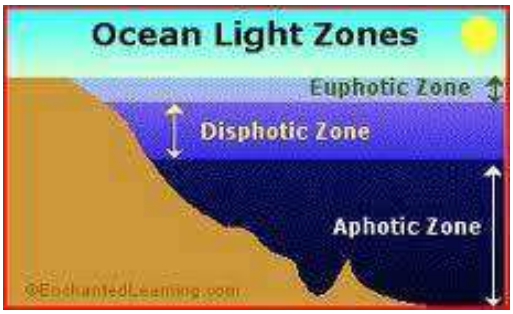
- Solar radiation is used to heat the surface of earth for melting and evaporation of water, to run photosynthesis in plants.

4. What is the effect of light on pigmentation of animals?

- Light induces pigmentation in animals.
- Living organisms at tropical areas have darker pigmentation because of more intensity of light in those areas.

5. What are the three zones in deep water bodies, based on the penetration of light?





- Ocean water and large lakes are distinguished into three zones depending on the penetration of light.
  a) **EUPHOTIC ZONE**: extends to the depth of 80 meters below the surface. Because of more light, the number of photosynthetic aquatic vegetation and phytoplankton and consumers is more in this zone.
  b) **DISHOTIC ZONE**: extends from a depth of 80 meters to 200 meters. Limited photosynthetic activities are present.
  c) **APHOTIC ZONE**: it is the region deeper than 200 meters. It is without light. No chance for photosynthetic plants in this zone.

6. Distinguish between diurnal and nocturnal animals.

- Diurnal animals are active during daytime and take rest during night time. Eg., Birds, Cattle, Humans
- Nocturnal animals are active during night time and take rest during day time. Eg., Owls, Bats

7. Distinguish between phototaxis and photo kinesis.

PHOTOTAXIS	PHOTOKINESIS
1.Oriented locomotory movement of animals in response to light	Non-directional movement shown by animals in response to light.
2.The rate of movement is not influenced by light	The rate of movement is related to the intensity of light stimulus.
3.Euglena shows positive phototaxis Earthworms, planarians show negative phototaxis.	Larvae of mussel crab Pinnotheres maculatus move faster with increasing light intensity.

8. What is photoperiodism?

- ► Photoperiod is the duriation of an organism' daily response to light.
- ► Photoperiodism is the growth, development and other responses of organisms to the photoperiod.

9. What is an entrainer ?

- ► Light is the entrainer that set or resets the biological clocks in organisms.

10. What is circa lunar rhythm? Give an example for it.?

- ► The correlation of some of the organisms and the phases of the moon is known as circa lunar rhythm.
- ► Reproductive cycles in polychaetes like palolo worms (*Eunice viridis*) related to phases of moon.
- ► Palolo worms swarm into the pelagic waters during the last quarter of the lunar cycle in th months of October and November to release the eggs and sperms.


Palolo worm

11. Why is biological light is a cold light?

- ► Biological light is known as cold light because of the absence of infrared radiation.

12. What is an optimum temperature?

- ► The temperature at which the life activities of organisms occur at the maximum level is known as optimum temperature.

13. What is Diapause?

- ► Diapause is the period during which growth or development is suspended and physiological activity is diminished in response to adverse enviornmenal conditions. It is shown by insects.

14. Distinguish between maximum and minimum effective temperatures?

- ► Maximum effective temperature: The highest temperature at which organism can live indefinitely.
- ► Minimum effective temperature: The lowest temperature at which organism can live indefinitely.

15. What is a thermocline? How does it influence the living organism in a lake?

- ► Thermocline is a layer or zone of water present below the epiliminion.
- ► In this zone, temperature decreases rapidly at the rate of 1^0 C per meter of depth.

16. What is meant by fall overture?

- ► After thermal stratification, fall overturn occurs. When the temperature of surface water decreases to 4^0 C, the density of surface water increases and the water becomes heavy. This heavy water sinks to the bottom and the lighter water of bottom rises to the top.
- ► Thus the water circulates or overturns in the entire lake. It is known as fall overturn. It helps for the introduction Oxygen from surface level to bottom.

17. What is spring overturn?

- ► Spring overturn occurs after winter stratification.
- ► In spring, the ice on the surface layer melts due to increase in temperature and the water warms up. At 4^0 C, the surface water becomes heavy and sinks. The water in the lake is stirred up. It is known as spring overturn.

18. Describe Van't Hoff's rule.

- ► The rate of biochemical reactions doubles with every 10^0 C rise in temperature. It is expressed as temperature coefficient or Q_{10}.

19. What is the influence of temperature on the sex of *Xenopsilla cheopis*?

- ► In rat flea, *Xenopsilla cheopis* , the male members are formed more than that of female members with the increase in temperature.

20. Distinguish between eurythermal and stenothermal animals.

EURYTHERMAL ANIMALS	**STENOTHERMAL ANIMALS**
1. Can tolerate wide fluctuation in temperatur 2. e.g., lizards, birds, mammals	Can tolerate only small variations in Temperature. e.g., corals, fishes

21.What is cyclomorphosis?Give an example.?

► Cyclical morphological changes in some animals in relation to seasonal changes in temperature are known as cyclomorphosis.

► The concept of cyclomorphosis was described in the planktonic crustacean *Daphnia* by Coker.

22. What does the Bergmann's rule elucidate?

► Bergman's rule explains the relationship between the body size of homeothermic animals and temperature.

► According to this rule, the size of homeotherms present at colder regions is larger. The advantages of having large sized body is

A)Large sized body ----

i) More volume in the body ….. Production of more heat.

ii) Less surface area …… Less heat loss to outside

Thus animals of colder region are able to produce more heat in the body, but lose less heat to outside and are able to retain more heat inside the body to live successfully in colder regions.

► According to this rule, homeotherms living in hot climate tend to be smaller size of the body. The advantage of having small sized body are

B**)Small sized body** :

i) Less volume in body ….. production of less amount of heat

ii) More surface area ….. More loss of heat to outside.

Thus animals of hot climate areas can produce less amount of heat only in their bodies, but can loose more heat to outside and can cool the body.

23. Which animals do possess salt glands? What is their function?

► Salt glands are present in marine birds like sea gulls and penguins and in Marine turtles.

► Salt glands are able to remove the excess salts from the body.

► Salt glands of sea birds open into the nasal cavity and the salt water flips out through the nostrils.

► Salt glands of turtle open near the eyes.

24. What is the difference between stenohaline and euryhaline animals?

STENOHALINE ANIMALS	**EURYHALINE ANIMALS**
1. Can tolerate narrow ranges of Salinity in water only E.g.,Freshwater and Marine water Fishes (except Migratory)	Can tolerate wide variations in salinity. E.g., Animals in estuarine waters.

25. What is the significance of high specific heat of water to living organisms?

► Water has high specific heat and so it has great capacity for absorbing heat with only minimal change in the temperature.

26. What is the significance of high latent heat of vaporization and high latent heat of fusion of water to living organisms?

- ► These features of water create a stable environment in the water medium, which is important for the survival of the aquatic organisms.

27. What are problems of animals in freshwater with respect to osmoregulation?

- ► Endosmosis is the main problem for freshwater animals.

28. What are the problems of animals in seawater with respect to osmoregulation?

- ► Exosmosis is the main problem for sea water animals.

29. What is physiological uraemia? Which animals follow this phenomenon to overcome the problem in water medium?

- ► Storing of urea in the body of some marine cartilaginous fishes is known as physiological uraemia.

30. How are reptiles adapted to terrestrial mode of life?

- ► Reptiles excrete semisolid uric acid to conserve water.
- ► Wall lizards survive with the water present in their food.
- ► Thorny devil, *Moloch horridus* has a hygroscopic system of grooves in its skin which can take water from dew into the mouth.



Moloch horridus

31. Distinguish between aglomerular and glomerular kidneys.

Aglomerular kidneys	GLOMERULAR KIDNEY
1.It has less number of nephrons and is without glomeruli	It has more number of nephrons and Glomeruli.
2.It is present in marine fishes	It is present in freshwater animals.
3.It helps to eliminate excess water in the forr of dilute urine.	It helps to reduce the loss of water along with urine.

SHORT ANSWER TYPE QUESTIONS

1. Give an account of the adaptations shown by the desert animals to overcome problems of water conservation in terrestrial habitat.

ANS : Terrestrial animals overcome the problems with the following measures.

- ❖ Fossoria (burrowing) animals come out of their burrows during night to avoid excess loss of water from the body.
- ❖ Earthworms burrow deep into the soil as the upper soil-layers dry up.

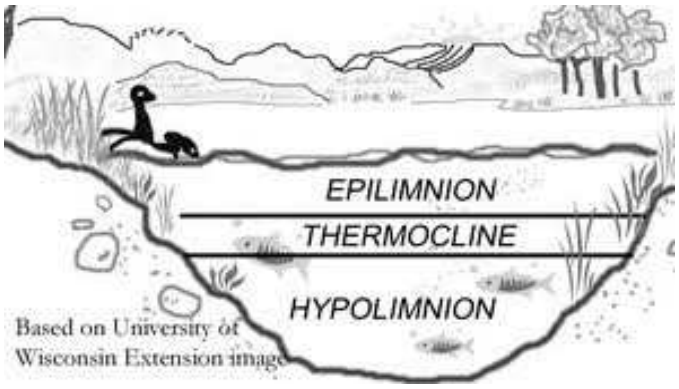
- Insects prevent water loss with chitinous exoskeleton.
- Reptiles, birds and insects excrete semisolid uric acid.
- Arachinds excrete guanine to conserve water.
- Mammals have 'U' shaped loop of Henle in nephrons to reabsorb water from glomerular filtrate and to produce hypertonic urine.
- Wall lizards survive with the water in their food.
- Thorny devil, *Moloch horridus* has a hygroscopic system of grooves in its skin which leads to corners of its mouth. Thorny devils drink water from dew that falls on their backs because of hygroscopic system.
- Woood rat of deserts (*Neotoma)* depends on the water present in the tissue of its food, cacti.



- The kangaroo rat (*Dipodomys spectabilis*) can survive ong periods without drinking water. It depends on metabolic water.
- Terrestrial animals lay cleidoic eggs with shell.
- A luid filled amnion develops around the embryo to protect it from dehydration.
- Camel has many adaptations to live successfully at deserts.

2. Describe the thermal stratification of water.

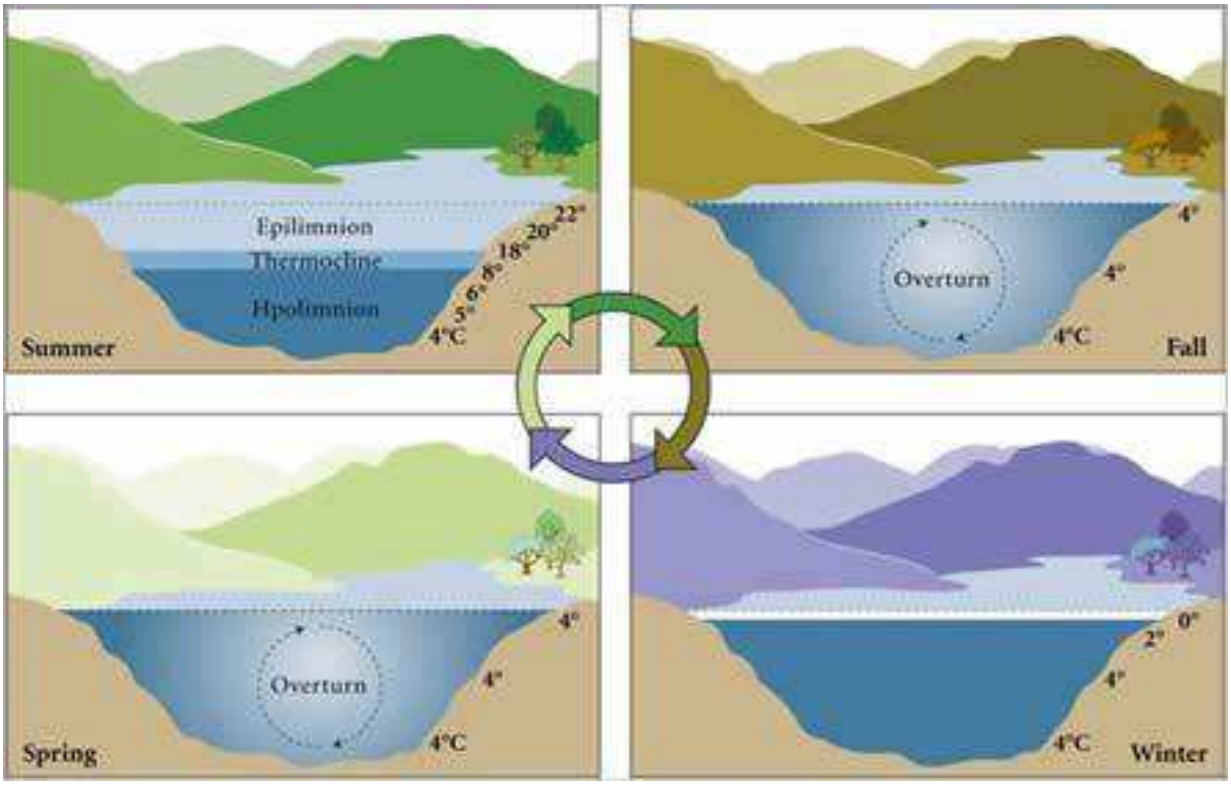
- In the temperate regions marked variations in temperature occur with the changes of seasons. Due to such temperature variations, thermal stratifications occur in the temperate lakes.
- Two types of thermal stratification occur in lakes of temperate regions.
  They are summer stratification and winter stratification.
  a) **SUMMER STRATIFICATION** ;
  _ During summer, three zones are formed in temperate lakes in the following manner….
  i)**EPILIMNION** : upper layer of water. It is warm, oxygen rich with temperature range of 21^0 to 25^0 C.
  ii)**METALIMNION (THERMOCLINE**) : it is middle layer. Temperature decreases rapidly at the rate of 1^0 C per meter of depth. The range of temperature is 210 to 9^0 c.
  iii) **HYPOLIMINION**: It is the bottom layer. It is cold and oxygen deficient zone of water.

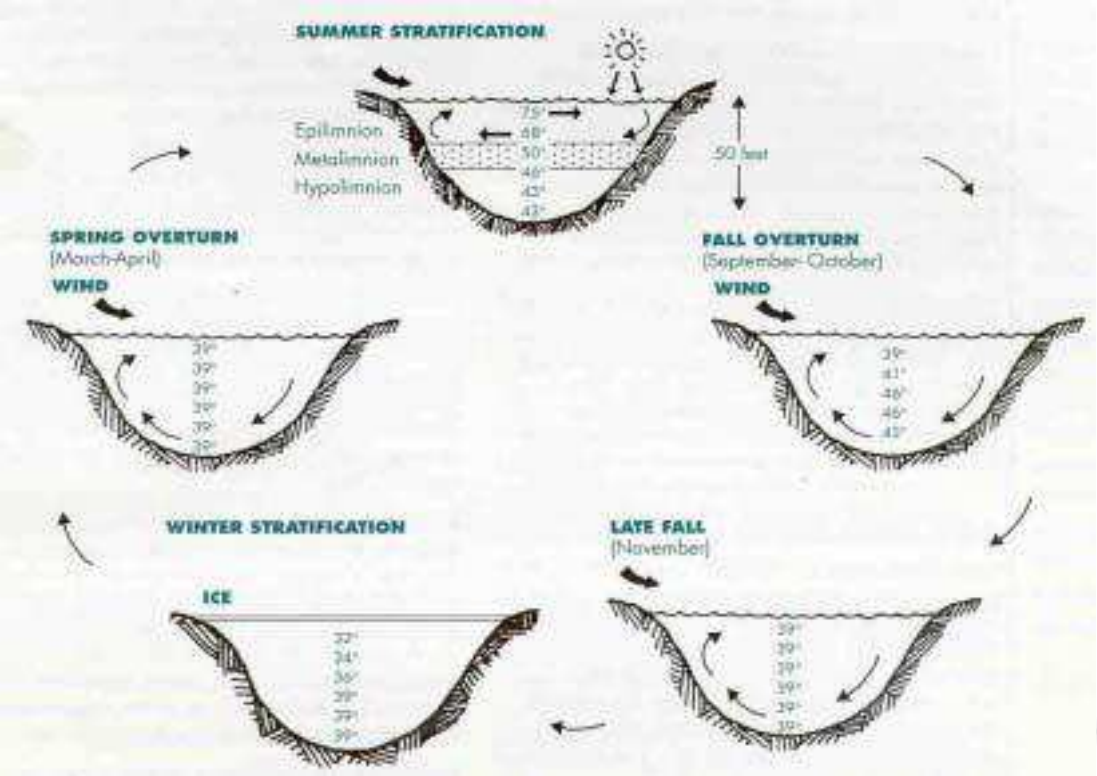


b) Winter stratification :

-- During winter, the surface water cools to below 4^0 C and becomes lighter and remains at the surface and finally freezes to ice.

