

# 13

## Organisms and Populations

### Multiple Choice Questions (MCQs)

**Q. 1** Autecology is the

- (a) relation of a population to its environment
- (b) relation of an individual to its environment
- (c) relation of a community to its environment
- (d) relation of a biome to its environment

**💡 Thinking Process**

*Ecology is study of the relationship of living organisms with their abiotic and biotic components. It consists of two branches.*

(i) Autecology

(ii) Synecology

**Ans. (b)** Autecology is the study of relationship of an individual other options are irrelevant to its environment. So, the relation of a population or community to its environment is called synecology.

**Q. 2** Ecotone is

- (a) a polluted area
- (b) the bottom of a lake
- (c) a zone of transition between two communities
- (d) a zone of developing community

**Ans. (c)** The adjacent biotic (natural) communities, generally do not possess a fine demarcation edge or line between them. The adjacent of two communities is represented by population of both the communities, and this transition zone between two communities is referred as **ecotone**.

Rest of the options do not define ecotone (zone of transition).

**Q. 3** Biosphere is

- (a) a component in the ecosystem
- (b) composed of the plants present in the soil
- (c) life in the outer space
- (d) composed of all living organisms present on earth which interact with the physical environment

**Ans. (d)** Biosphere is composed of all living organisms present on earth which interact with their physical environment. In other words a biosphere or ecosphere term is collectively used for all the ecosystems of world.

Ecosphere or biosphere can not be defined by other three options, as they represent only a part of ecosystem.

**Q. 4** Ecological niche is

- (a) the surface area of the ocean
- (b) an ecologically adapted zone
- (c) the physical position and functional role of a species within the community
- (d) formed of all plants and animals living at the bottom of a lake

**Ans. (c)** Ecological niche is ecologically adapted zone, *i.e.*, the specific place of habitat occupied by individual of a species. It in turn is determined by factors such as by its range of tolerance. *i.e.*, the physical position and functional role of a species within the community, etc.

Rest of the options are incorrect.

**Q. 5** According to Allen's rule, the mammals from colder climates have

- (a) shorter ears and longer limbs
- (b) longer ears and shorter limbs
- (c) longer ears and longer limbs
- (d) shorter ears and shorter limbs

**Ans. (d)** According to Allen's rule, the mammals (endothermal animals) from colder climates or areas show shorter extremities like ears and limbs as compared to the mammals of warm region. The shorter extremities of mammals in colder region help to minimise heat loss and maintain homeostasis.

Rest of the other options does not stand true for Allen's rule.

**Q. 6** Salt concentration (salinity) of the sea measured in parts per thousand is

- (a) 10-15
- (b) 30-70
- (c) 0-5
- (d) 30-35

**Thinking Process**

*Habitat of an organism is characterised by both abiotic component and biotic component. Abiotic components consist of temperature, water, light and soil.*

**Ans (d)** Next to temperature water is an important abiotic component influencing the life of an organism/organisms. In an oceanic ecosystem, the organisms face water related problems like pH, salinity of water. The salt concentration (salinity) of sea measured in parts per thousand is 30-35.

The other three options are incorrect.

**Note** The salinity (measured in parts per thousand) is less than 5 in land water, 30-35 in sea water and > 100 in some hypersaline water bodies like lagoons.

**Q. 7** Formation of tropical forests needs mean annual temperature and mean annual precipitation as

- (a) 18 - 25°C and 150 - 400 cm                      (b) 5 - 15°C and 50 - 100 cm  
(c) 30 - 50°C and 100 - 150 cm                      (d) 5 - 15°C and 100 - 200 cm

**Ans. (a)** Formation of that tropical forest need annual temperature 18-25°C and annual rainfall (precipitation) above 140 cm, usually between 150-400 cm and reach upto 1000 cm/year.

Tropical forest (tropical rain or evergreen forest mainly occurs in equatorial or subequatorial region like Amazon, Central America and Orinco and Congo river basins of South America and Africa respectively.

The other options are incorrect.

**Note** *The average mean temperature to form a tropical/subtropical rain forest is 17°C - 25°C and climate is characterised by mild winter.*

**Q. 8** Which of the following forest plants controls the light conditions at the ground?

- (a) Lianas and climbers                                      (b) Shrubs  
(c) Tall trees    (d) Herbs

**Ans. (c)** In a forest ecosystem, light is an important abiotic component that controls a number of life processes in organism. In forest, its intensity, duration and quality at ground is controlled by tall trees, which have higher productivity than shrubs and herbs growing underneath. Lianas and climber are woody vines which make commensalism association with tall trees. Herbs and shrubs occupies lower strata of forest.

