

Short Answer Questions-I (PYQ)

[2 Marks]

Q.1. Explain the response of all communities to environment over time.

Ans. Environmental factors like temperature, water, light, soil, etc., may influence the members of communities in varying degrees. Organisms in response to these factors try to adapt according to their capacities, by maintaining a constant internal environment through homeostasis or migration to a less stressful environment or suspending activities till favourable conditions return.

Q.2. An organic farmer relies on natural predation for controlling plant pests and diseases. Justify giving reasons why this is considered to be a holistic approach.

Ans. Besides acting as 'conduits' for energy transfer across trophic levels, predators are used in biological control of plant pests. This ability of the predator is based on its regulating the prey population. The natural predators reduce interspecific competition and do not harm the crop plants. For example, in an area the invasive cactus can be brought under control by cactus-feeding predator (a moth). Using natural predation, the ecosystem is kept stable without harming any of the trophic levels.

Q.3. Apart from being part of the food chain, predators play other important roles. Mention any two such roles supported by examples.

Ans.

- i. Keeps prey population under control. For example, the invasive prickly. Poor cactus in Australia was brought under control only after a cactus feeding predator (a moth) was introduced in the country.
- ii. Maintains species diversity by reducing intensity of competition among prey species. For example, when the starfish *Pisaster* was removed from its community of American Pacific Coast, more than 10 species of invertebrates become extinct.

Q.4. Mention four adaptive features that help cacti survive in xeric environment.

Ans. Adaptation in desert plants:

- i. Desert plants have thick waxy coating on leaf called cuticle for minimum loss of water, through transpiration.
- ii. They have special photosynthetic pathway (CAM) that enables minimum loss of water during day time because stomata remain closed.
- iii. Some desert plants develop spines instead of leaf and photosynthetic function is carried out by the flattened stem.
- iv. Stomata are arranged in deep pits to minimise loss through transpiration.

Q.5. In certain seasons we sweat profusely while in some other season we shiver. Explain.

Ans. Human beings maintain a constant body temperature of 37°C.

- **In summers:** The outside temperature is much higher than our body temperature. Therefore, we sweat profusely. This results in evaporative cooling and our body temperature is brought down to normal (37°C).
- **In winters:** The outside temperature is much lower than our body temperature. Therefore, we start to shiver; this action (of shivering) is a kind of exercise (work) that produces heat and raises the body temperature.

Q.6. Why are small animals rarely found in the polar regions? Explain.

OR

Why are small birds like humming birds not found in polar regions? Explain.

Ans. Small animals like humming birds have a large surface area relative to their volume. So they tend to lose body heat very fast when it is cold outside. Then, these animals have to use their energy (generated by metabolic reactions) to generate body heat. That is the reason why small sized animals are rarely found in the polar regions.

Q.7. Why the plants that inhabit a desert are not found in a mangrove? Give reasons.

Ans. In mangroves the soil is oxygen deficit because of excess water present. Plants in mangroves develop special roots called breathing roots or pneumatophores for respiration. This adaptation is not present in desert plants because of which they do not survive in mangroves.

Q.8. Bear hibernates whereas some species of zooplanktons enter diapause to avoid stressful external conditions. How are these two ways different from each other?

Ans. Hibernation is the winter sleep seen in cold-blooded animals in polar regions in which they suspend their metabolic activities when external temperature becomes unfavourable. Whereas, diapause is the phenomenon seen in insects during their developmental stages, in which metabolic activities are suspended due to unfavourable conditions.

Q.9. Many fresh water animals cannot survive in marine environment. Explain.

Ans. Marine environment has high salt concentration. These fresh water animals in such hypertonic surroundings suffer from osmotic problems. Their bodies start losing water by exosmosis.

Q.10. How do seals adapt to their natural habitat? Explain.

Ans. Seals adapt to the cold climate by developing a thick layer of fat (blubber) below their skin that acts as an insulator and reduce excess loss of body heat.

Q.11. Some organisms suspend their metabolic activities to survive in unfavourable conditions. Explain with the help of any four examples.

Ans.

- i. Polar bear—They hibernate during winter to escape the cold weather.
- ii. Snails/fishes—They go into aestivation during summer to avoid heat related problems and desiccation.
- iii. Seeds of higher plants/spores of bacteria/fungi—They become dormant in unfavourable conditions and in case of *Amoeba* cyst formation takes place.
- iv. Some species of zooplankton—They undergo diapause.