-- Water below it remains at 4^0C and sustains aquatic life. It is known as winter stratification or winter stagnation. The respiratory active of aquatic organisms also decreases. The aquatic organisms are not subjected to hypoxia because the oxygen content of the water is not depleted significantly.





2. Describe the effect of light on the movement in organisms.

❖ Light influences the movements of organism. It brings about two types of movement in animals like phototaxis and photokinesis.

PHOTOTAXIS	**PHOTOKINESIS**
1.Oriented locomotory movement of animals in response to light	Non-directional movement shown by animals in response to light.
2.The rate of movement is not influenced by light	The rate of movement is related to the intensity of light stimulus.
3.Euglena shows positive phototaxis Earthworms, planarians show negative phototaxis.	Larvae of mussel crab Pinnotheres maculatus move faster with increasing light intensity.

3. What is photoperiodism ? Explain it with examples.

- ❖ Photoperiod is the duration of an organism's daily exposure to light. It is considered as the length of the day.
- ❖ The growth, development and other responses of organism to the photoperiod is known as photoperiodism.

- ❖ Critical photoperiod is the photoperiod of certain length at which most of seasonal events are triggered. The length of critical photoperiod varies with species and also with same species at different latitudes.
- ❖ SHORT day animals: Activities are triggered when the photoperiod falls below the critical photoperiod. It occurs during the later summer or early autumn.
- ❖ LONG day animals: Activities are triggered when the photoperiod prolongs beyond the length of critical photoperiod. It occurs during spring. These are Circannual rhythms.
- ❖ Diapause in insects, development of gonads, deposition of body fat, and migratory behavior in birds are some responses to photoperiod.

4. What are Biological rhythms? How are they controlled?

- ❖ Many behavioural activities in the living organisms occur at regular intervals precisely at the same time and are known as Biorhythms or Biological rhythms.
- ❖ Biorhythms with periodicity of about 24 hrs are called as Circadian rhythms.

E.g., i) emergence of fruit flies (Drosophila) from pupae at dawn.
ii) return of birds to nest on trees at dusk.

- ❖ Correlation of some organism and phases of moon is known as circalunar rhythms. Reproductive cycles of polychaetes like palolo worms (*Eunice viridis*) are related to phases of moon.
- ❖ These worms come into pelagic water during the last quarter of the lunar cycle in the months of October and November to release the eggs and sperms.
- ❖ Biological rhythms are controlled by innate or endogenous biological clocks.
- ❖ Light is the entrainer that sets or resets the biological clocks.

5. Write as short notes on Bioluminescence.

- ❖ Emittance of light from living organisms is known as bioluminescence.
- ❖ Bioluminiscence or biological light or cold light is emitted by many animals like jelly fishes, ctenophors, chaetopterus, squids, pyrosoma, deep-sea fishes etc.
- ❖ Due to absence of infra red radation, heat cannot be produced in theis radiation. So bioluminescent light is considered as Cold light.
- ❖ Luciferin is the light emitter. Six types luciferin molecules are identified. Luciferin reacts with an enzyme, luciferases, salt and oxygen and produce light and water.
- ❖ These rectants some times form a unit known as photoprotein. It produces light by Ca^{2+} ions.
- ❖ LUCIFERIN + 0_2 + ATP ➔ OXYLUCIFERIN + H_2O + ADP + LIGHT

6. Write short notes on Van't Hoff's rule.

- ► Temperature influences the activity of enzymes which involve in most of the metabolic activities.
- ► The effect of temperatue on metabolic activities of animals is more significant in poikilotherms than in homeotherms because the homeotherms can maintain constant body temperature.
- ► Van't Hoff's rule explains the concept that the metabolic rate increases with the rise in temperature from minimum effective temperature up to optimum temperature. The rate of biochemical reactions doubles with every rise of 10^0 C temperature.
- ► The effect of temperature on the rate of a reaction is expressed as Temperature coefficient or Q_{10} . It is generally 2.

Q_{10} = rate of reaction at X^0C / Rate of reaction at $(X---10)^0C$

7.Explain Cyclomorphosis with an example.?

- ► Cyclical morphological changes in some animals in relation to seasonal changes in temperature are known as cyclomorphosis.
- ► The concept of cyclomorphosis was described in the planktonic crustacean *Daphnia* by Coker.
- ► Coker observed the following changes in the head of Daphnia during different seasons.

a)Winter ----- head is round.
b)Spring ------ helmet like projection begins to develop on head
c)summer ------ projection reaches maximum size.
d)autumn ----- projection begins to decrease in size

- ► Coker explained the reason for the appearance of helmet like projection on the head of Daphnia in the following manner.

i) During winter, the water is cool and dense. So the organism can easily float in water.

ii) During summer, the water warm and less dense. So organism cannot float easily in water. Hence it develops a hood like projection to increase the surface area of the body to increase the BUOYANCY.

8. Camel is a ship of desert. Justify.

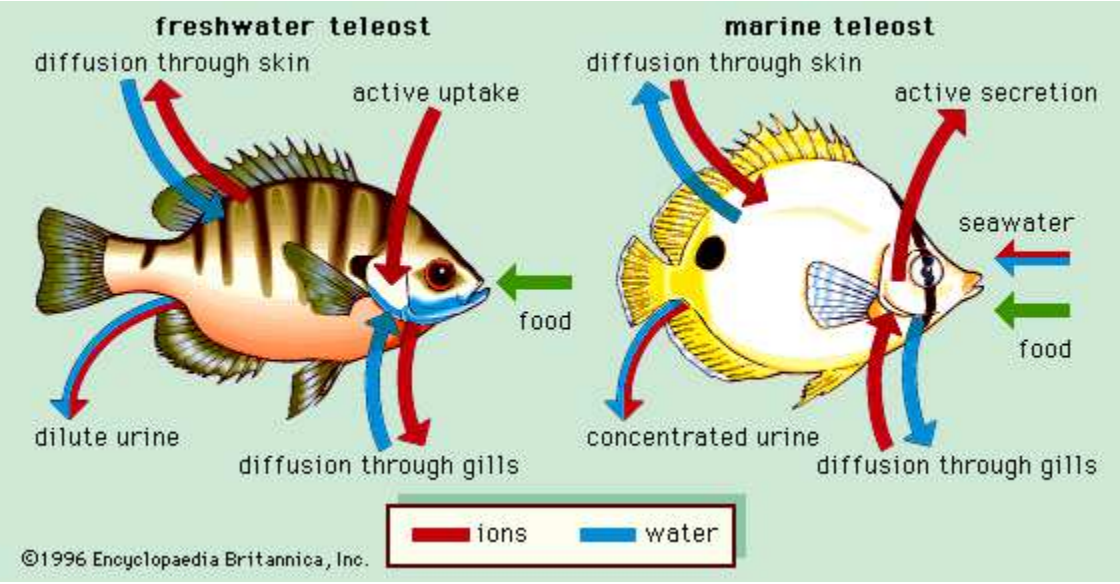
- ► Camel, *Camelus dromedaries* is considered as ship of desert because it has following adaptations to live successfully…….

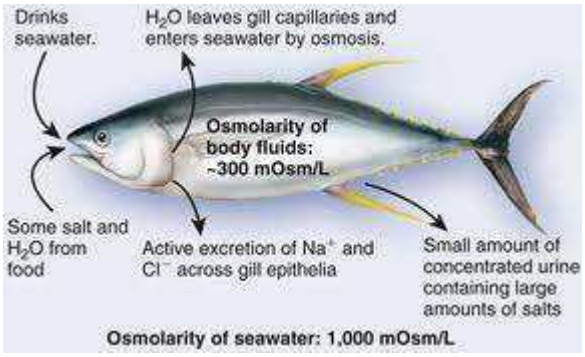
a) Camel loses body water 40% of its body weight
b) It sweats only when its body temperature rises to 41^0 C.
c) Evaporation of its sweat takes place at the skin level not at the surface of its coat. Hence cooling of body is very efficient.

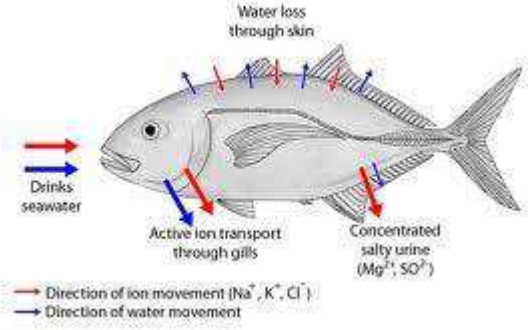
d)Fat is stored in hump only. Subcutaneous fat is absent to allow easy loss of heat through the skin during nights by conduction to cool the body.
e) It oval RBCs facilitate their flow in a dehydrated state. These RBCs withstand high osmotic variation without rupturing, when drinking large amounts of water.
f) Kidneys are very efficient.
G) Urine comes out as thick syrup and its faeces are dry.

9. Compare the adaptation of freshwater and marine teleost fishes.?

FRESH WATER FISH	MARINE WATER FISH
1.They face the problem of Endosmosis	They face the problem of exosmosis
2.well developed glomerular kidney	Less efficient aglomerular kidney
3. Dilute urine with excess water	Concentrated urine with less water
4. Chloride cells in gills absorb salts from surrounding water	Chloride secreting cells of gills eliminate excess salts to out side.







9. Describe about migratory fishes.

- A)Anadromous migration : Migration from sea water to fresh water for breeding .
  E.g., Salmon , *Hilsa.*
  B)Catadromous migration : Migratiion from fresh water to sea water for breeding.
  E.g., *Anguilla bengalensis* .

Migratory fishes are euryhaine and have glomerular kidney to adjust to the changing salinities. Chloride cells in gill can absorb or excrete salts.

10. Describe about UV rays.

- Short wave length rays of sunlight less than 360 nm are known as Ultraviolet rays.
- UV radiation is of 3 types …
  a)UV – C --- 100nm to 280 nm ……. Lethal
  b)UV - B ---280 nm to 320 nm ……. Harmful
  c)UV - A --- 320 nm to 360 nm --- convert sterol of skin into Vitamin D

11. Describe Bergmann's rule, Allen's rule, Jordan's rule & Gloger's rule.

- **A)BERGMANN'S RULE** ; Explains the relationship between body size of homeotherms and temperature. Homeotherms of colder region have large body size while the homeotherms of warmer region are smaller in size.

  B) ALLEN'S RULE: It explains the relation between extremities of body of homeotherms and temperature. The extremities of the body are shorter in the animals of colder region are shorter than those of the species living in warmer regions.

  Large extremities increase the surface area and help to lose heat to outside.

  C) JORDAN'S RULE: It explains the effect of temperature on early segmentation in development certain species fishes (cod fishes).

  D) GLOGER'S RULE: it explains the effect of temperature on pigmentation of animals. High intensity of light causes dark pigmentation in animals.

BIOTIC FACTORS - TROPHIC LEVELS

VERY SHORT ANSWER TYPE QUESTIONS:

1. **Distinguish between photoautorophs and chaemoautotrophs.**
   - **A)Photoautotrophs** : the organisms which can synthesize food (starch) by the process of hotosynthesis utilizing radiant energy, CO_2 and water are known as photoautotrophs.
     Eg., Green plants & phytoplankton.
   - B**)Chemoautotrophs** :The organisms which obtain energy by breaking down chemical substances are chemoautotrophs.
     Eg., Bacteria like sulphur and iron bacteria.
2. **Distinguish between macroconsumers and microconsumers.**
   - Animals feed on autotrophs are known as macroconsumers. They are primary, secondary and tertiary consumers.
   - Decomposers which decompose the dead bodies of organisms are known as microconsumers of ecosystem.
3. **Distinguish between herbivores and carnivores.**
   - Animals which feed on producers directly are called primary or first grade consumers. These are herbivores.
   - Animals that feed on the primary consumers (herbivores) are considered as secondary consumers or primary carnivores (flesh eating).
4. **What are decomposers? Write their significance.**
   - Decomposers are the organisms which decompose the dead bodies of organism and waste materials into nutrients. They include the saprotrophs, detritivores and mineralisers.
   - Decomposers play an important role in an ecosystem by converting complex molecules of dead organism into simpler and reusable molecules.
   - The producers cannot continue to exist forever in the absence of decomposers because minerals are not returned to the environment
5. **What is ecotone? Why does ecotone consist of more number of species than the two ecosystems?**
   - Transition zone between the two biotic communities is known as ecotone.
   - When the species from communities enter into this zone, it consists of more number of species. This effect is Edge effect. It leads to increase in the number of species and diversity of organisms in ecotone. These species are known as edge species.
6. **What do you mean by deystone species?**
   - The species having much greater influence on biotic community characteristics, relative to their abundance in biomass or number are said to be keystone species.
   - E.g., Fig trees in tropical forests are the keystone species as they produce large amount of fruits.
7. **Define competitive exclusion.**
   - The organisms which are better-able to compete than others in a given portion of an ecosystem exclude their competitors from that part of ecosystem. It is known as competitive exclusion.

- E.g., *Lemna gibba* excludes *Spirodela polyrhiza*.

8. List out any two defence adaptations to avoid predation in animals.

- Defence adaptations to avoid predation in animals are
  a) Camouflage (blending colouration)
  b) Venomous nature.
  c)Spiniscene (Spines over the body)
  d)mimicry (two species resembling each other)
  e)warning colouration.

9. What do you mean by Allelopathy?

- Chemical inhibition of one species by another is known as allelopathy.
  e.g., Needles of pine trees release acids into the soil. These acids inhibit growth of grasses and other plants in that area.

10. Distinguish between primary and secondary ecological successions.

- Primary succession is the succession that begins on an area which is not inhabited by any biotic community to establish a climax community.
- Secondary succession is the succession that begins in an area from which a community was removed to establish a climax community.

11. What is a pioneer community in n ecological succession? What is its role in the succession?

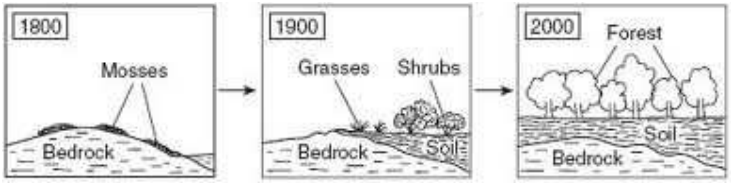
- Pioneer community is the first community to be established in either primary or secondary succession. It reacts with the habitat alters it and exists for a short time only.

12. What is climax community in succession? What is its role?

- Climax community is to be established finally with the stabilization of environment. It can not be replaced.