**Q. 9** What will happen to a well growing herbaceous plant in the forest if it is transplanted outside the forest in a park?

- (a) It will grow normally  
(b) It will grow well because it is planted in the same locality  
(c) It may not survive because of change in its micro climate  
(d) It grows very well because the plant gets more sunlight

**Ans. (c)** In a forest ecosystem tall trees of forest plants controls the light condition, *i.e.*, intensity, duration and quality of light at the ground. A well growing herbaceous plant in forest receive less intensity, duration and quality of light, but when it is transplanted in a park outside its natural habitat, the light will be received uninterrupted.

So due to change in its microclimate, it may not survive. Rest of the other options are incorrect to depict the fate of plant.

**Q. 10** If a population of 50 *Paramecium* present in a pool increases to 150 after an hour, what would be the growth rate of population?

- (a) 50 per hour      (b) 200 per hour      (c) 5 per hour      (d) 100 per hour

**💡 Thinking Process**

*Population growth is the important characteristic of population, which is determined by addition and loss of individual. In case of higher addition of organisms/individual than lost, population show positive growth, i.e., vital index is more than 100. But when vital index is less than 100, population show negative growth.*

*Population growth is controlled by interaction between three factors naturally; biotic potential, standing state and environmental resistance.*

**Ans. (d)** Biotic potential is the natural capacity of a population to multiply/increase at its maximum rate under favourable environmental conditions. Population of *Paramecium* show 100 per hour growth, *i.e.*, two individuals are produced by one.

**Q. 11** What would be the per cent growth or birth rate per individual per hour for the same population mentioned in the previous question (Question 10)?

- (a) 100                      (b) 200                      (c) 50                      (d) 150

**Ans. (b)** Growth rate is 200% as one organism is producing two individuals at a time. (Refer to Question number-10).

**Q. 12** A population has more young individuals compared to the older individuals. What would be the status of the population after some years?

- (a) It will decline                      (b) It will stabilise  
(c) It will increase                      (d) It will first decline and then stabilise

**Ans. (c)** Variation in number of individuals in a population is expressed as population density and population size. A population of more young individual than older individuals, will show positive growth in future (after some yrs), *i.e.*, it will increase after some time.

Rest of the options do not represent the correct status of population.

**Q. 13** What parameters are used for tiger census in our country's national parks and sanctuaries?

- (a) Pug marks only                      (b) Pug marks and faecal pellets  
(c) Faecal pellets only                      (d) Actual head counts

**Ans. (b)** The parameters used for tiger census in our country's national park and sanctuaries are foot prints (pug marks) and faecal pellets of conserved animals.

**Q. 14** Which of the following would necessarily decrease the density of a population in a given habitat?

- (a) Natality > mortality                      (b) Immigration > emigration  
(c) Mortality and emigration                      (d) Natality and immigration

**Ans. (c)** Population growth means increase in its size and is determined by addition and loss of individual in a population. Population density is the number of individuals present per unit volume/area at given time.

Thus, mortality and emigration would necessarily decrease the density of a population in a given habitat due to loss of individual result from mortality (deaths) and emigration.

When natality rate will be more than mortality rate and increased immigration rate would necessarily increase the density of a population.

**Q. 15** A protozoan reproduces by binary fission. What will be the number of protozoans in its population after six generations?

- (a) 128                      (b) 24                      (c) 64                      (d) 32

**Ans. (c)** **Binary fission**, a mode of asexual reproduction in protozoan produce two offsprings from parent individual.

So                      Single protozoan  $\xrightarrow{\text{Multiplied}}$  Two (2 individual)  $\rightarrow$   
(Ist generation)                      (II)  
4  $\rightarrow$  8  $\rightarrow$  16  $\rightarrow$  32  $\rightarrow$  64 Nos  
(III)                      (IV)                      (V)                      (VI)

Thus, the population of protozoan will be 64, after six generations.

**Q. 16** In 2005, for each of the 14 million people present in a country, 0.028 were born and 0.008 died during the year. Using exponential equation, the number of people present in 2015 is predicted as

- (a) 25 millions (b) 17 millions  
(c) 20 millions (d) 18 millions

**Ans. (b)** Exponential equation

$$\begin{aligned}dN / dt &= (b - d) \times N \\dN/10 &= (0.028 - 0.008) \times 14 \quad (0.020) \times 14 \\dN / 10 &= .28 \\dN &= .28 \times 10 \\dN &= 2.8 \\&= 14 \text{ million} + 2.8 \text{ million} \\&= 16.8 \text{ million} = 17 \text{ million}\end{aligned}$$

So, the number of people present in 2015 is predicted as 17 millions.