Q.12. Plants that inhabit a rain-forest are not found in a wetland. Explain.

Ans. Plants in wetland are adapted differently. The soil in wetland lacks oxygen. So, for respiration the roots have to grow above the soil. These roots are called breathing roots or pneumatophores. This feature is not present in roots growing in rainforest.

Q.13. How does our body adapt to low oxygen availability at high altitudes?

Ans. Our body adapts to low oxygen availability by increasing red blood cell production, decreasing the binding capacity of haemoglobin and by increasing breathing rate.

Q.14. How does a desert plant adapt to the dry, warmer environmental conditions?

Ans. Adaptations of a desert plant:

- i. Leaf surface has a thick cuticle.
- ii. Stomata are situated in deep pits.
- iii. Stem is flattened and performs photosynthesis.
- iv. Leaves are modified into spines as in *Opuntia*. (Any two)

Q.15.

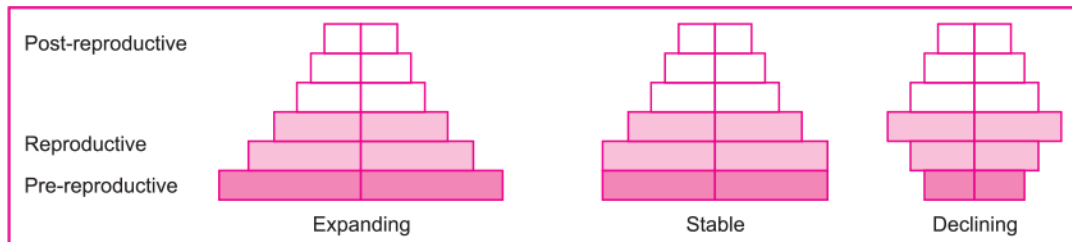
- a. Explain “birth rate” in a population by taking a suitable example.
- b. Write the other two characteristics which only a population shows but an individual cannot.

Ans.

- a. Birth rate is expressed as the number of births per 1,000 individuals of a population per year. For example, in a pond there were 200 frogs and 40 more were born in a year. Then, the birth rate of the population will be $40/200 = 0.5$ frogs per year.
- b. Sex ratio, age distribution, population density, population growth. (Any two)

Q.16. Construct an age pyramid which reflects an expanding growth status of human population.

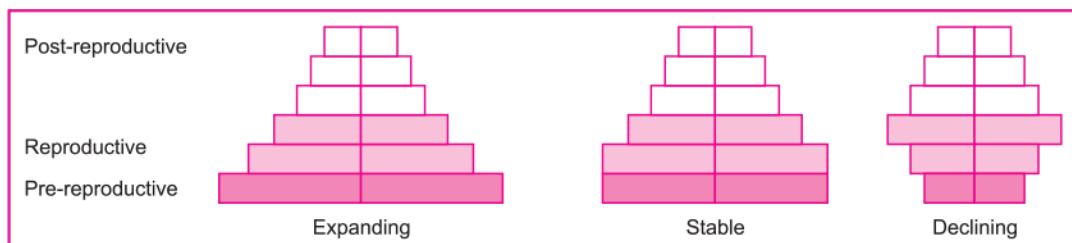
Ans.



Representation of age pyramids for human population

Q.17. Construct an age pyramid which reflects a stable growth status of human population.

Ans.



Representation of age pyramids for human population

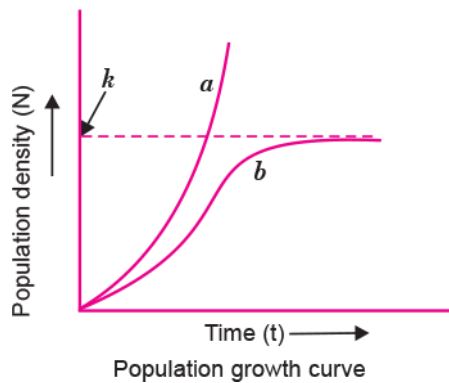
Q.18.

- What is “*r*” in the population equation given: $\frac{dN}{dt} = rN$?
- How does the increase and the decrease in the value of ‘*r*’ affect the population size?

Ans.

- ‘*r*’ is called intrinsic rate of natural increase.
- Population size increases with increase in ‘*r*’ and it decreases with decrease in ‘*r*’.

Q.19. Identify the curves ‘*a*’ and ‘*b*’ shown in the graph given below. List the conditions responsible for growth patterns ‘*a*’ and ‘*b*’.