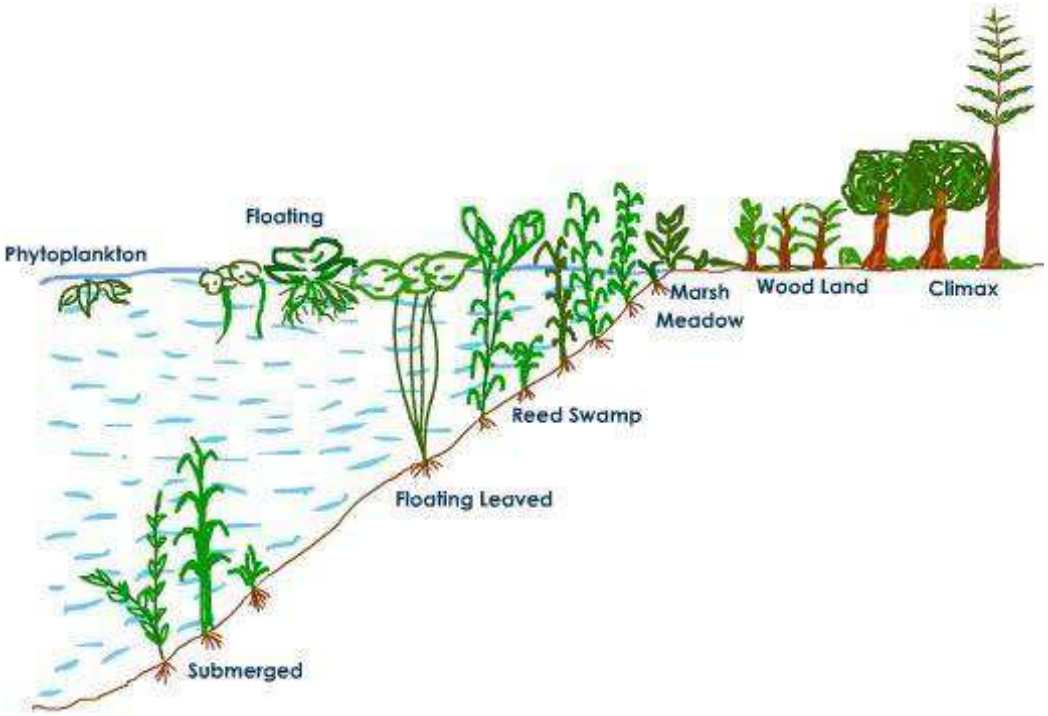
13. What are the various seral stages of xerosere?

- Various seral stages of Xerosere are
  LICHENS → MOSS → HERBACEOUS STAGE → SHRUB → FOREST STAGE.



14. What are the various seral stages of hydrosere ?

- SUBMERGED STAGE →FLOATING STAGE →REED-SWAMP STAGE →MARSH STAGE →WOODLAND STAGE.



15. Define a food chain. What is the significance of any food chain in ecosystem?

- ❖ Food chain the chain of organism existing in any natural community through which energy is transferred.
- ❖ Food chain involves the transfer of energy from the source in plants through a series of organisms.

16. What are two major types of food chains?

- ❖ Two major types of food chains are
  a) Grazing good chain b) Detritus food chain

17. Distinguish between primary detritus feeders and secondary detritus feeders.

- ❖ Primary detritus feeders directly feed on dead bodies or detritus.
- ❖ Secondary detritus feeders feed on primary detritus feeders.

18. Bring out major differences between grazing and detritus food chains.?

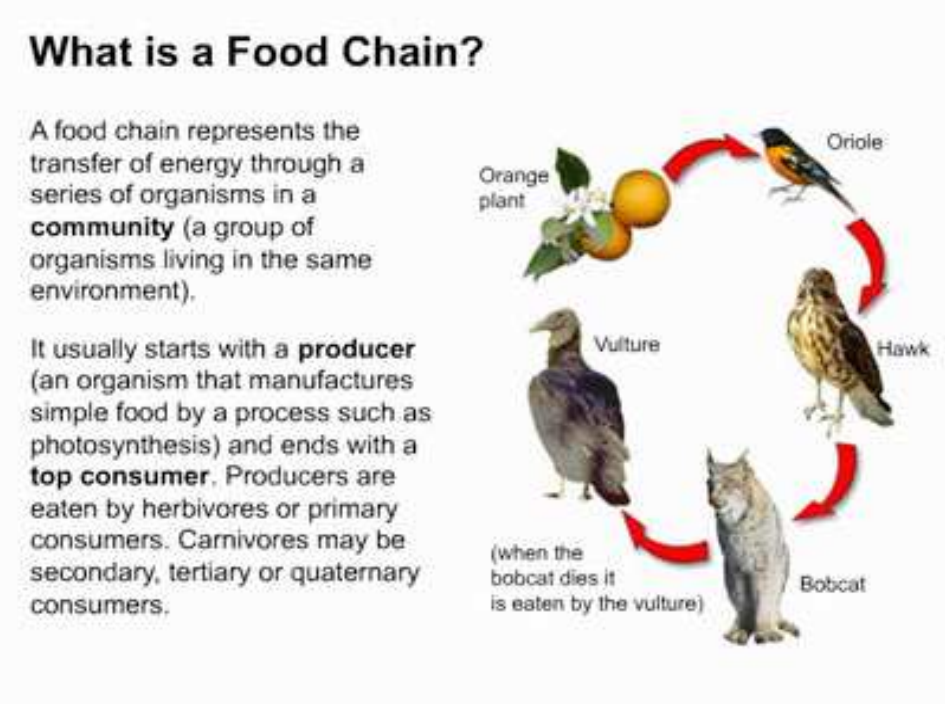
Grazing food chain	**Detritus food chain**
1.Grazing animals play an Important role	Dead organism of grazing food chain form a source of food for other organisms.

19. Why is pyramid of energy is always upright?

- ❖ Available energy gradually decreases from first trophic level to climax trophic level in all types of food chains.
- ❖ Hence pyramid of energy is always upright in all types of food chains.

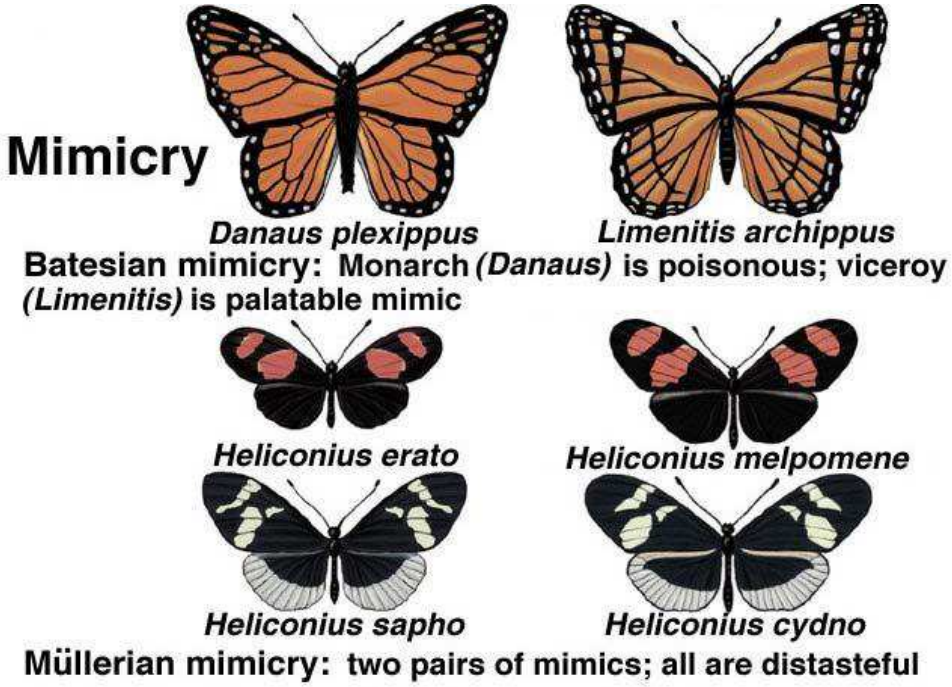
20. Why is pyramid of biomass in aquatic ecosystem is inverted?

- ❖ Pyramid of biomass in an aquatic ecosystem is inverted, because the biomass of phytoplankton is less than that of next trophic level



21. Distinguish between Batesian and Mullerian mimicry.

- A) Batesian mimicry:: The type of defenceless organism (mimic) mimicking other organism (model) having a defence is Batesian mimicry.
  e.g., viceroy butterfly (*Limentis archippus*) without poison mimics monarch butterfly (*Danaus plexippus*) with poison to avoid the predation
  B) Mullerian mimicry: The process in which the mimics share the same Defence mechanism as model.
  e.g.,Blue color of *Morpho* butterflies



SHORT ANSWER TYPE QUESTIONS

1. Explain the different biotic factors in a biotic community.

- A biotic community consists of producers, consumers and decomposers.

A) PRODUCERS:

- Green plants and phytoplankton re the producers. They can trap the radiant energy from the sun and synthesise chemical energy. They can produce starch by photosynthesis.
- Chemoautotrophs like iron and sulphur bacteria obtain energy by breaking down chemical substances.
- Producers occupy the first trophic level in most food chains.

B) CONSUMRS: Animals feed on autotrophs form consumers.They are of different types like primary, secondary and tertiary consumers.

I) PRIMARY CONSUMERS: animals which feed on producers are known as primary consumers or first grade consumers. These are herbivores.

- In terrestrial system, cow, deer, rabbits, grasshoppers, snails are primary consumers.
- In aquatic system, zooplankton forms the primary consumers.
- They form the second trophic level in food chain.

ii) SECONDARY CONSUMERS: They feed on primary consumers.

- They are primary carnivores. They form third trophic level in food chain.
- Frogs, dogs, foxes, wolves of terrestrial ecosystem and fishes of the aquatic ecosystem are secondary consumers.

iii) TERTIARY CONSUMERS: They feed on secondary consumers.

- They are secondary carnivores. They are climax consumers mostly.
- Hawks, vultures, lions, tigers of terrestrial ecosystems and large predatory fishes of the aquatic systems belong to this category.

C) DECOMPOSERS (SAPROTROPHS, DETRITIVORES AND MINERALISERS):

- Dead bodies and waster products form a source of energy and nutrients for the decomposers like saprotrophs, detritivores and mineralisers.
- Saprotrophs absorb substances through general body surface from dead bodies.
- Detritivores ingest detritus as food.
- Mineralisers mineralize humus.
- Decomposers are considered as microconsumers of ecosystem.
- Decomposers convert complex molecules of dead organisms into simpler and reusable molecules. These breakdown products are recycled in ecosystem and are made available to the producers.

2. What are the various interactions among organisms in a biotic community?

- Interactions among the organism are competition, allelopathy, predation and symbiosis.

I) COMPETITION: It is generally observed to acquire some limiting abiotic factors in environment. Plants compete for water, light, minerals and carbon dioxide. Some plants are

better-able to compete than others in a certain area. These species exclude their competitors from that part. It is known as 'competitive exclusion'.

E.g., *Lemna gibba* excludes *Spirodela polyrhiza*.

II) ALLELOPATHY:

Chemical inhibition of one species by another is known as allelopathy.

e.g., Needles of pine trees release acids into the soil. These acids inhibit growth of grasses and other plants in that area.

III) SYMBIOSIS:

Interactions among different species to live together are known as symbiotic associations. They include mutualism, commensalism, amensalism and parasitism.

- Mutualism is an association in which both partners are metabolically dependent and both are beneficial.
- Commensalism is an association in which one (commensal) gets benefit and the other is unaffected.
- Parasitism is an association where one (parasite) lives at the expenses of the other.
- Ammensalism is an association where one is harmed and the other is unaffected. (e.g.,*Taxocara*, a nematode is an amensal on rodents)

IV) PREDATION:

Predation is an interaction in which one organism is killing of other for food.

- It is a conduct for transfer of energy in a food chain. It limits the size of the prey population.
- Prey species have evolved various defence mechanisms to avoid the predation by predators.
- Camouflage (blending coloration), venomous nature, spiniscence, mimicry, warning coloration is the adaptations in animals to avoid the predation.
- Mimicry is the process where two species resembling each other.
- A) Batesian mimicry: The type of defenceless organism (mimic) mimicking other organism (model) having a defence .

  e.g., viceroy butterfly (*Limentis archippus*) without poison mimics monarch butterfly (*Danaus plexippus*) with poison to avoid the predation
- B) Mullerian mimicry: The process in which the mimics share the same defence mechanism as model.

  e.g.,Blue color of *Morpho* butterflies

3. What is a food chain? Explain the various types of food chains.

- Food chain the chain of organism existing in any natural community through which energy is transferred.
- Food chain involves the transfer of energy from the source in plants through a series of organisms.
- Two major types of food chains are

  a) Grazing good chain b) Detritus food chain.

A) GRAZING FOOD CHAIN OR PREDATOR FOOD CHAIN.

- Grazing animals play an important role in the transfer of energy to the carnivores.
- Producers prepare the food in this chain.
- Primary consumers feed on producers.
- Secondary consumers feed on primary consumers.
- Tertiary consumers feed on secondary consumers.
- Grazing food chains are linear and are usually with 4 to 5 trophic levels.

Trophic level	**Description**	**Terrestrial Ecosystem**	**Aquatic Ecosystem**
1st	Producers	Green plants	Phytoplankton
2nd	Primary consumers/ Herbivores	Cattle,sheep,rabbits, Deer,insects, snail	Zooplankton,
3rd	Secondary consumers/ Primary carnivores	Fox, wolf , snake	Small fishes
4th	Tertiary consumers/ Secondary carnivores/ Climax carnivores	Lion, tiger, vulture, hawk	Large fishes, seal

I) Terrestrial ecosystem:

a) GRASS ➔ DEER ➔ TIGER

b) GRASS ➔ GRASSHOPPER ➔ FROG ➔ SNAKE ➔ HAWK

c) ROSEBUSH SAP ➔ APHIDS ➔ SPIDERS➔ SMALL BIRDS ➔ HAWK

ii) In Aquatic Ecosystem:

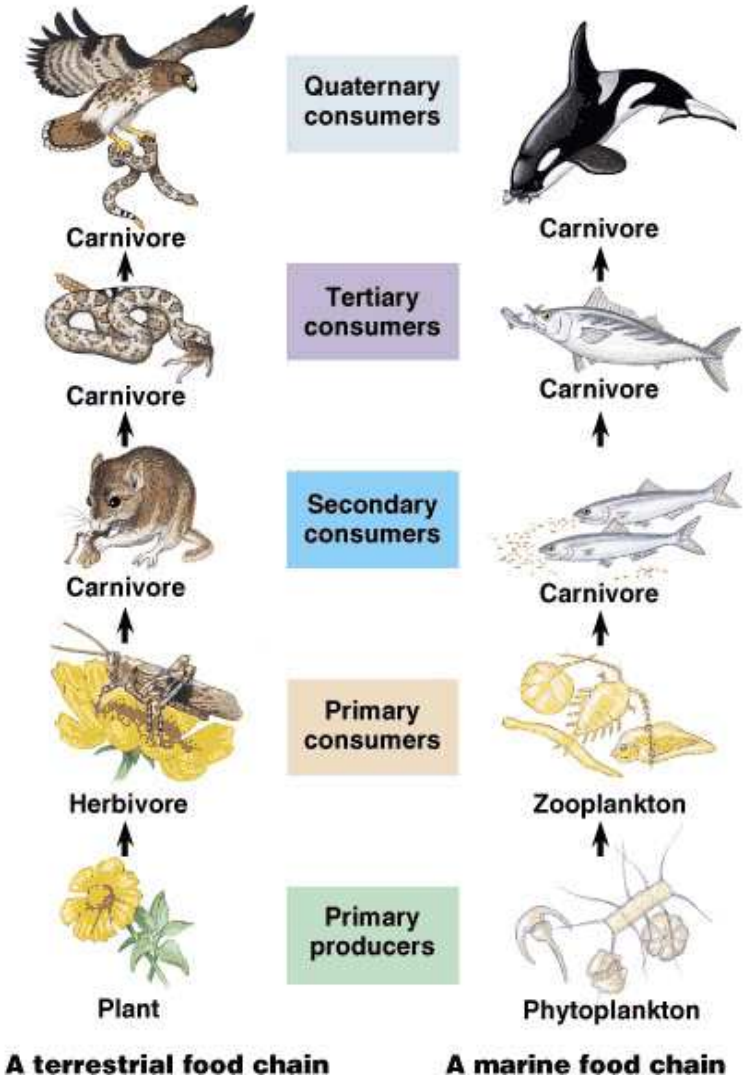
a)PHYTOPLANKTON ➔ ZOOPLANKTON ➔ SMALL FISH ➔ SQUID➔ SEAL

B) DETRITUS FOOD CHAIN:

- Dead organisms of grazing food chain for a source of energy for other organisms like decomposers (saprotrophs, detritivores and mineralizers.)
- Saprotrophs like fungi and bacterial live on dead organic matter.
- Detritivores ingest small fragments of decomposing organic matter known as detritus.
- Mineralisers cause mineralization of humus.
- Detritivores may be eaten by carnivores, which may then be consumer by other carnivores and form a food chain based on detritus.
- Primary detritus feeders and secondary detritus feeders are present.