**Q. 17** Amensalism is an association between two species where

- (a) one species is harmed and other is benefitted  
(b) one species is harmed and other is unaffected  
(c) one species is benefitted and other is unaffected  
(d) both the species are harmed.

**💡 Thinking Process**

*Interspecific interactions in population arise from the interaction of populations of two different species. This could be beneficial, neutral or detrimental to one or both of the species.*

**Ans. (b)** When one species is benefitted and other is harmed, in an association between two species, it is called amensalism. In commensalism one species is benefitted and other is unaffected.

The other options are incorrect because while in when one species is harmed and other is benefitted, the relationship is termed as parasitism.

**Q. 18** Lichens are the associations of

- (a) bacteria and fungus (b) algae and bacterium  
(c) fungus and algae (d) fungus and virus

**Ans. (c)** Lichens represent a positive (beneficial) interaction between two different species, one fungus and another algae.

Rest of the species combination or associations are not true for lichens.

**Note** *Algal species is called as phycobiont while fungal species is referred to as mycobiont. The fungal species comes from two classes Ascomycetes (ascolichen) and Basidiomycetes (basidiolichen).*

**Q. 19** Which of the following is a partial root parasite?

- (a) Sandal wood (b) Mistletoe (c) *Orobancha* (d) *Ganoderma*

**Ans. (a)** Sandal wood (*Santalum album*) is partial root parasite.

**Mistletoe** (*Viscum*) is considered as hemiparasite which derive a part of nourishment from host plant. *Orobancha* is a holo parasite which infects species from favciae i.e., beans, loranthus, *Ganoderma* are parasite, basidiocarpic mushrooms.

**Q. 20** Which one of the following organisms reproduces sexually only once in its life time?

- (a) Banana plant    (b) Mango    (c) Tomato    (d) Eucalyptus

**💡 Thinking Process**

*Reproductive phase in higher plants is characterised by appearance of flowers. Sexually there are two types of flowering plants: monocarpic and polycarpic.*

**Ans. (a)** Monocarpic plants are those plants which flower once in their life e.g., all annuals (wheat, rice), biennials like carrot and radish, perennial like bamboo. Banana is a monocarpic plant, so reproduces sexually once in its lifetime.

Rest of the options are incorrect.

## Very Short Answers Type Questions

**Q. 1** Species that can tolerate narrow range of temperature are called.....

**Ans. Stenothermal Organisms**

Temperature, a major abiotic factor affects the metabolism, activity and so many other physiological functions of the organism.

On the basis of temperature tolerance, organism can be classified as eurythermal and stenothermal.

- (i) Eurythermal organisms can tolerate and thrive in a wide range of temperatures.
- (ii) Stenothermal organisms tolerate only a narrow range of temperatures.

**Q. 2** What are eurythermic species?

**Ans.** Eurythermic species are those species which possess or show a wide range of temperature tolerance.

**Q. 3** Species that can tolerate wide range of salinity are called.....

**Ans. Euryhaline species**

Water, another major abiotic component affects the life of organism. The quality of water like pH, salinity (salt concentration) are water related problems faced by aquatic organisms, organisms or species that can tolerate wide range of salinity are regarded as **euryhaline Species**.

**Q. 4** Define stenohaline species.

**Ans.** Stenohaline species are those species which show a narrow range of salinity tolerance.

**Q. 5** What is the interaction between two species called?

**Ans.** Interaction between two species is called interspecific interaction. These could be beneficial, detrimental or neutral to one of the species or both.

**Q. 6** What is commensalism?

**Ans.** Commensalism is an interaction where one species is benefitted and the other is unaffected. e.g., an orchid growing as an epiphyte on a mango branch.

**Q. 7** Name the association in which one species produces poisonous substance or a change in environmental conditions that is harmful to another species.

**Ans.** Parasitism is the association in which one species produces poisonous substance or a change in environmental conditions that is harmful to another species. Examples are protozoans such as *Amoeba* and *Plasmodium vivax* that lives in human body and cause diseases.

**Q. 8** What is mycorrhiza?

**Ans.** Mycorrhiza is a symbiotic association between a fungus and the root of higher plants like conifers *i.e.*, *Pinus* and leguminous plants.

**Note** Fungal hyphae get protection and nourishment from its symbiont, while in turn helps in absorption of organic solutes to higher plants.

**Q. 9** Emergent land plants that can tolerate the salinities of the sea are called.

**Ans.** Halophytes emergent land plants that can tolerate the salinities of sea and are even able to maintain their water supply from the same are called as halophytes.