Ans. Curve 'a' is exponential growth curve. When the resources (food + space) are not limited, this type of growth curve appears.

Curve 'b' is logistic growth curve. When the resources become limited at certain point of time, this type of growth curve appears.

Q.20. Explain Verhulst-Pearl Logistic Growth of a population.

Ans. According to Verhulst–Pearl Logistic growth, a population growing in a habitat with limited resources initially shows a lag phase, followed by phases of acceleration and deceleration and finally an asymptote when the population density reaches the carrying capacity. It is given by the following equation:

$$\frac{dN}{dt} = rN \left[\frac{K - N}{K} \right]$$

where N = population density at time t

r = intrinsic rate of natural increase

K = carrying capacity.

Q.21. Co-evolution is a spectacular example of mutualism between an animal and a plant. Describe co-evolution with the help of an example.

OR

Describe the mutual relationship between fig tree and wasp and comment on the phenomenon that operates in their relationship.

Ans. Co-evolution can be observed in Fig (plant) and wasp (animal). The female wasp uses the fruit for oviposition or egg laying. It also uses developing seeds within the fruit for nourishing its larvae. The wasp in turn pollinates the fig inflorescence. The given Fig species can be pollinated by its 'partner' wasp species and no other species.

Q.22. Egrets are often seen along with grazing cattle. How do you refer to this interaction? Give a reason for this association.

Ans. The interaction between them can be referred to as commensalism. Egrets always forage close to where the cattle are grazing because the cattle, as they move stir up

and flush out insects from the vegetation which otherwise might be difficult for the egrets to find and catch.

Q.23. Explain brood parasitism with the help of an example.

Ans. Koel is a parasitic bird (which has lost the instinct to make its own nest to lay eggs), has evolved the technique of laying eggs in the nest of a crow. Its eggs bear resemblances to those of crow.

Q.24. Explain parasitism and co-evolution with the help of one example of each.

Ans. Mode of interaction between two species in which one species (parasite) depends on the other species (host) for food and shelter is called parasitism. In this one organism is benefitted and the other is harmed.

For example, Human liver fluke or Malarial parasite or *Cuscuta*.

Co-evolution is the relationship between two interacting organisms where both organisms failed to survive in the absence of the other.

For example, Fig and fig wasp or *Ophrys* and bumble bee.

Q.25. What is mutualism? Mention any two examples where the organisms involved are commercially exploited in agriculture.

Ans. Interaction between two species in which both are benefitted is called mutualism.

- i. Rhizobium in the roots (nodules) of legumes.
- ii. Mycorrhiza Glomus with the roots of higher plants.

Q.26. How does the Mediterranean orchid *Ophrys* ensure its pollination by bees?

Ans. The petals of the *Ophrys* resembles the female of a bee species in size, colour and odour, etc. Male bee mistakes the *Ophrys* for female bee and tries to copulate. Few pollen grains adhered with the body of the male bee fall over stigma of the flower thereby leading to pollination.

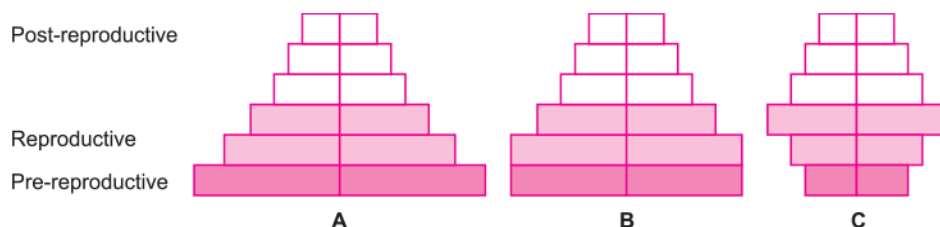
Q.27. How do plants benefit from having mycorrhizal symbiotic association?

Ans. Mycorrhizal association is found between fungi and the roots of higher plants. The fungi help the plant in the absorption of essential nutrients from the soil while plant in turn provides energy-yielding carbohydrates to fungi.

Q.28. Why do clown fish and sea anemone pair up? What is this relationship called?

Ans. The clown fish gets protection from predators which stay away from stinging tentacles of anemone but anemone does not derive any benefit from the fish. This relationship is called commensalism.

Q.29. Study the three different age pyramids for human population given below and answer the questions that follow:



- Write the names given to each of these age pyramids.
- Mention the one which is ideal for human population and why.