1) LEAF LITTER ➔ EARTH WORMS ➔ BIRDS ➔ HAWK

2) DEAD ANIMALS ➔ FLIES AND MAGGOTS ➔ FROG ➔ SNAKE



4. What are the various types of ecological pyramids? Explain them. ?

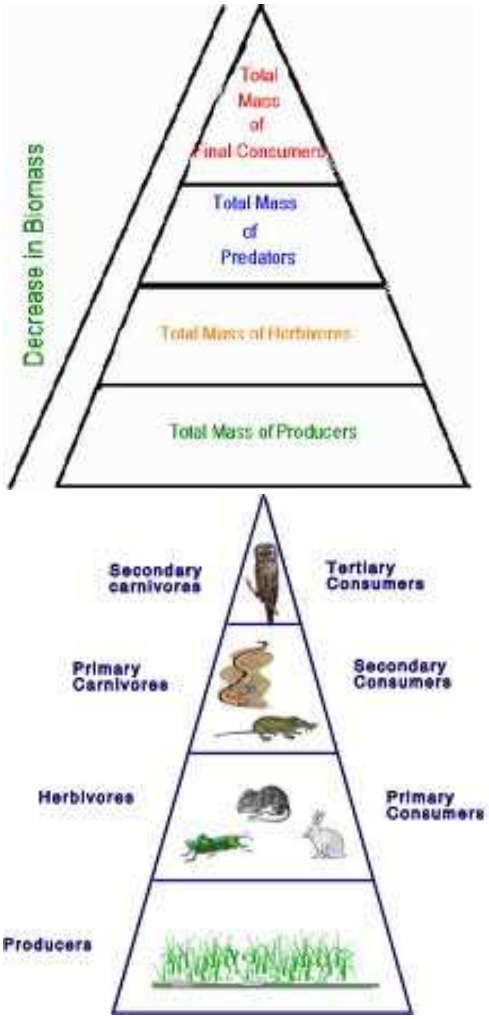
The concept of ecological pyramids was first described by Charles Elton. Ecological pyramids represent the trophic structure and the trophic function of an ecosystem. Ecological pyramids start with producers on the bottom and proceed through the various trophic levels. Ecoogical pyramids are of three types. They are Pyramids of numbers, Pyramids of biomass and pyramids of energy.

A) PYRAMIDS OF NUMBERS :

- When the organisms in a given area are counted and their numbers are grouped into trophic levels, a progressive decrease in the number of organisms and an increase in the size of the body at each successive trophic level are observed.

- In a lake ecosystem, phytoplanktons which form the first trophic level are more in number. Zooplanktons which form the second trophic level are relatively less in numbers. Small fishes which form third trophic level are very less in number. The members like large fishes which form the climax trophic level are very less in number.

- Thus in the pyramid of numbers there is gradual decrease in the number of organism (UPRIGHT PYRAMID). But in the food chain involving parasites, the pyramid of numbers is inverted. A single tree supports a large number of fruit eating herbivorous birds and squirrels which in turn support a still larger number of parasites.



B) PYRAMID OF BIOMASS:

- Dry weight of organism is known as biomass. It is calculated in the units of grams per meter^2.
- An ecological pyramid of biomass shows the fact that amount of biomass gradually decrease or reduce at each trophic level from the bottom level to top level i.e., producers level to top consumers level.
- Such a pyramid is an UPRIGHT pyramid.
- But, pyramid of biomass in an aquatic ecosystem is inverted because the biomass of phytoplankton is less that that of the next trophic level.

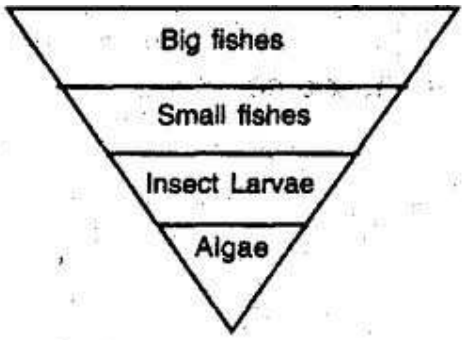
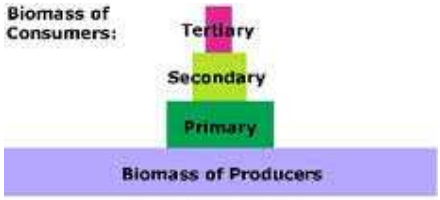


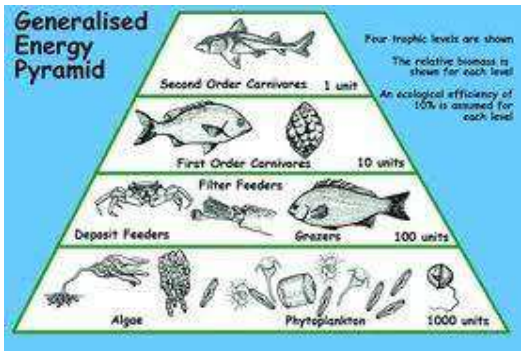
Fig 6.8 Inverted pyramid of biomass



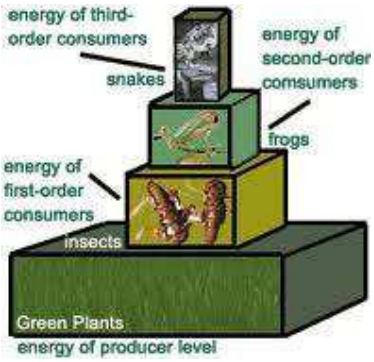
Pyramid of Biomass

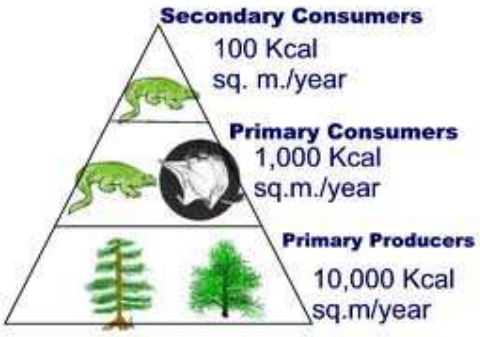
B) PYRAMID OF ENERGY :

- The pyramid of energy indicates the amount of energy available at each trophic level and amounts of energy that flow through the food chain.
- This pyramid shows the loss of energy at each trophic level from the producer level to climax carnivore level.
- Larger amount of energy is available at the producer level than at that of the energy at the primary consumer level. It decreases gradually than onwards towards the climax carnivore level.







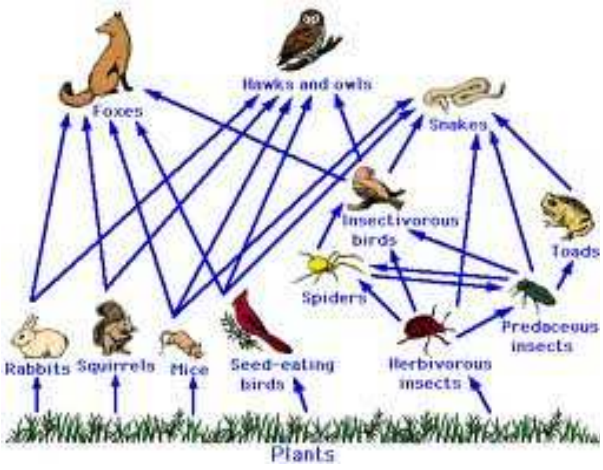


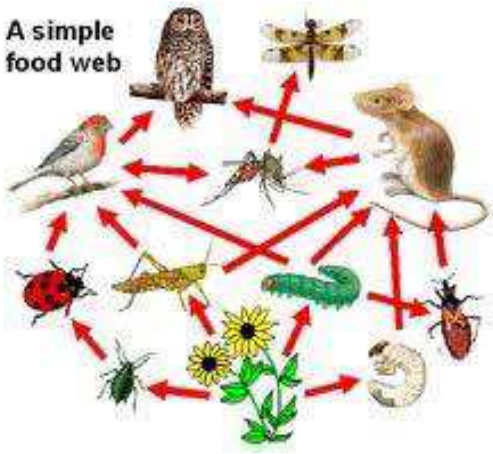
5. Describe Food Web. Discuss about different links among organisms in food web.

- ❖ Feeding relationships within an ecosystem are more complex. Most organisms feed on more than one organism.
- ❖ Some animals feed on plants, animals and fungi of different trophic levels. They are known as omnivores.
- ❖ The cross-linking of different trophic levels of different food chains forms a mesh or web of interlinking food chain. Such a web of cross-linked food chains is called a Food web.
- ❖ Food web maintains the stability of ecosystem.
- ❖ The greater the number of alternative pathways the more stable is the biotic community.

Different links in food web are:

a) IOTA LINK : Direct linking between prey and predator.
b) LAMDA LINK: A branching link in which a predator feeding on more than one type of prey organisms.
c) GAMMA LINK; A branching link in which one prey organism is predated by more than one type of predators.





FUNCTIONAL ASPECTS OF AN ECOSYSTEM

VERY SHORT ANSWER TYPE QUESTIONS:

1. Distinguish between gaseous and sedimentary biogeochemical cycles.

- A) Gaseous cycles: Atmosphere is the reservoir. E.g.,Nitrogen, Carbon etc.
- B) Sedimentary cycles: Sedimentary rocks are the reservoirs.
  E.g.,Sulphur, Phosphorous etc.,

2. What is the residence time?

- The period of time that a chemical is held in one place is known as residence time.

3. Distinguish between an exchange pool and a reservoir.

- A) Exchange pool: chemicals are held fro short periods. Biotic factors act as exchange pools generally.
- B) Reservoir : Chemicals are held for long periods of time. Abiotic factors act as reservoir generally.

4. What is an open system and closed system?

- **Open system**: Light energy is transformed into chemical energy by cellular processes like photosynthesis which ultimately converted to kinetic energy. Without the continued input of solar energy, biological systems would quickly shut down. Thus the earth is an Open system with respect to energy flow.
- **Closed system:** During decomposition, the materials are not destroyed or lost, so the earth is a closed system with respect to elements. The elements are cycled endlessly between their biotic and abiotic components within ecosystems.

5. What is ammonification ? Give an example of ammonifying bacteria.

- Conversion of Nitrogen into ammonia is known as ammonification.

6. What is nitrogen fixation? Give two examples of fixation of atmospheric nitrogen.

- Conversion of atmospheric nitrogen into available form to plants is known as nitrogen fixation.
- Nitrogen can be fixed in lightning or by industrial methods or by bacteria in the soil (*Azotobacter*), or in the roots of legumes (*Rhizobium*). Cyanobacteria in water are also nitrogen-fixing bacteria.

7. Give two examples for nitrite and nitrate bacteria.

- Bacteria which convert ammonia into nitrite is Nitrite bacteria.
  E.g., *Nitrosomonas.*
- Bacteria which convert nitrites into nitrates that can be absorbed by plants are known as Nitrate bacteria.
  E.g., *Nitrobacter.*

8. What is denitrification ? Give an example.

- Denitrification is the process where some nitrates are converted back into nitrogen gas.
- *Pseudomonas* and *Clostridium* are denitrifying bacteria.

9. Define productivity in an ecosystem.

- The total amount of organic material produced by living organisms of a particular area within a set period of time is Productivity.

10. What is the difference between gross and net primary production in an ecosystem?

- Total primary productivity is known as Gross primary productivity (GPP). It is the rate at which biomass is produced by organisms which convert inorganic substrates into complex organic substances.
- Gross production is partly used for respiration by producers and the remaining is stored in their tissues in the form of Primary Productivity.
  It is used for growth and reproduction by the plants.

11. Define exploitation efficiency.

- Exploitation Efficiency: The percentage of the production of one trophic level that is ingested by the other trophic level above.

$$\text{Exfloitation Efficiency} = \frac{\text{The food ingested}}{\text{Total food available for ingestion}} \times 100$$

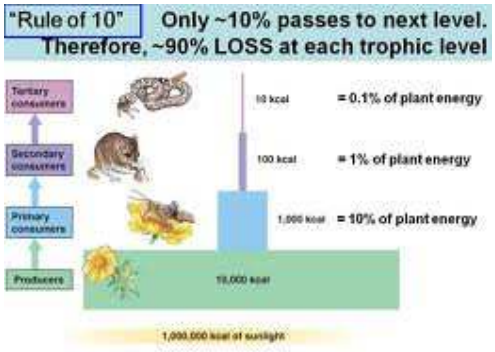
12. Define Assimilation efficiency.

- Assimilation Efficiency : The percentage of the energy ingested that is actually absorbed across the wall of the gut.

$$\text{Assimilation Efficiency} = \frac{\text{The food digested}}{\text{Total food ingested}} \times 100$$

13. What is trophic efficiency? How is it defined by Lindeman?

- Trophic Efficiency is the efficiency of transfer of energy from one trophic level to the higher trophic level.
- Lindeman defined trophic efficiency as 10% rule. It is the average trophic efficiency.



14. What are the two functional aspects of an ecosystem?

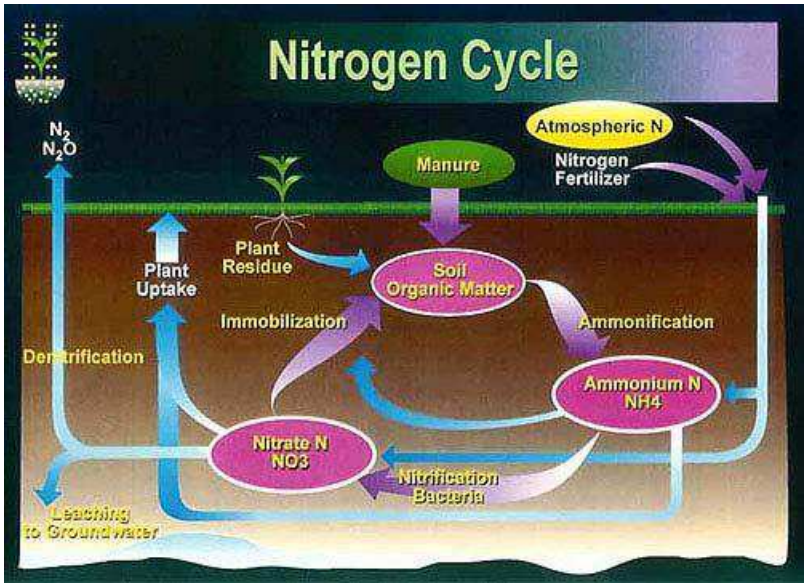
- Energy flow and recycling of nutrients are the two functional aspects of an ecosystem.

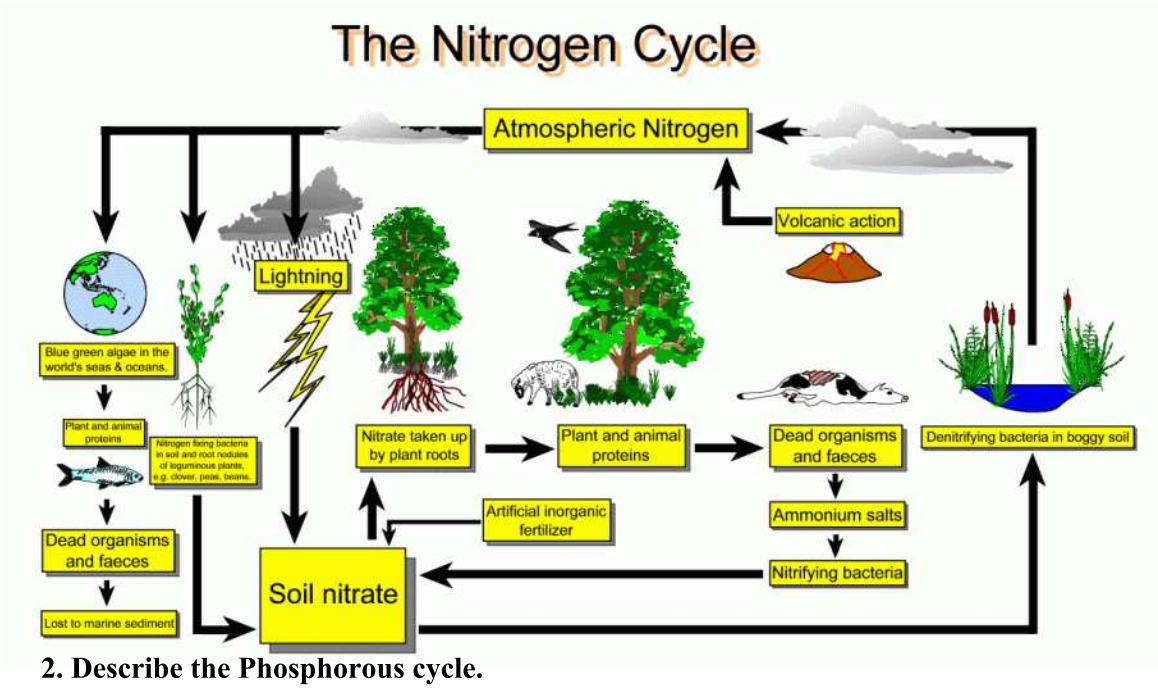
SHORT ANSWER TYPE QUESTIONS

1. Describe the Nitrogen cycle..?

- Nitrogen is a very important element in proteins and nucleic acids.
- Atmosphere is the largest reservoir of Nitrogen. Nitrogen can be fixed in lightning or by industrial methods or by bacteria (*Azotobacter*) in soil, or by bacteria (*Rhizobium)* in the roots of legumes.
- Decomposers decompose dead bodies of plants and animals.
- Nitrogen can be changed into ammonia by ammonifying bacteria.