**Q. 10** Why do high altitude areas have brighter sunlight and lower temperatures as compared to the plains?

**Ans.** At high altitude the sun light is brighter as compared to plains, it is because of reduced distance from the sun and particles free air. Similarly lower temperatures are because of lower atmospheric pressure which is more in plains as compared to high altitude.

**Q. 11** What is homeostasis?

**Ans.** Homeostasis is the tendency of the organism to maintain a constant internal environment despite varying external environmental conditions like temperature.

**Q. 12** Define aestivation.

**Ans.** Aestivation is a behavioural adaptation to avoid extreme heat and dessication in summer season. In which the organism slows down its metabolic activities.  
It is also known as summer sleep.

**Q. 13** What is diapause and its significance?

**Ans.** It is a stage of suspended development that some organisms like zooplanktons in lakes and ponds, adopt to survive under unfavourable conditions.

**Q. 14** What would be the growth rate pattern, when the resources are unlimited?

**Ans.** In case of unlimited resources, the pattern of growth rate is **exponential**.

**Q. 15** What are the organisms that feed on plant sap and other plant parts called?

**Ans.** The organism that feed on plant sap and other parts of plants are termed as **phytophagous**.

**Q. 16** What is high altitude sickness? Write its symptoms.

**Ans.** High altitude sickness is experienced by the people going to high altitudes, where oxygen concentrations are low and the body system reacts by developing the symptoms like nausea, headache and heart palpitations.

**Q. 17** Give a suitable example for commensalism.

**Ans.** An interaction between blue whale and the barnacle growing on its back is an example of commensalism (interspecific relation) between them.

**Q. 18** Define ectoparasite and endoparasite and give suitable examples.

**Ans.** Ectoparasite feeds on the external surface of the host organism, e.g., Lice on humans and ticks on dogs. Many marine fish are infested with ectoparasitic copepods.

Endoparasites live inside the host body at different sites (liver, kidney, lungs, red blood cells, etc.). Such as malarial parasites *P. vivax*, gut parasites, i.e., tapeworm.

Their morphological and anatomical features of endoparasites are greatly simplified while emphasising their reproductive potential.

**Q. 19** What is brood parasitism? Explain with the help of an example.

**Ans.** Brood parasitism is the phenomenon in which an organism (parasite) lays eggs on the nest of other organism (host).

e.g., Cuckoo (koel) bird lays its eggs in the nest of its host and lets the host incubate them. The eggs of the parasitic bird resemble the host's egg in size and colour to reduce the chances of the host bird detecting the foreign eggs and ejecting them from the nest.

## Short Answer Type Questions

**Q. 1** Why are coral reefs not found in the regions from West Bengal to Andhra Pradesh but are found in Tamil Nadu and on the east coast of India?

**Ans.** Coral reefs are found in zone with high salt concentration (salinity), optimal temperature and with a less siltation condition which fairly facilitate to colonise corals. In case of high siltation and water flow, coral reef do not colonise.

**Q. 2** If a freshwater fish is placed in an aquarium containing sea water, will the fish be able to survive? Explain giving reasons.

**Ans.** No, a freshwater fish placed in the aquarium containing sea water, will not be able to survive. Because, its body system is adapted to function normally in a narrow range of salinity and it cannot survive in the high salinity of sea water.

**Q. 3** Why do all the freshwater organisms have contractile vacuoles whereas majority of marine organisms lack them?

**Ans.** Contractile vacuole helps in osmoregulation. Because of the cellular environment of a freshwater organism being hypertonic, the water diffuses inside the cell constantly and gets collected in the contractile vacuole, which squeezes the extra water out of the cell periodically.

Thus, keeping the internal environment constant. While in case of marine organisms, this does not occur due to high salinity, therefore no need of contractile vacuole.

**Q. 4** Define heliophytes and sciophytes. Name a plant from your locality that is either heliophyte or sciophyte.

**Thinking Process**

*On the basis of light tolerance or adaptation, plants may be heliophytes and sciophytes.*

**Ans.** Plants growing well in bright sunlight or favour bright light are called **heliophytes** or sun plants. While those plants which require low intensity of light or partial shade for growing are termed as shade loving plants or **sciophytes**.

**Q. 5** Why do submerged plants receive weaker illumination than exposed floating plants in a lake?

**Ans.** Submerged plants receive weaker illumination than exposed floating plants in a lake because all colours of the visible components of the spectrum of light do not enter or penetrate in the depths of water.

**Q. 6** In a sea shore, the benthic animals live in sandy, muddy and rocky substrata and accordingly developed the following adaptations.

- (a) Burrowing
- (b) Building cubes
- (c) Holdfasts/peduncle

Find the suitable substratum against each adaptation.