- Nitrite bacteria like *Nitrosomons* of soil convert ammonia into nitrite.
- Nitrate bacteria like *Nitrobacter* change nitrites into nitrates. These nitrates can be absorbed by plants and later transferred to animals.
- Some nitrates are also converted back into nitrogen gas through the process of Denitrification by denitrifying bacterial like *Pseudomonas* and *Clostridium.*





2. Describe the Phosphorous cycle.

- The phosphorus cycle is considered as sedimentary cycle.
- Phosphorus cycle describes the movement of phosphorus through the lithosphere, hydrosphere and biosphere.
- Phosphorus normally occurs as part of a phosphate ion (Orthophosphate). Most phosphates are present as salts in ocean sediments or in rocks.

- Geologiocal upheavals bring ocean sediments on to land. The weathering of rock will carry terrestrial phosphates back to the ocean.
- Plants absorb phosphates from soil and then transferred to animals.
- After death of organisms, the phosphates return to soil.

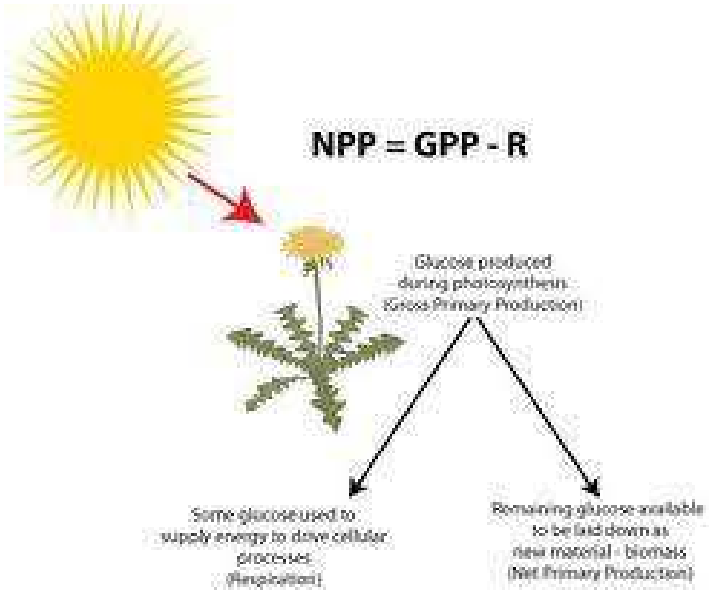
3. Describe the productivity in Producers.

- The total amount of organic material produced by living organisms of a particular area within a set period of time is considered as Productivity.
- Energy production in an ecosystem is categorized into Primary productivity and Secondary productivity.

PRIMARY PRODUCTIVITY:

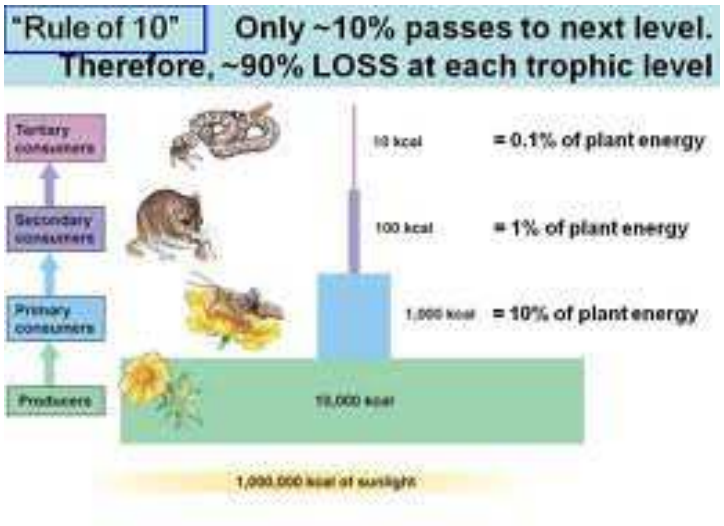
- Primary productivity is the rate at which biomass is produced by organisms like green plants by photosynthesis and some bacteria by chemosynthesis.
- The total primary productivity is known as gross primary productivity (GPP). About 50 % of light energy that falls on the plants is absorbed. Of this 1 % is converted into chemical energy.
- Gross production is partly used for respiration and rest is stored in the tissues as Net primary productivity. It is used for growth and reproduction by the plants.
- Generally about 20 to 25 % of the GPP is utilized by the plant for its respiration.

NPP = GPP --- R



4. Discuss Lindeman rule.

- Raymond Lindeman is referred to as the “founder of Modern ecosystem ecology”.
- The average trophic efficiency is the efficiency of transfer of energy from one trophic level to the higher trophic level.
- According to Lindeman the trophic efficiency is 10%.
- This rule is referred to as 10% rule (Lindeman’s trophic efficiency rule).



5. If the net secondary production in primary carnivores is 15 KJ in an Ecosystem, calculate the net primary production and net secondary production in tertiary carnivores.

ANS :

In any ecosystem, the energy flow occurs in the following manner.

We apply Lindeman's rule (10 % trophic efficiency rule)

PRODUCERS ➔ HERBIVORES ➔ PRIMARY CARNIVORES ➔SECONDARY

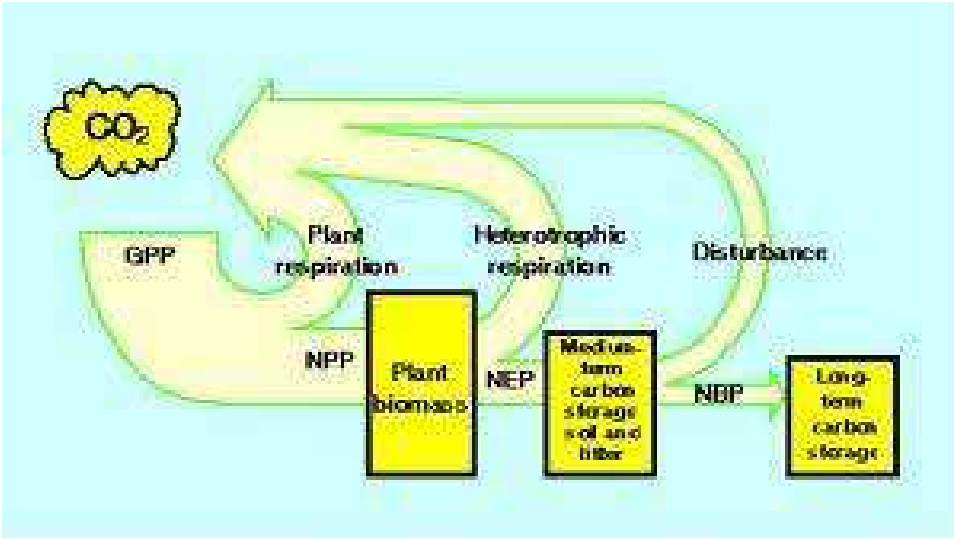
NPP → 10% → NSP → NSP → NSP

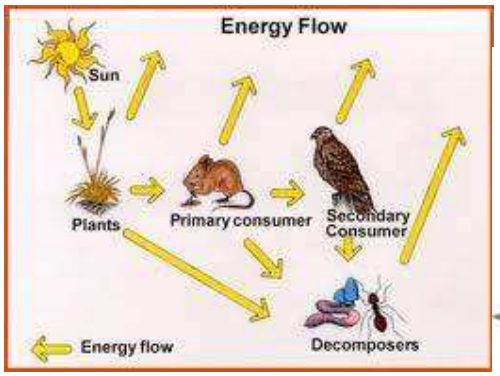
1500 → 150 → 15 → 1.5

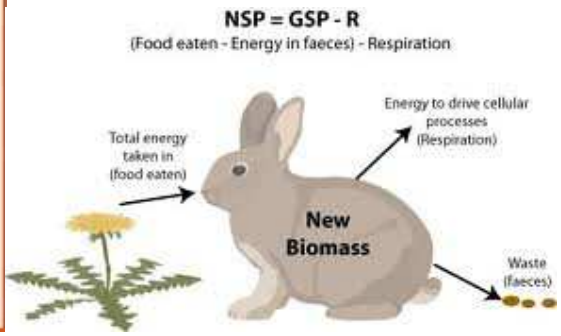
CARNIVORES ➔ TERTIARY CARNIVORES.

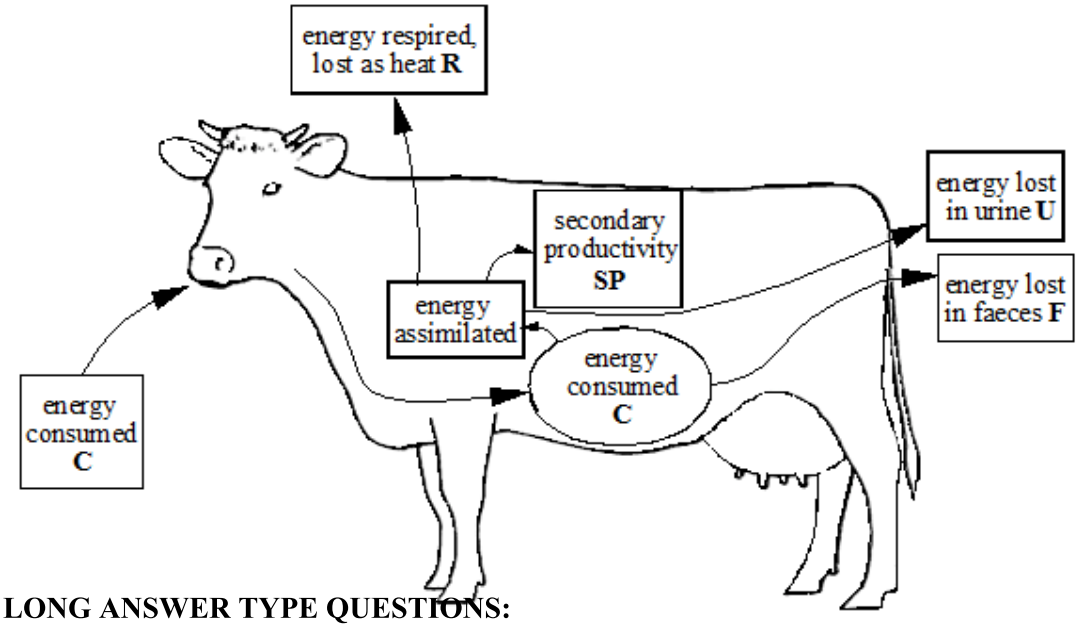
→ NSP

→ 0.15









LONG ANSWER TYPE QUESTIONS:

1. Describe the flow of energy in an Ecosystem .

- Energy the capacity to do work.
- Energetics the study of the laws of energy and its transformations.
- The standard international unit of energy is JOULE.
- The ecosystems and the organisms which form the biotic component of ecosystems may be different, but the pattern of flow of energy in aall the ecosystems remains the same. The energy stores as reserve food in the plants is transferred to herbivores and from them to the carnivores.
- Energy flow is always follows unidirectional.
- The weight or quantity of organisms in an area at a given moment is Standing crop.
- The total amount of organic material produced by living organisms of a particular area within a set period of time is the Productivity.
- The flow of energy in an ecosystem occurs as an open system.

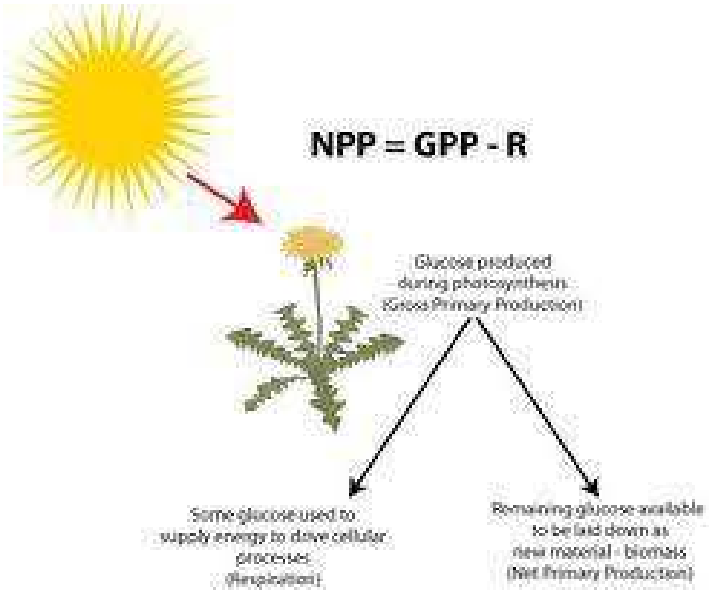
Energy production in an ecosystem is categorized into Primary productivity and Secondary productivity**.**

I) PRIMARY PRODUCTIVITY :

- Primary productivity is the rate at which biomass is produced by organisms like green plants by photosynthesis and some bacteria by chemosynthesis.

- The total primary productivity is known as gross primary productivity (GPP). About 50 % of light energy that falls on the plants is absorbed. Of this 1 % is converted into chemical energy.
- Gross production is partly used for respiration and rest is stored in the tissues as Net primary productivity. It is used for growth and reproduction by the plants.
- Generally about 20 to 25 % of the GPP is utilized by the plant for its respiration.

NPP = GPP --- R



II) SECONDARY PRODUCTIVITY :

- The rate at which consumers convert the chemical energy of the ingested food into heir own body substance is known as Secondary productivity of ecosystem.
- The potential energy of primary production is consumed by herbivores and omnivores which may be eaten by carnivores, which in turn may be eaten by other larger carnivores.
- Exploitation Efficiency: The percentage of the production of one trophic level that is ingested by the other trophic level above.

$$\text{Exfloitation Efficiency} = \frac{\text{The food ingested}}{\text{Total food available for ingestion}} \times 100$$

- Assimilation Efficiency : The percentage of the energy ingested that is actually absorbed across the wall of the gut.

$$\text{Assimilation Efficiency} = \frac{\text{The food digested}}{\text{Total food ingested}} \times 100$$

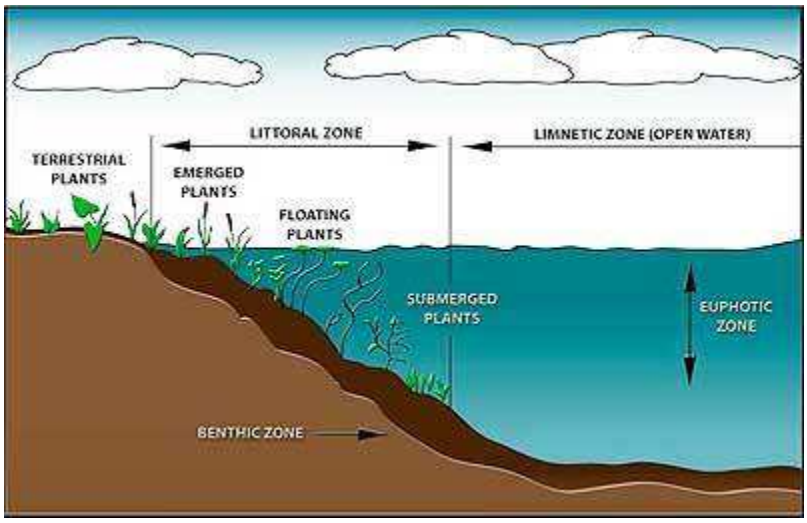
- Gross secondary production (GSP) is the total plant material ingested by the herbivores minus the materials lost as faeces .
- A part of GSP is utilized in respiration, and the rest is stored in the tissues of consumers. It is known as Net Secondary Production (NSP).It is used for growth and reproduction**.**

TRANSFER OF ENERGY:

- The proportion of energy lost in the first transformation of absorbed solar energy to the chemical energy in producers is high i.e.,99 %.
- Subsequent transfers are much more efficient. The average trophic efficiency is 10 %.
- This rule is generally referred to as 10 % rule.