**Ans.** In a sea shore, water current restrict distribution of organisms. In streamed areas of ocean, animals are strong swimmer or possess attaching organs such as peduncle, or live under stone, in burrows etc.

Burrowing animals like tubeworm, *Nerlies* are strong swimmer. Burrowing, building cubes and holdfast or peduncle adaptation are found in sandy, muddy and rocky substratum respectively.

**Q. 7** Categorise the following plants into hydrophytes, halophytes, mesophytes and xerophytes. Give reasons for your answers.

- (a) *Salvinia*
- (b) *Opuntia*
- (c) *Rhizophora*
- (d) *Mangifera*

**Ans. (a)** *Salvinia* is a hydrophytes – Partially or completely submerged in water.

**(b)** *Opuntia* is a xerophyte – Dry habitat succulent leaves.

**(c)** *Rhizophora* is a halophyte – Saline habitat

**(d)** *Mangifera* is a mesophyte – Terrestrial habitat.

**Q. 8** In a pond, we see plants which are free-floating; rooted-submerged, rooted emergent rooted with floating leaves. Write the type of plants against each of them.

| Plant Name             | Type |
|------------------------|------|
| (a) <i>Hydrilla</i>    |      |
| (b) <i>Typha</i>       |      |
| (c) <i>Nymphaea</i>    |      |
| (d) <i>Lemna</i>       |      |
| (e) <i>Vallisneria</i> |      |

- Ans.** (a) *Hydrilla* is submerged hydrophyte  
 (b) *Typha* is rooted emergent  
 (c) *Nymphaea* is rooted with floating leaves  
 (d) *Lemna* is free floating hydrophyte  
 (e) *Vallisneria* is rooted submerged hydrophytes.

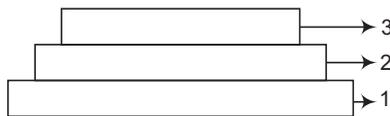
**Q. 9** The density of a population in a habitat per unit area is measured in different units. Write the unit of measurement against the following

- (a) Bacteria .....  
 (b) Banyan .....  
 (c) Deer .....  
 (d) Fish .....

**Ans.** The density of population per unit area is measured in following units

- (a) The density of a bacterial population in a habitat per unit area is measured in volume/number unit.  
 (b) Biomass/area/region is measuring unit for density of population of banyan.  
 (c) Number/area is measuring unit for the density of population of deer.  
 (d) Weight/area is measuring unit for density of population of fish.

**Q. 10**



- (a) Label the three tiers 1, 2, 3 given in the above age pyramid.  
 (b) What type of population growth is represented by the above age pyramid?

**Ans. (a)** The three tiers are to be labelled as

- (i) Pre-reproductive phase      (ii) Reproductive phase  
 (iii) Post-reproductive phase  
 (b) The given age pyramid represents the expanding type of population growth.

**Q. 11** In an association of two animal species, one is a termite which feeds on wood and the other is a protozoan *Trichonympha* present in the gut of the termite. What type of association they establish?

**Ans.** The termite provides shelter and space for the protozoan *Trichonympha* to live. The Protozoa present in gut digests the wood, which termite feeds upon. In the absence of *Trichonympha* the termite is unable to digest wood and hence dies. Thus, the association of two given animal species represent mutualism.

**Q. 12** Lianas are vascular plants rooted in the ground and maintain erectness of their stem by making use of other trees for support. They do not maintain direct relation with those trees. Discuss the type of association the lianas have with the trees.

**Ans.** The type of association, the lianas have with the trees is **commensalism** because the plant gets the support of the tree without affecting harming or providing any benefit to the tree.

**Q. 13** Give the scientific names of any two microorganisms inhabiting the human intestine.

**Ans.** The scientific names of two microorganisms inhabiting the human intestine are *Escherichia coli* and *Lactobacillus*.

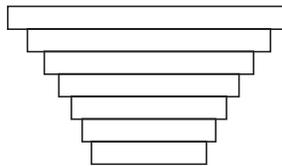
**Q. 14** What is a tree line?

**Ans.** Tree line is the edge of the habitat where trees are capable of growing. Due to environmental conditions such as cold temperature, high altitude or lack of moisture the trees are not found beyond this line and if found show stunted growth or form low dense matted bushes.

**Q. 15** Define 'zero population growth rate'. Draw a age pyramid for the same.

**Ans.** When the pre-reproductive age group individuals are comparatively fewer and both reproductive and post-reproductive stages are almost in equal stage, i.e., at same level. It is zero population growth rate.

An inverted bell shaped age pyramid is obtained for zero population growth rate.



**Q. 16** List any four characters that are employed in human population census.

**Ans.** A population has the following characteristics that are employed in human population census.

- (i) Natality and mortality
- (ii) Sex ratio
- (iii) Population density
- (iv) Age distribution
- (v) Population growth

**Q. 17** Give one example for each of the following types

- (a) Migratory animal
- (b) Camouflaged animal
- (c) Predator animal
- (d) Biological control agent
- (e) Phytophagous animal
- (f) Chemical defense agent

**Ans. (a)** Migratory animal-American buffalo and dolphin.

**(b)** Camouflaged animal-Grasshopper and chameleon.

**(c)** Predator animal-Lion.

**(d)** Biological control agent-*Myxoma* virus to kill European rabbit and *Gambusia* fish to check growth of mosquito larvae.

**(e)** Phytophagous animal-Insects (beetle, butterfly, etc.).

**(f)** Chemical defense agent-Cardiac glycosides.

**Q. 18** Fill in the blanks

| Species A | Species B | Type of Interaction | Example |
|-----------|-----------|---------------------|---------|
| +         | -         | _____               | _____   |
| +         | +         | _____               | _____   |
| +         | _____     | Commensalism        | _____   |

**Ans.**

| Species A | Species B | Type of Interaction | Example                         |
|-----------|-----------|---------------------|---------------------------------|
| +         | -         | Predation           | Phytophagous animal and plants. |
| +         | +         | Protocooperation    | Oxpecker and black rhino        |
| +         | -         | Comensalism         | Sea anemone and Hermit crab     |

**Q. 19** Observe the set of 4 figures A, B, C and D and answer the following questions.

- I. Which one of the figures shows mutualism?
- II. What kind of association is shown in D?
- III. Name the organisms and the association in C.
- IV. What role is the insect performing in B?



Fig. (A)



Fig. (B)



Fig. (C)

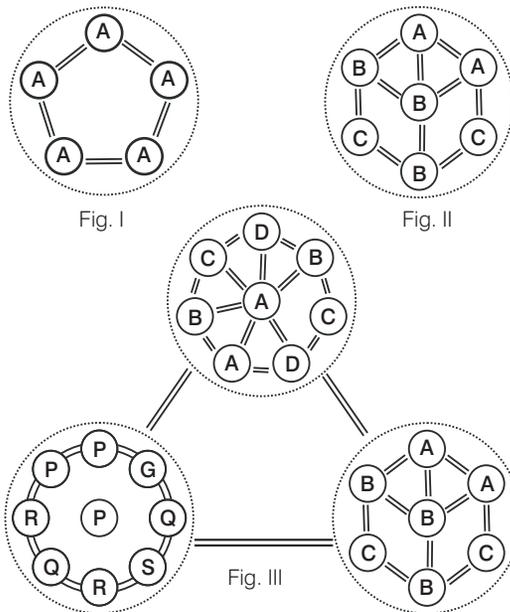


Fig. (D)

- Ans.** I. Figure A show a pollinator (bee) on a flower. The association between pollinator insect and plant is termed as mutualism.  
 II. Predation.  
 III. Egrets and grazing cattle is good example of commensalism.  
 IV. Scavenging- The insect is playing the role of an scavenger.

### Long Answer Type Questions

**Q. 1** Comment on the following figure: I, II and III, A, B, C, D, G, P, Q, R, S are species.



- Ans. Figure I** It is a single population and all individuals are of the same species, *i.e.*, a individuals interact among themselves and their environment intraspecific interaction.
- Figure II** It is a community and it contains three populations of species A, B and C. They interact with each other and their environment and is called interspecific interaction.
- Figure III** It is a biome. It contains three communities of which one is in climax and other two are in different stages of development. All three communities are in the same environment and they interact with each other and their environment.

**Q. 2** An individual and a population has certain characteristics. Name these attributes with definitions.

- Ans.** An individual and a population has following certain attributes like pattern of distribution, dispersal biotic potential and gene pool. **Phenomenon of distribution** of individual within geographical boundaries of the population is termed as **interpopulation** dispersion or internal distribution patterns or dispersion.

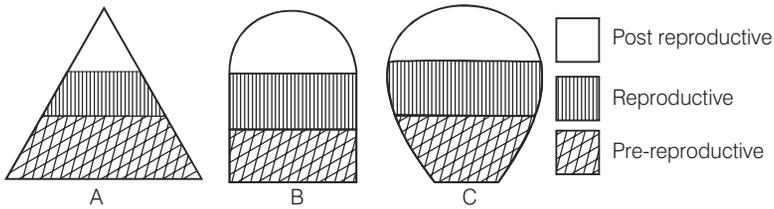
**Dispersal** an individual is dispersed at one or another time during their life in a population which is revealed by immigration or emigration.