- The trophic efficiency in herbivores is percentage of the net primary production that is converted to net secondary production in herbivores.

LAKE ECOSYSTEM



VERY SHORT ANSWER TYPE QUESTIONS:

1. What are the three zones of a lake?

- Littoral zone, limnetic zone and profundal zone are the three zones of lake.

2. What is a littoral zone in a lake?

- Littoral zone is a shallow water zone close to shore. Light penetrates up to the bottom.

3. Euphotic zone of a lake includes water of littoral and limnetic zones. Why?

- Littoral zone is shallow water zone where light penetrates up to the bottom.
- Limnetic zone the zone of open water which extends upto the effective light penetration level.
- Thus both littoral and limnetic zones are related to euphotic zone in which light penetration occurs effectively.

4. Name any four emergent plants in the lake ecosystem.?

1.Emergent	Partly submerged & partly exposed	Provide nutrient pump.	Link between Water and land	*Typha(*cattails) *Scirpus(*bulrushes) *Sagittaria* (arrow head) *colacasia*

5.Why are limnetic and profundal zones of lake are absent in a shallow pond ?

- Limnetic zone extends up to the depth of effective light penetration level.
- Profundal zone is the bottom area which is beyond the depth of effective light penetration.
- But in shallow ponds, the light can penetrates upto the bottom of the pond.
- So limnetic and profundal zones are absent in a shallow pond.

6. Write any four examples for floating vegetation in a lake.

Floating	Free floating or Rooted floating	Free floating : *Pistia , Wolffia, Lemna* (duckweed) *Azolla, Eichhornia*
		Rooted floating : *Nymphaea* (water lily), *Trapa*

7. What is compensation level in a lake?

- The amount of light decreases until a depth is reached where the rate of photosynthesis equals the rate of respiration which is known as Effective Light penetration or the Compensation level.
- At this depth, photosynthetic rate of producers balances respiratory rate.
- Net addition of oxygen is zero.

8. What is the lower border of limnetic zone in a lake?

- Effective light penetration or compensation level is the lower border of limnetic zone in a lake.

9. What are the consumers present in the limnetic zone in a lake?

- Zooplanktons, Limnetic Nekton are the consumers in limnetic zone.

10. What are the characteristic features of profundal zone in a lake?

Profundal zone is the bottom and deep-water area.

- It is beyond the depth of effective light penetration.
- Photosynthetic plants do not occur in this zone.
- Oxygen content is very low. A thick layer of mud and sand is present.
- It is absent in ponds.

11. How does littoral zone differ from the limnetic zone in a lake?

LITTORAL ZONE	**LIMNETIC ZONE**
1.It is the shallow water zone close to shore 2.Light penetrates up to the bottom 3. vegetation is abundant	It is the zone of open water which is not connected to either shore or bottom It extends up to the effective light penetration level Vegetation is limited

12. How does limnetic zone differ from profundal zone in a lake?

LIMNETIC ZONE	**PROFUNDAL ZONE**
..It is the zone of open water which is not connected to either shore or bottom ..It extends up to the effective light penetration level. ..Vegetation is limited	..It is the bottom and deep-water area. ---It extends beyond the depth of effective light penetration. ..vegetation is absent.

13. What are the various groups of phytoplankton in a lake?

PHYTOPLANKTON:

- ► These are chlorophyll bearing floating microorganisms in water.
- ► They are producers in littoral zone.
- ► Eg., a)Diatoms : coscinodiscus, Nitzshia
  b)green algae : *Volvox, spirogyra*
  c)Cyanobacteria : *Oscillatoria, Nostoc*

d)Euglenoids : *Euglena, Phacus*

e)Dinoflagellates : *Gymnodinium, Cystodinium*

14. What is the significance of nutrient pump in a lake?

- Emergent vegetation or amphibious plants present near the shore in littoral zone of a lake is fixed to soil and obtain the nutrients from the soil.
- Thus they form the link between water and land by providing a nutrient pump.

15. which zone of a lake is with more biodiversity, why?

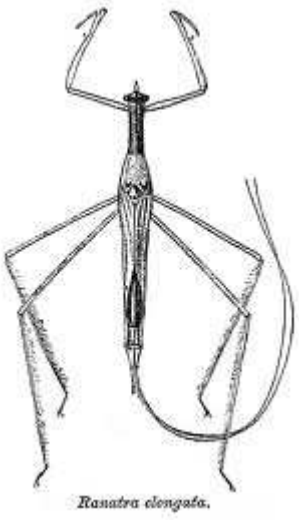
- Littoral zone of a lake has more biodiversity.
- Light is more available here which results the abundant vegetation. It causes more dissolved oxygen content in water.
- So consumers are also are more in this zone.
- It increases biodiversity in this are.

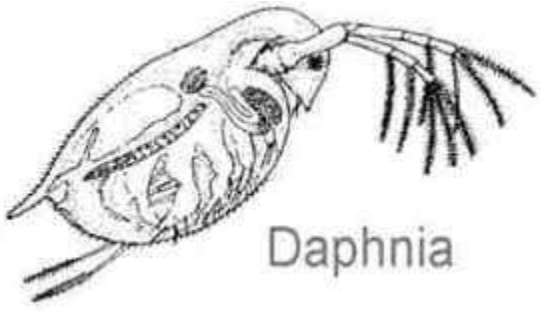
16. Which zone is with high primary productivity in a lake?

- LITTORAL ZONE has high primary productivity because vegetation is more abundant in this zone.

17. Why are producers absent in profundal zone?

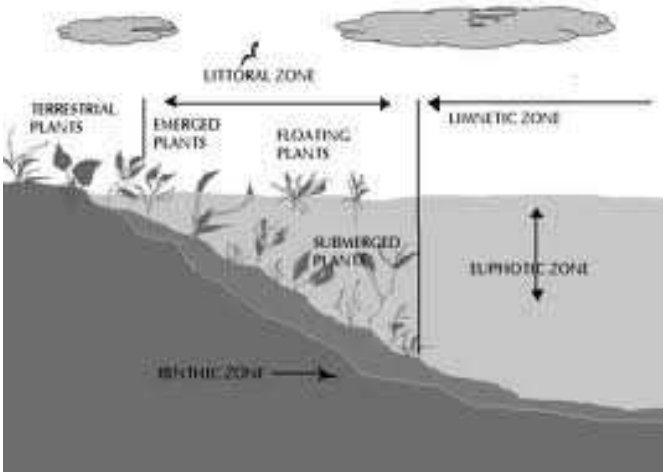
- Profundal zone is located at the bottom of lake. It is present beyond the depth of effective light penetration.
- Due to the absence light, Producers are absent in this zone.





SHORT ANSWER TYPE QUESTIONS:

1. Describe the habitat and biotic community of littoral zone in a lake.





HABITAT:

- Littoral zone is the shallow water zone close to shore. Light can penetrates up to bottom.
- Vegetation is abundant and dissolved oxygen content also is high.
- Consumers are also more. Water is relatively warmer.

BIOTIC COMMUNITY:

- It includes producers and the consumers.

A) PRODUCERS :

- Rooted plants and phytoplankton are the producers.
- Rooted plants (vegetation) are of three types like emergent vegetation, floating vegetation and submerged vegetation shown in table below.

Type of vegetation	**Nature of plants**	**Characters**	**Role**	**Eg.,**
1.Emergent	Partly submerged & partly exposed	Provide nutrient pump.	Link between Water and land	Typha(cattails) Scirpus(bulrushes) Sagittaria (arrow head) colacasia
2.Floating	Free floating or	Free floating : Pistia , Wolffia, Lemna (duckweed)		

	Rooted floating	Azolla, Eichhornia
		Rooted floating : Nymphaea (water lily), Trapa
3.Submerged	In water. Away from shore	a)rooted to soil : Valisneria, Chara(muskgrass) Potamogeton, Hydrilla
		b)free submerged : Ceratophyllum (coontails) Utricularia

PHYTOPLANKTON:

- ► These are chlorophyll bearing floating microorganisms in water.
- ► They are producers in littoral zone.
- ► Eg., a)Diatoms : coscinodiscus, Nitzshia
  b)green algae : *Volvox, spirogyra*
  c)Cyanobacteria : *Oscillatoria, Nostoc*
  d)Euglenoids : *Euglena, Phacus*
  e)Dinoflagellates : *Gymnodinium, Cystodinium*

B) CONSUMERS: consumers are more in this zone than in the other two zones. They are

Consumer	**Character**	**Eg.,**
1.Zooplankton	Microscopic floating animals with limited locomotory power	Protozoans, rotifers , crustaceans like copepods (*Cyclops*), Cladocerans (*Daphnia*-water flea)
2.Nekton	With more swimming capacity	Fishes, amphibians, terrapins, water snakes, insects like *Ranatra* (water scorpion), *Notonecta* (back swimmer) Diving beetles like *Dytiscus*
3.Neuston	Living at air water interface a)Epi or Supra neuston – on surface of water	*Gerris* (water striders) ;beetles like *Dineutes*
	b)hypo or infraneuston – on underside of air water interface	Larvae of mosquitoes (Wrigglers)
4. Periphyton	Cling to aquatic plants	Water snails, nymphs of insects, bryozoans, turbellarians, hydras etc.
5.Benthos	At bottom only or beneath the sand or debris.	Chironomid larvae, clams, red annelids, isopods, amphipods, Cray fishes




GERRIS

2. Describe the habitat and biotic community of Limnetic zone of a lake.

LIMNETIC ZONE::

A) HABITAT: It is the zone of open water. It extends up to the effective light penetration level.

- The amount of light decreases until a depth is reached where the rate of photosynthesis equals the rate of respiration which is known as Effective Light penetration or the Compensation level.
- At this depth, the net addition of oxygen to water is zero. This level will be at the depth at which light intensity is about 1% of sunlight penetrating the lake.
- It is absent in shallow ponds.

B) **BIOTIC COMMUNITY**: Producers and consumers are present in this zone.

a) PRODUCERS: Phytoplankton is the only producer in this zone.

b) CONSUMERS: Zooplankton, Limnetic Nekton are the consumers.

3. Describe the habitat and biotic community of profundal zone in a lake.

PROFUNDAL ZONE::

A) HABITAT: It is bottom and deep-water area.

- It is beyond the depth of effective light penetration.
- Photosynthetic plants do not occur in this zone.
- Oxygen content is very low. A thick layer of mud and sand is present.
- It is absent in ponds.

B) BIOTIC COMMUNITY:

- Animals which can survive at low oxygen levels only can survive here.
- They depend on the organisms falling from limnetic and littoral zone for their food.
- It is dominated by decomposers at the bottom of the lake.
- It contains the nekton and bottom contains the benthos like *Chironomid* larvae (blood worms), red annelids and molluscans like clams.
- Bacteria are more which decompose the dead plants and animals and release the nutrients to biotic communities of limnetic and littoral zone.
- *Chaoborus* (phantom larva) lives as a planktonic organism in limnetic zone during night and moves to the bottom to live as a benthic from during the day time.

LONG ANSWER TYPE QUESTIONS

1. Describe the lake as an ecosystem..?

- ❖ Lake is a natural water body with water throughout the year.
- ❖ Light cannot penetrate beyond the depth of 200 meters. So vegetation does not occur beyond that depth.
- ❖ Thermal stratification occurs in lakes of temperate regions.
- ❖ Oxygen is poor in deeper waters.
- ❖ Three zones in a lake are Littoral, Limnetic and Profundal zones.

LITTORAL ZONE:

- ✹ Littoral zone is the shallow water zone close to shore. Light can penetrates up to bottom.
- ✹ Vegetation is abundant and dissolved oxygen content also is high.
- ✹ Consumers are also more. Water is relatively warmer.

BIOTIC COMMUNITY:

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chaoborus

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POPULATION ECOLOGY

VERY SHORT ANSWER TYPE QUESTIONS:

1. **Define population.**
   - Population is a group of organisms belonging to the same species, living in an area.
   - The word population is derived from Latin word *Populus* means people.
2. **Is population ecology is an autecology?**
   - Yes, population ecology is an autecology because Autecology is the study of interrelationships between individual organisms of the same species or population and their environment.
3. **Distinguish between absolute natality rate and specific natality rate.**
   - Natality is the number of young members produced in unit time. (Birth rate)

Absolute natality rate	**Specific natality rate**
1.Natality rate in the population	Natality rate per individual in population

4. **Distinguish between potential natality rate and ecological natality rate.**

Potential natality rate	**Ecological natality rate**
1. Maximum natality rate in population under unlimited environmental conditions.	Natality rate under given limited ecological conditions. 2. It is less than potential natality rate.

5. **Distinguish between potential mortality rate and ecological mortality rate.**

Potential mortality rate	Ecological motality rate
1. Minimum number of deaths under unlimited conditions. 2. It is always less than ecological mortality	Death of individuals under given ecological conditions.

6. **What is reproductive potential?**
   - Reproductive capacity of individuals is known as reproductive potential.
   - It is the fundamental feature of organisms.
7. **What is biotic potential?**
   - The maximum reproductive potential under unlimited environmental resources is known as biotic potential.

     r_{max}= growth rate in unlimited environmental sonditions.

     r = b --- d where r = growth rate
     b = specific natality rate
     sd = specific mortality rate.
8. **What is environmental resistance?**
   - Environmental means the sum total of limiting factors of both biotic and abiotic, which act together to limit the size of the population.
   - It includes the factors like predation, food supply, heat, light, space, intraspecific competition etc.
9. **What is lag phase?**

- ❖ Lag phase or positive acceleration phase is the first phase of population growth curves.
- ❖ It is an establishment phase.
- ❖ Growth rate is slow during this phase as the members adapt to new conditions during this phase.

10. What is negative acceleration phase?

- ❖ It occurs after logarithmic phase in sigmoid population growth curve.
- ❖ It is a declining phase which occurs due to declining birth rate or rising death rate.
- ❖ It is due to increased environmental resistance under conditions of increased densities of populations.

11. What is carrying capacity?

- ❖ The maximum stable population that a particular environment can support over a long period of time.
- ❖ The size of populations may show fluctuations around the carrying capacity.

12. Why is J shaped growth curve is said to be density independent?

- ❖ Regulation of growth rate is not dependent on population density until the final crash in 'J' shaped growth curve.
- ❖ So it is considered as density independent growth curve.

13. What is population crash?

- ❖ Population crash occurs in 'J' shaped growth curve.
- ❖ The sudden decrease in the population after reaching the peak level is known as crash.
- ❖ It occurs due to the factors like seasonal changes or the end of breeding phase of organisms.

14. What is the condition for an increasing population with respect to age group?

- ❖ In a growing or increasing population, the pre reproductive or immature animals occur in large numbers.
- ❖ It gives TRIANGULAR shaped age pyramid for growing population.

15. When is a population said to be stable with respect to age groups?

- ❖ When all the three age groups occur in almost equal numbers, then the population is said to be stable.
- ❖ It provides BELL shaped age pyramid for stable population

16. What are the density independent factors that regulate the growth of population?

- ❖ Density independent factors are extrinsic factors. They affect the birth rate or death rate independent of population density.
- ❖ Variations in climatic conditions like temperature, food, space and shelter.

17. What are the density dependent factors that regulate the growth of a population?

- ❖ Density dependent factors are intrinsic factors which vary with density of population.
- ❖ They are competition, predation, migration, disease, territorial behaviour.

SHORT ANSWER TYPE QUESTIONS;

1. How do natality, mortality and population dispersal affect the density of a population?

- ► Natality is the number of young members produced in a unit time.
- ► Absolute natality rate is the natality rate in the population.

- ► Specific natality rate is the natality rate per individual in a population.
- ► Potential natality rate is the maximum natality rate in a population under unlimited environmental conditions.
- ► Ecological natality rate is the natality rate under given limited ecological conditions.
- ► Mortality refers to the death of the individuals in a population.
- ► The size of a population depends on the relative rates of natality and mortality.
- ► When natality is more, the size of population increases. If mortality rate is high, the size of population decreases.

POPULATION DISPERSAL:

- ❖ Population dispersal is the movement of individuals into and out of a population. It occurs in three forms like emigration, migration and immigration.
- ❖ Emigration is the outward movement of members from a population to other area. Its impact is decrease in the size of that population.
- ❖ Immigration is inward moment of members into the population from the neighbouring areas. It impact is increase in the size of that population.
- ❖ Migration means inward and outward movements from one area and return movement to that area. They influence the size of population temporarily.

2. EXPLAIN THE DIFFERENT TYPES OF POPULATION GROWTH CURVES..

- ❖ Growth is the fundamental, dynamic, biological feature show by the populations of all species.

- ➢ Growth and decline in size of pupation over a unit period of time , under given environmental conditions can shown graphically in the form of Growth Curves.
- ➢ Growth curves are plotted by taking Time on X –axis and number of organisms per unit area on the Y – axis.
- ➢ There are two basic forms of growth curves , S – shaped and J – shaped.

A) S – SHAPED OR SIGMOID GROWTH CURVE :

- ➢ Many populations of microorganisms, plants and animals exhibit this basic sigmoid growth curve. This growth curve show four phases in the following manner……

a) LAG or POSITIVE ACCELERATION PHASE :

- ❖ It is the initial phase. Population establishes with new environment. So the growth is very slow initially.

b) LOGARITHMIC PHASE :

- ❖ Once the populations establishes with new conditions, it multiplies rapidly due to the abundance of food and favourable conditions.
- ❖ Births (natality) exceed the deaths (Mortality) during this phase.

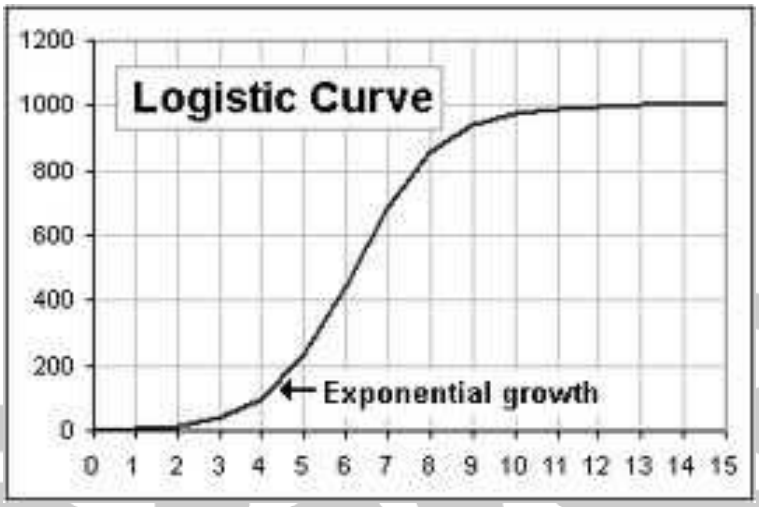
c) NEGATIVE ACCELERATION PHASE ;

- ❖ It occurs due to decline in the amount of available food.
- ❖ It is a declining phase.
- ❖ It occurs due to declining birth rate or raising death rate.
- ❖ It occurs due to increased environmental resistance.

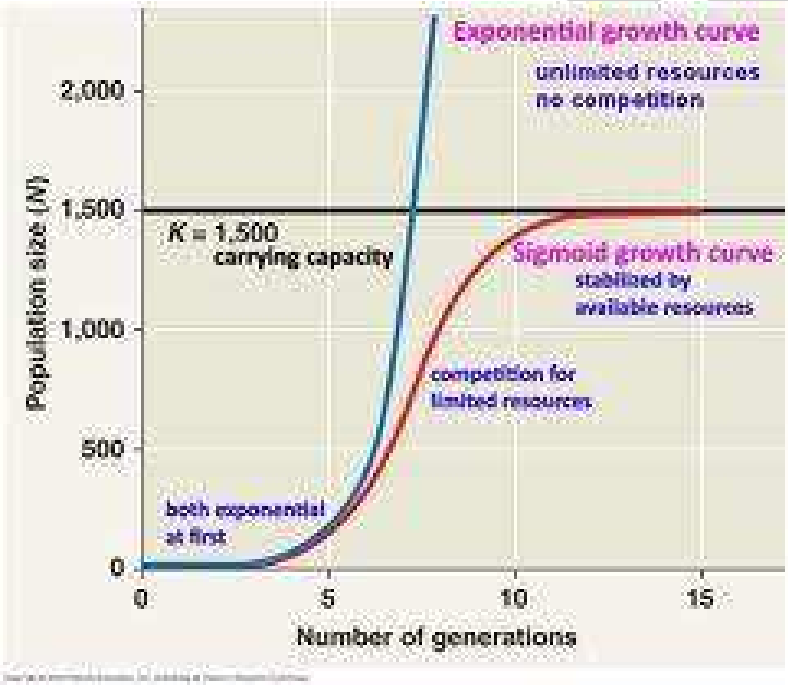
d) ZERO POPULATION GROWTH PHASE or STABILIZING PHASE :

- ❖ At this phase the natality rate approximately equals the mortality rate.
- ❖ It is a stationary phase or state of equilibrium.

- It occurs due to the declining of available food in proportion to the number of individuals,
- The point of stabilization or zero growth rate represents the maximum carrying capacity of the given environment for the organisms concerned.
- Carrying capacity is the maximum stable population that a particular environment can support over a long period of time.
- Sigmoid growth curve is considered as Logistic curve and it reflects a changing ratio of births and deaths over a period of time.
- The size of a population may show fluctuations around the carrying capacity.

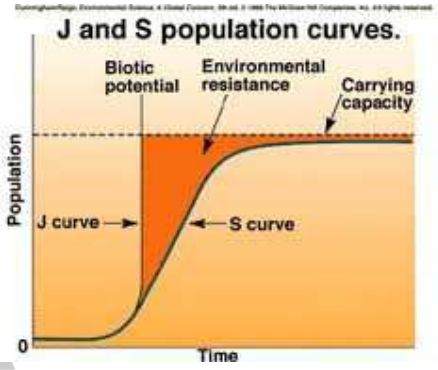


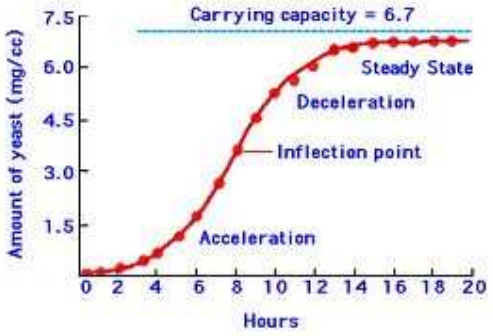
- Sigmoid growth curve is considered as Density Dependent as the growth rated depends on the number present in the population.

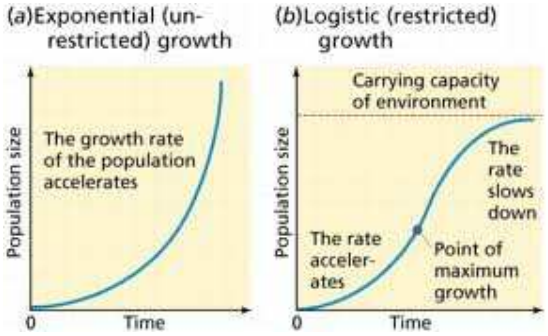


B) J – SHAPED or EXPONENTIAL GROWTH CURVE

- ❖ Populations of some species have the potential to grow exponentially. This type of growth is represented by J – shaped curve on graph.
- ❖ It is shown by algal bloom, plant sap sucking insects like aphids.
- ❖ It also has initial lag phase or establishment phase. But later the population continues to grow exponentially till it reaches the peak level where environmental resistance comes into operation.
- ❖ Sudden decrease in population after reaching the peak is referred to as CRASH.
- ❖ This growth curve is considered as Density independent as the regulation of growth rate is not dependent on population density until the final crash.
- ❖ Crash may occur by the factors like seasonal changes or the end of the breeding phase of the organisms.
- ❖ This growth curve never depends on carrying capacity.
- ❖ The population may cross the carrying capacity if the conditions are favourable for long time.
- ❖ The population may crash before reaching carrying capacity if the conditions turn in to unfavourable.







3. Explain the importance of Age pyramids? (May '09)

- ❖ Individuals in a population can be divided into 3 groups based on their age. They are
  a)Prereproductive age group (Young)
  b) Reproductive age group (middle aged)
  c) Post reproductive age group (Old)
- ❖ The chances of death are usually more in young & old members.

- When a individuals of three different age groups in population are arranged in such a way that young ones at the bottom, middle aged in the middle and old persons at the top. The diagrammatic representations of the size of the population take different shapes based on the distribution of age groups. These are called AGE PYRAMIDS.
- The shape of age pyramid indicates the status of a population in the following manner…

Type of population	**Shape of age pyramid**	**Dominated by**
1.Growing	Triangular	Prereproductive age Group (immature)
2.Stable	Bell	All age groups occur in Equal numbers
3.Declining	Urn (inverted pot)	Prореroductive age group (old)

BIODIVERSITY

VSAQ:

1. Define biodiversity.

- Biodiversity is the diversity of life. It is the variation of life a al levels of biological organization-within a species, among species and comparative diversity among ecosystems.
- Biodiversity is the totality of genes, species and ecosystems of a region.

2. Distinguish between species richness and species evenness.

Species richness	Species evenness
1.It is the number of species per unit area	It is the relative abundance of the different species making up the richness of area

3. Distinguish between species diversity and ecosystem diversity.

Species diversity	Ecosystem diversity
1.It is the diversity among species in an ecosystem.	It is the diversity among ecosystems on earth. It is the diversity of higher level of organization

4. Define species endemism?

The species which are unique to any given area are considered as endemic species.
Areas rich in endemic species might be sites of active speciation.

5. What is genetic diversity?

It is the diversity of genes within a species.
Genetic diversity is the number of genes of a specific trait that exist within the population of a species.

6. What is an alpha diversity?

Diversity with a particular area, community or ecosystem is alpha diversity**.**

7. What is a biodiversity hotspot?

A biodiversity hot spot is a bio geographic region that both a significant reservoir of biodiversity and is threatened with destruction.
They are identified by Dr.Norman Myers**.**

8. Define the terms ecotope, ecoregion & ecozone.

- **ECOTOPE /BIOTOPE:** An area that is uniform in environmental conditions ad in its distribution of animal and plant life.
- **ECOREGION**: An area constituting a natural ecological community with characteristic flora, fauna and environmental conditions and bounded by natural rather than artificial borders.
- **ECOZONE / BIOGEOGRAPHIC REALM**: Largest scale of biogeograhic division of the earth's surface based on the historic and evolutionary distribution patterns of plants and animals.

9. Name the biodiversity hotspots in India.?

India has three biodiversity hot spots. They are
a)Western ghats/Sri Lanka b)Indo-Burma (covering eastern Himalayas)
c)Himalayan region.





Hotspots in India

10. Explain species interdependence with one example.

- When a species depends on other species for its existence, if any harm occurs for that species, the dependent species is also effected.
- Best example for this the relationship between the Calvaria major and Dodo bird in Mauritius.
- Seeds of *Sideroxylon grandiflorum (Calvaria major)* , a tree in Mauritius, germinates when they pass through the abrasive stone-filled gizzard of dodo bird, *Raphus cucullatus.*
- But dodo birds became extinct in 17th century. So only a few old calvaria trees survive now.



DODO



***Calvaria major* tree**

11. What is Ramsar wetland ?

- Ramsar wetland is the wetland declared in Ramsar convention.
- Eg., Kolleru lake in A.P. . In India, 6 Ramsar wetlands are present.

12. Name any two bird sanctuaries in India.?

- 1)Bharatpur Bird Sancturary (Keoldeo Ghana National Park) – Rajasthan.
- 2)Ranganthittu Bird Sanctuary -- Karnataka.

13. Name the plant from which chemical pesticide is extracted. Name the organism that can be used as biopesticide.?

- *Chrysanthemum* is the plant from which biodegradable pesticide, Pyrethrin is extracted.
- *Bacillus thuringienisis* is the organsism which acts as biopesticide.

14. List any four environmental roles of biodiversity.?

Biodiversity

a)Maintains homeostasis of ecosystems and provides environmental services like water resources, soil protection, pollution control etc..

b) Natural vegetation at catchment maintains hydrological cycle, regulate and stabilize water runoff.

c)Plants prevent soil erosion as the roots bind the soil.

d)Ecological systems perform the function of recycling.

15. How do exotic species pose a serious threat to biodiversity ?give one example.?

When exotic species are introduced to ecosystems and establish themselves as self-sustaining populations, the endemic species in that ecosystem may not survive.

E.g., i) Nile perch is an established exotic species reduces the endemic species of great African lakes Victoria, Malawi and Tanganyika.

ii) Lanatana bushes, Eupatorium shrub, Parthenium, Hyacinth are the exotic species introduced into our areas developed at the expense of ours.

16. What do you meant by Superspecies ?

Superspecies are the highly fecund, ultra-competitive, generalist species.

When they introduce into new area, they destroy the less competitive native species.

17. What are biosphere reserves ?

Biosphere is an area which is set aside for the conservation of the resources of the biosphere and for the improvement of the relationship between man and the environment. It is protected area for the whole ecosystem.

18. What do you mean by saacred forests and sacred lakes ?

They are protected by local communities. These are undisturbed.

19. What do you mean by Cryopreservation ?

Cryopreservation is the technizue in which embryos, animal cells, spermatozoa etc., are preserved at -196^{O} C.

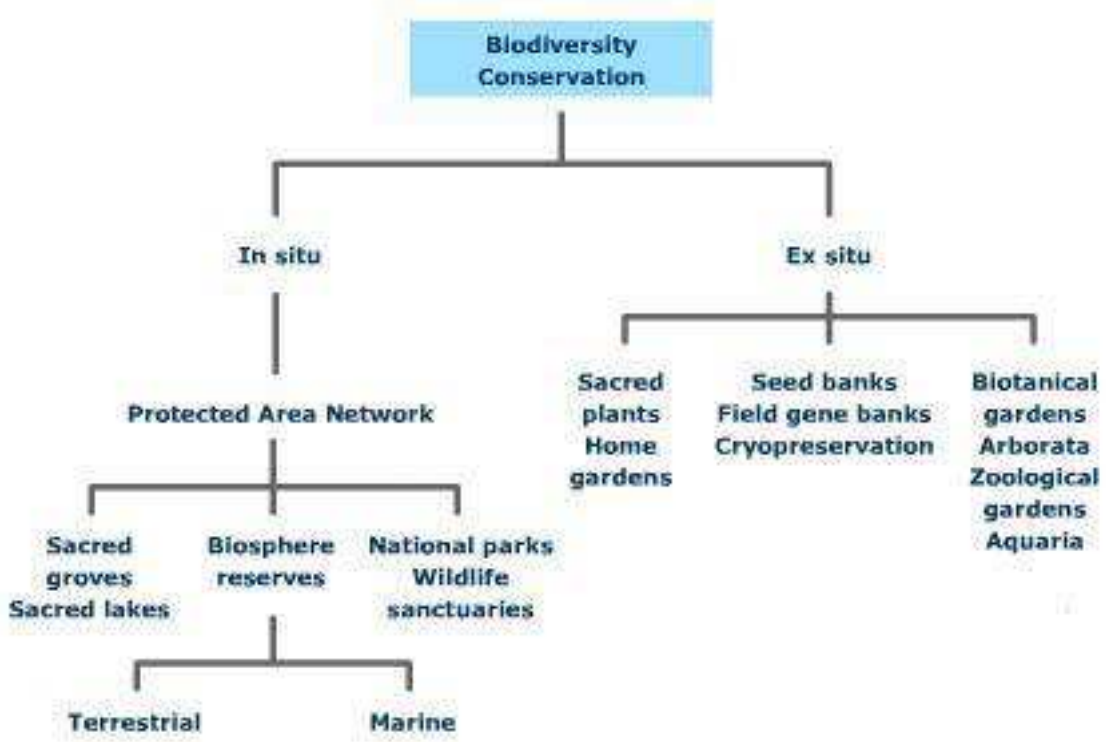
20. What are Red Data Books ? Write abut their significance.?