- (i) **Immigration** is the number of individuals of the same species that have come into the habitat from elsewhere during a specified time period.
- (ii) **Emigration** is the number of individuals of the population who exit or leave the habitat and go elsewhere during a specified time period.

**Biotic Potential** Biotic potential is the natural capacity of a population to increase its size under ideal environmental conditions.

**Gene pool** All the genotypes of all individuals in a breeding population is referred to as gene pool.

**Q. 3** The following diagrams are the age pyramids of different populations. Comment on the status of these populations.

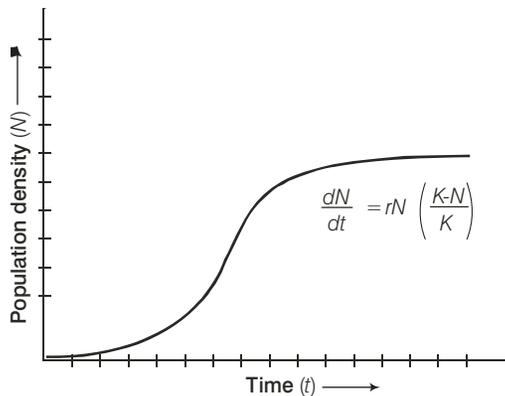


**Ans. Figure A** It is a 'pyramid' shaped age pyramid. In this figure, the base, *i.e.*, pre-reproductive stage is very large as compared with the reproductive and post-reproductive stages of the population. This type of age structure indicates that the population would increase rapidly.

**Figure B** It is an 'inverted bell' shaped pyramid. In this figure, the pre-reproductive and reproductive stages are same. This type of age structure indicates that the population is stable.

**Figure C** It is 'urn' shaped pyramid. In this figure, the pre-reproductive and reproductive stages are less than the post-reproductive stages of this population. In this population more older people are present. This type of age structure indicates that the population definitely is declining.

**Q. 4** Comment on the growth curve given below.



**Ans.** The growth curve shown above is logistic growth curve or S-shaped curve. Logistic growth curve is considered more realistic because unlimited resources are not available in an ecosystem or in a habitat, where  $K$ —stands for carrying capacity.  $N$ —indicates population density, which is the number of species of a population per unit area.  $r$ —is for intrinsic rate of natural increase.

**Q. 5** A population of *Paramecium caudatum* was grown in a culture medium. After 5 days the culture medium became overcrowded with *Paramecium* and had depleted nutrients. What will happen to the population and what type of growth curve will the population attain? Draw the growth curve.

**Ans.** Initially, after a lag phase, the population will grow in an exponential manner as the nutrients and space will be abundant.

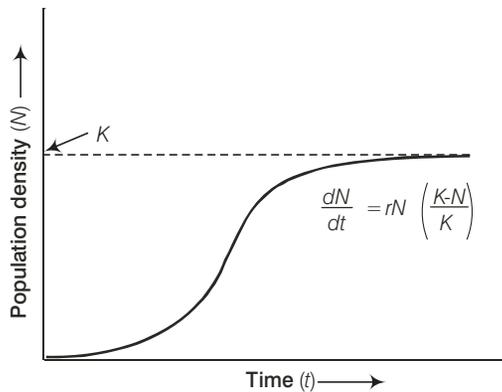
When the food sources get depleted, the population density starts decreasing and ends in an asymptote phase, then the population density reaches the carrying capacity (maximum number of individuals of a population or species that a given environment can sustain indefinitely).

The population shows a pattern of logistic growth giving an S-shaped curve.

Where  $K$  = carrying capacity

$N$  = population density at time 't'

$r$  = Intrinsic rate of natural increase



**Logistic growth curve**

**Q. 6** Discuss the various types of positive interactions between species.

**Ans.** The interspecific interaction are of three types positive or beneficial, negative or antagonistic and last neutral interaction.

Some positive interactions are scavenging, commensalism, proto cooperation and mutualism.

**Mutualism** This interaction confers benefits on both the interacting species, e.g.,

- (i) Lichens represent an intimate mutualistic relationship between a fungus and photosynthesising algae or cyanobacteria.
- (ii) The mycorrhizae are associations between fungi and the roots of higher plants. The fungi help the plant in the absorption of essential nutrients from the soil while the plant in turn provides the fungi with energy-yielding carbohydrates.
- (iii) Plants offer nectar, juicy and nutritious fruits to animals that help pollinate their flowers and disperse their seeds.