- Red Data books have Red Data List published by IUCN (International Union for the Conservation of Nature and Natural Resources.
- Publishing of that books created in 1963.
- Different categories of species are given in that book/List.

21. Distinguish between in-situ conservation and ex-situ conservation.?

A)In-situ conservation means On-site conservation. It is the process of protecting an endangered species in its natural habitat like National parks, Sanctuaries, biosphere reserves and sacred forests.

B)Ex-situ conservation (Off-site conservation) : It involves the conservation of genetic resources of psecies away from their area of origin or development. It includes off site collection and gene banks.



21. Distinguish between national parks and sanctuaries.

NATIONAL PARKS	SANCTUARIES
1. Natural habitats of certain endangered species.	Protected areas for specific endangered faunal species.
2. No biotic interference is allowed	Limited biotic interference is allowed
3. Ecotourism is permissible	Ecotourism is permissible
4. Private ownership is not allowed	Private owner ship is allowed with restrictions.
5. Boundaries are legally declared	Boundaries are not circumscribed.

22. What do you mean by near threatened status of a species?

Taxa which do not qualify for conservation dependent, but which are close to qualifying for vulnerable are considered as threatened species.

23. Distinguish between critically endangered and endangered status of a species.

- Critically endangered (CR): A taxon which is facing an extremely high risk of extinction in the wild in the immediate future.

  Eg., *Podophyllum, Berberis nilgiriensis*

- Endangered (EN) : It is facing a high risk of extinction in the wild in the near future.

  Eg., Red panda, lion tailed macaque

24. Distinguish between Orthodox and Recalcitrant seed banks.

ORTHODOX SEED BANKS	RECALCITRANT SEED BANKS
1. Orthodox seed can tolerate the moisture content up to 3 %.	Don't survive at low moisture.
2.can survive at anaerobic condition	Can't survive at anaerobic condition.
3. can survive at low temperature	Can't survive at low temperature.

Eg., cereals and legumes	Eg., coconut, cocoa seeds, tea, jackfruit

25. Distinguish between Extinct and Extinct in Wild

- Extinct: Last individual had died e.g. Dodo
- Extinct in the wild (EW): It is known to survive only in cultivation or in captivity.

26. What do you mean by vulnerable status of species?

Vulnerable species is not critically endangered but is facing a high risk of extinction in the wild in the near future. E.g., *Antelope cervicapra.*

27.What is Tikerpada in Orissa famous for ?

- World's first captive breeding crocodi les started at Tikerpada, Orissa.
- It is Crocodile Breeding Project.

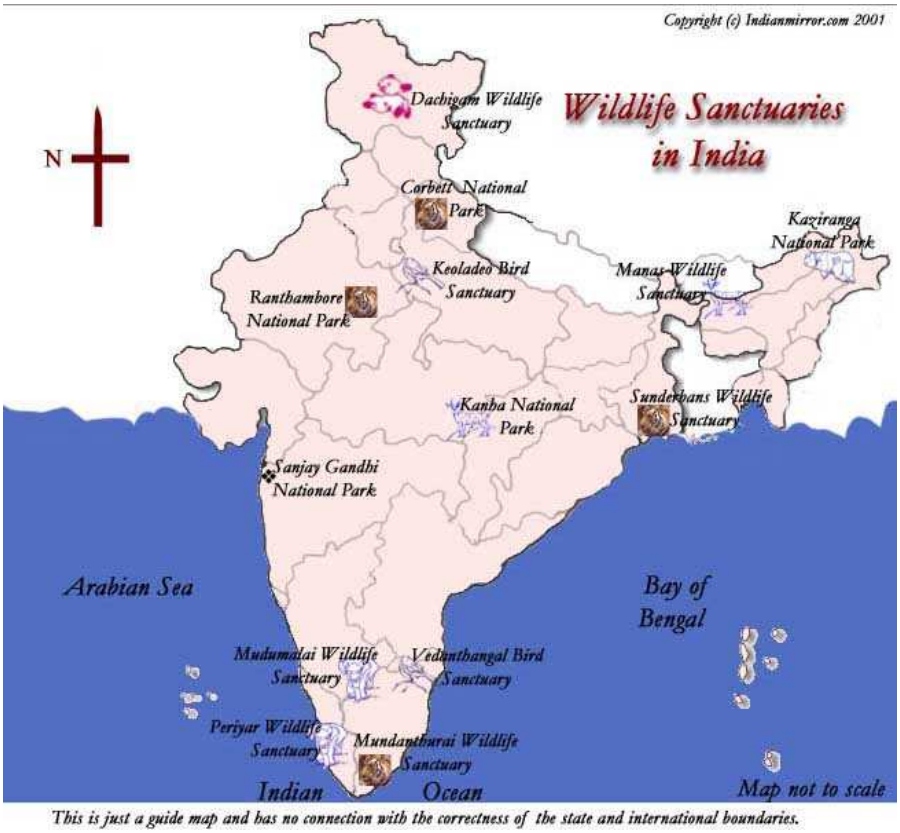
28. Name the two centers in India where migratory birds are protected.

- Kolleru lake ---- A.P.
- Ranganthittu Bird Sanctuary - Karnataka.

29. Name the FIVE World heritage sites of biodiversity in India.

HERITAGE SITE	STATE
1.Khaziranga national park	*Assam*
2.Manas National Park	Assam
3.Sunderbans National Park	West Bengal
4.Keoladeo Ghana National Park	Rajasthan
5. Nanda Devi national Park	Uttarakhand

Name	Location
Corbett National Park	Uttar Pradesh
Kanha National Park	Madhya Pradesh
Gir National Park	Gujarat
Sultanpur Lake bird Sanctuary	Haryana
Dachigam Sanctuary	Jammu and Kashmir
Simlipal	Orissa
Desert National Park	Rajasthan
Annamalai	Tamil Nadu
Bandipur National Park	Karnataka
Bir Molibagh Sanctuary	Punjab



SAQs:

1. Describe the various types of biodiversity.

- Biodiversity is the diversity of life. Three levels of biodiversity are genetic diversity, species diversity and ecological diversity.

1. GENETIC DIVERSITY: It is the diversity of genes within a species.

Genetic variability is present among the population and the individuals of the same species.

Genetic diversity increases with environmental variability.

It is advantageous for survival.

Genetic recombination and gene or chromosomal mutations cause genetic variations. There are 10^{10} different genes distributed across the world's biota i.e., fauna and flora.

2. SPECIES DIVERSITY:

-- It is the diversity among species in an ecosystem. It refers to the variety of species within a region.

-- Species are the distinct units of biodiversity.

-- Each species has a specific role (Niche) in an ecosystem.

-- Biodiversity hotspots are the best examples for species diversity.

-- Species richness is the simplest measure of biodiversity.

-- Species richness is the number of species per unit area.

-- Species richness increases from high latitudes to the low latitudes. The peak of richness is present between 20^{O} N and 30^{O} N.

-- Higher species diversity is present at lower latitudes as those areas are larger with more solar radiation and resources.

3. ECOSYSTEM DIVERSITY: It is the diversity at a higher level of organization. It is of three types…

- Alpha diversity: diversity within a particular area, community or ecosystem and is measured by counting the number of tax within area.
- Beta diversity: Species diversity between two ecosystems. It involves the comparing the number of tax that are unique to each of the ecosystems.
- Sorrensen's similarity index: B = 2 c / S1 + S 2
- Gamma diversity: It is measure of the overall diversity for different ecosystem within a region.

2. Describe the various types of indices to measure the biodiversity?

A) Species richness: it is the simplest measure of biodiversity.

- Species richness is the number of species per unit area.
- Species richness increases from high latitudes to the low latitudes. The peak of richness is present between 20^{O} N and 30^{O} N.
- Higher species diversity is present at lower latitudes as those areas are larger with more solar radiation and resources.

B) Species evenness:

Species evenness is the relative abundance of the different species making up the richness of the area.

3. Explain the different types of in-situ management of biodiversity?

- In-situ conservation means ''on-site conservation'. In this process, protection is given to endangered species in its natural habitat.
- It includes the areas like national parks, sanctuaries, biosphere reserves and sacred forests.

a) National parks and Sanctuaries :

NATIONAL PARKS	SANCTUARIES
1.natural habitats of certain endangered species.	Protected areas for specific endangered faunal species.
2. No biotic interference is allowed	Limited biotic interference is allowed
3. Ecotourism is permissible	Ecotourism is permissible
4. Private ownership is not allowed	Private owner ship is allowed with restrictions.
5. Boundaries are legally declared	Boundaries are not circumscribed.

b) Biosphere Reserves: It is an area which is set aside for the conservation of the resources of the biosphere and for the improvement of the relationship between and the environment. Biosphere reserve is a protected area for the whole ecosystem.
Each biosphere reserve is intended to fulfil three basic functions ---

- Conservativion function
- Developmental function
- Logistic function

A biosphere reserve has core zone, buffer zone and transition zone.

c) Sacred forests and sacred lakes; they are protected by local communities. These areas are undisturbed.

4. Explain the different types of ex-situ management of biodiversity.

- Ex-situ conservation or off-site conservation involves the conservation of genetic resources of species away from their areas of origin. It includes off site collection and gene banks.
- Off-site collection: collection of wild and domesticated organisms in gardens and zoos etc.
- Gene banks: These are of 4 types like seed gene banks, field gene banks, in vitro preservation and cryopreservation.
- Seed banks are orthodox and recalcitrant types.

ORTHODOX SEED BANKS	**RECALCITRANT SEED BANKS**
1. Orthodox seed can tolerate the moisture content up to 3 %. 2.can survive at anaerobic condition 3. can survive at low temperature Eg., cereals and legumes	Don't survive at low moisture. Can't survive at anaerobic condition. Can't survive at low temperature. Eg., coconut, cocoa seeds, tea, jackfruit

- Recalcitrant plants are maintained in Orchrds (field gene banks).
- In labs, tissue culture is used to develop callus, mbryoids, polen grains, shot tips for plants without visible seeds. (*in vitro* preservation).
- Cryopreservation is the technique in which embryos, animal cells, spermatozoa etc. are preserved at -196^{O} C.

5. Discuss the various potential threats to biodiversity

A)Habitat degradation & its loss :

Deforestation, conversion of forests and grass lands into agricultural lands, conversion of multi-storey – natural forests into forests of teak, sal etc., and repeated fires in forests degrade habitat.

B) Invasion of Nonnative species:

Introduction of exotic species in various ecosystems affect the existence of endemic species.

Eg., Exotic species, Nile perch reduced the endemic species of great African lakes Victoria, Malawi and Tanganyika.

C) **Species interdependence:**

When a species depends on other species for its existence, if any harm occurs for that species, the dependent species is also effected.

Best example for this is the relationship between the *Calvaria major* and Dodo bird in Mauritius.

Seeds of *Sideroxylon grandiflorum (Calvaria major)* , a tree in Mauritius, germinates when they pass through the abrasive stone-filled gizzard of dodo bird, *Raphus cucullatus.*

But dodo birds became extinct in 17th century. So only a few old calvaria trees survive now.

D) Erosion of Barriers:

Rich diversity exists due to barriers like seas, oceans, mountain ranges, deserts etc. It gives protection to endemic species from highly fecund, ultra-competitive, generalist 'Super species'.

But after the invention of aeroplanes, ships and others superspecies are able to reach that areas. It affects on the growth of endemic species.

E) Pollution :

Pollutants amplify in the trophic levels through biomagnifications.

They reduce the life span of organisms.

F) Over Exploitation of Resources:

Overuse or misuse of resources threatens the biodiversity.

Logging, hunting, fishing, poaching reduce the species.

6. Explain the different roles of biodiversity.

A) Ecological role:

Each species as a special kind of function in an ecosystem. They can produce energy, produce organic material, and decompose organic material, recycling of water and nutrients.

B) Economic role:

Biodiversity is a reservoir of resources for food, medicines, and other products. Various types of animals and crops produce food.

Various types of medicines are available from plants

Medicine/product	**Source**	**Role**
1.Quinie	Bark of *Cinchona*	Treat malaria
2.Digitalin	Foxglove plant	Treat chronic heart trouble
3.Morphine	Poppy plant	Pain relief
4.Vinblastin & Vincristin	Vinca	Anticancer
5.Anti hypertensive drug	Sarpagandha	
6.Pyrethrin	*Chrysanthemum*	Biodegradable pesticide
7.*Bacillus thuringienisis*		Biopesticide

- Ethical role :
- Scientific role
- Environmental role : Biodiversity maintains homeostasis of ecosystems and provides services like water resources, soil protection, pollution control etc. Natural vegetation at catchment maintains hydrological cycle, regulated stabilize water runoff.

Plants prevent soil erosion as the root bind the soil.

6. Explain the different IUCN categories of species?

- ❖ INTERNATIONAL UNION FOR THE CONSERVATION OF NATURE AND NATURAL RESOURCES (IUCN) was founded in the year 1948.
- ❖ IUCN Red List (Red data List) created in 1963 by IUCN.
- ❖ The latest update is the 2006 Red List. It classified the species into nine groups on the basis of rate of decline, size of population, area of distribution etc. They are…..

Group	**Character**	**Example**
1.EXTINCT (EX)	Last individual has died	Dodo bird
2.EXTINCT IN THE WILD (EW)	Known to survive only in captivity or cultivation	
3.CRITICALLY(CR) ENDANGERED	Facing a high risk of extinction in the wild in the immediate future	*Podophyllum, Berberis nilgiriensis*
4.ENDANGERED (EN)	Facing a high risk of extinction in near future	Red Panda, Lion Tailed Macaque
5.VULNERABLE (VU)	Facing a high risk of extinction in the Medium term future.	*Antelope cervicapra*
6.NEAR THREATENED(NT)	Close to qualifying for vulnerable	
7.LEAST CONCERNED(LC)		
8.Data deficient		
9.NOT EVALUATED		

7. What is a biosphere reserve? List out some biosphere reserves in India.

➔ Biosphere Reserve is an area which is set aside for the conservation of the resources of the biosphere and for the improvement of the relationship between man and the environment. It is protected area for whole system.

➔ In India, four biospheres are present …. They are

a)Nilgiri Biosphere Reserve

b)Nanda Devi Biosphere Reserve

c)Sunderbans Biosphere Reserve

d)Gulf of Mannar Biosphere Reserve. Parts of world net work of B.Rs.]

8. What are the special projects to conserve selected species in India?

Special Projects in India at various regions are

Project	**Location**	**Special features**
1.Project Tiger	15 in India like a)Indravathi – Chattishgrh b)Nagarjuna-Srisailam – A.P	Protection to tiger, *Panthera tigris tigris*
2.Crocodile Breeding Project	Tikerpada, Orissa (World's first)	a)*Crocodylus porosus*(brackish) b)*Gavialis gangeticus* (river) c)*Crocodylus palustris* (swamp)
3.Snow-leopard Reserve	Himalayas	Snow-leopard, *Uncia uncia*
4.Project Elephant	Periyar National park Kerala	Asiatic elephant, *Elephas maximus indicus*
5. Lion project	Gir national park, Gujarat	*Panthera leo persica* (Asiatic lion)



UNCIA UNCIA



PANTHERA TIGRIS TIGRIS



ASIATIC ELEPHANT



ASIATIC LION



CROCODYLUS POROSUS



GAVIALIS GANGETICUS (gharial)

9. Explain the salient features of biodiversity in India.

- Endemism of Indian biodiversity is high.
- About 33% of recorded flora is endemic and concentrated in North-East, Western Ghats, North-west Himalayas and Andaman and Nicobar islands
- About 62% of known amphibian species are endemic in Western Ghats.
- Nearly 50% of lizards are endemic in Western Gats.
- India is a centre of crop diversity—the homeland of 167 cultivated species and 320 wild relatives of crop plants.

VSAQ:

01. WWF (May'04)
02. Measures to take for conservation of forests (March'05)
03. 5 products from forests (May'05)
04. Animal in Periyar sanctuary . Its state (May'07)
05. Reason for endangered nature of tree Calvaria major (March'08)
06. What is biosphere reserve (March'09)
07. Red Data Book
08. National Parks & Sanctuaries

SAQ:

01. Define Biodiversity. Write its importance (March'10 ; March'11)

02. Measures to conserve forests (May'07; March'07; May'04; March'04)
03. IUCN categories of species

LAQ

01. Biodiversity. Types of it (March'08)
02. Biodiversity in Indian context (May'09)
03. Wild life management in India (June'10)