**Commensalism** This is the interaction in which one species benefits without affecting the other, e.g.,

- (i) An orchid growing as an epiphyte on a mango branch.
- (ii) Barnacles growing on the back of a whale.
- (iii) The cattle egret foraging close to the cattle that stir up and flush out insects from the vegetation.
- (iv) Sea anemone that has stinging tentacles and the clown fish that lives among them to get protection from predators.

**Scavenging** is the act of feeding by scavenger like bacteria, fungi on the remain of dead animals.

**Protocooperation** in the type of relationship in which both partners mutually obtain benefits. But they associate purely to benefit from each other and can live without each other.

**Q. 7** In an aquarium two herbivorous species of fish are living together and feeding on phytoplanktons. As per the Gause's principle, one of the species is to be eliminated in due course of time, but both are surviving well in the aquarium. Give possible reasons.

**Ans.** Competition is a rivalry relationship between two or more organisms. A competition between individual of same species (intraspecific) is more acute than the competition between individual of different species as all the members in a intraspecific competition have same basic requirements like food, water, light, space, mating and shelter.

But this is true only when resources are limited. According to Gause's principle, one of the species is to be eliminated.

But studies recently have revealed that species facing intraspecific competition may evolve mechanism to encourage co-existence rather than exclusion. This can also be done by a method known as 'resource partitioning'.

**Q. 8** While living in and on the host species, the animal parasite has evolved certain adaptations. Describe these adaptations with examples.

**Ans.** Parasites have evolved special adaptations such as

- (i) The loss of unnecessary sense organs as in lice, mites and fleas don't have wings.
- (ii) Presence of adhesive organs or suckers to cling on to the host-in tapeworms and leeches.
- (iii) Loss of digestive system *i.e.*, tapeworm.
- (iv) High reproductive capacity *i.e.*, roundworm produces large progeny.

**Q. 9** Do you agree that regional and local variations exist within each biome? Substantiate your answer with suitable example.

**Ans.** A biome can be define as the large communities of the world and shows that area with similar climate have communities of same type. Climate is the main factor that determine the type of soil which in turn determines the type of vegetation. The type of vegetation and climate together determine the kind of microorganisms and animals.

The other determining factors are latitude and altitude, intensity and duration of winter and summer days, water mass and topography. The main biome of the world does not show boundary of any country and regional and local variations exist in each biome.

*e.g.*, temperate deciduous forest receive an annual precipitation between 75-150 cm and tropical rain forest show a rainfall above 140 cm/yr which may reach upto 400 cm/yr.

**Q. 10** Which element is responsible for causing soil salinity? At what concentration does the soil become saline?

**Ans.** Soil salinity is the salt content in soil, which is caused by improper irrigation. The process of increasing salt content is termed as salinisation.

**Causes of Soil Salinity** The high salt concentration of soil is caused by improper irrigation method from a salt laden water table. When salt concentration in soil is increased, than it get accumulated due to evaporation.

Human activities like fertilising crop is also responsible for salinity of soil. As fertiliser contain potassium, which can form a naturally occuring salt-sylvite. Salinity of soil degrades soil and vegetation. Normally the pH value of soil comprises between 2.2-9.7, while above which the soil is degrading by salt content.

**Q. 11** Does light factor affect the distribution of organisms? Write a brief note giving suitable examples of either plants or animals.

**Ans.** Plants require sunlight for photosynthesis. Therefore, light is an important factor that affects the distribution of plants. e.g.,

(i) Many species of small plants (herbs and shrubs) growing in forests are adapted to photosynthesise optimally under very low light conditions so they will be seen distributed in shady areas under tall, canopied trees.

(ii) Many plants in the shade will grow vertically to gain access to light. These plants will appear to have smaller leaves and smaller than others of the same species of the same age found in conditions with better sunlight.

(iii) Large sized trees will be present in areas that get abundant sunlight.

(iv) Plants dependent on sunlight to meet their photoperiodic requirements for flowering, will try to be distributed in area, where this requirement is being met for their reproductive success.

**Q. 12** Give one example for each of the following

I. Eurythermal plant species .....

II. A hot water spring organism .....

III. An organism seen in deep ocean trenches .....

IV. An organism seen in compost pit .....

V. A parasitic angiosperm .....

VI. A stenothermal plant species .....

VII. Soil organism .....

VIII. A benthic animal .....

IX. Antifreeze compound seen in antarctic fish.....

X. An organism which can conform.....

**Ans.** I. Mango, *Acacia*

II. Archaeobacteria

III. Jelly fishes

IV. Earthworm

V. *Cuscuta*

VI. *Cocos nucifera*

VII. Bacteria

VIII. *Octopus*

IX. Salt content (osmotic regulation)

X. All plant and fish like large mouth bass (temperature conformer)