Ans.

- A — Expanding pyramid B — Stable pyramid C — Declining pyramid
- Stable pyramid is ideal for human population because it maintains the stability in all population phases.

Q.30. Answer the following questions:

Q. How is *Cuscuta* adapted to be a parasitic plant?

Ans. *Cuscuta* has lost its chlorophyll and leaves during evolution and thus it derives its nutrition from host plant, thus, it is a parasitic plant.

Q. Why do cattle avoid browsing on *Calotropis* plants? Explain.

Ans. Cattle avoid browsing on *Calotropis* plants because it produces poisonous cardiac glycosides.

Short Answer Questions-I (OIQ)

[2 Mark]

Q.1. Explain relationship between biotic potential and environmental resistance.

Ans. Biotic potential is defined as the maximum inherent capacity of an organism to reproduce or increase the number of individuals. Whereas the environmental resistance is the biotic and abiotic factors of the environment, that do not allow the population of organisms to grow unlimited and keep the population size in control.

Q.2. “Snow leopards are not found in Kerala forests and tuna fish are rarely found beyond tropical latitude in the ocean”. Study the above two cases and state the possible reasons for the same.

Ans. Change in temperature from their established habitats affects the kinetics of the enzymes and through it the basal metabolism, activity and other physiological functions of the organism.

Q.3. Why are coral reefs not found from West Bengal to Andhra Pradesh but found in Tamil Nadu on the east coast of India?

Ans. High salinity, optimal temperature and less siltation are essential to colonise corals. If siltation and fresh water inflow are very high, the corals don't colonise. In contrast when the siltation and fresh water in flow by the rivers are very less, the corals do colonise.

Q.4. Besides acting as 'conduits' for energy transfer across trophic levels, predators play other important roles. Justify.

Ans. Besides acting as 'conduits' of energy transfer across trophic levels, predators play other important roles like

- i. They keep prey population under control.
- ii. Predators also help in maintaining species diversity in a community by reducing the intensity of competition among competing prey species.

Q.5. Is it possible to achieve 'zero population growth rate'? If yes, what kind of age pyramid is obtained?

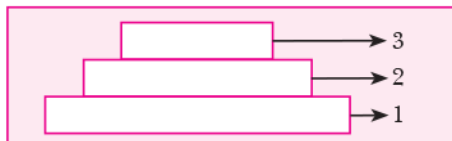
Ans. Yes. An inverted bell shaped age pyramid is obtained. The young or pre-reproductive age group individuals are less in number and both post-reproductive and reproductive stage are in the same level.

Q.6. Name the type of curve that characterises most population growing in favourable environment. Also define carrying capacity.

Ans. When the environment is favourable, the growth curve is J-shaped.

In nature, a given habitat has resources to support only a certain number of individuals of a population beyond which no further growth is possible. This limit is called carrying capacity (K).

Q.7.



- 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.
 - 1. represents Pre-reproductive age group
 - 2. represents Reproductive age group
 - 3. represents Post-reproductive age group
- b. Expanding population.

Q.8. Name two basic types of competition found amongst organisms. Which one of them is more intense and why?

Ans. The two basic types of competitions are:

- i. Interspecific competition
- ii. Intraspecific competition

The intraspecific competition is more intense because the requirement of the individual of the species are similar.

Q.9. What is Gause's competitive exclusion principle? Explain with an example.

Ans. Gause's competitive exclusion principle states that two closely related species competing for the same resource cannot coexist indefinitely and the competitively inferior one will be eliminated eventually by the superior one. For example, after the introduction of goats in Galapagos Islands, the Abingdon tortoise became extinct within a decade due to greater browsing efficiency of the goats.

Q.10. Name the interaction in each of the following:

Q. *Cuscuta* growing on a shoe flower plant.

Ans. Parasitism

Q. Mycorrhizae living on the roots of higher plants.

Ans. Mutualism

Q.11. The 'clown' fish lives among the tentacles of sea anemone. What is this interaction between them called and why?

Ans. The interaction between clown fish and sea anemone is called commensalism. The clown fish gets protection from predators which stay away from the stinging tentacles of sea anemone. The sea anemone does not appear to derive any benefit by hosting the clown fish.

Q.12. In a sea shore, the benthic animals live in sandy, muddy and rocky substrata and accordingly developed the following adaptations. Find the suitable substratum against each adaptation.

- a. Burrowing _____
- b. Building cubes _____
- c. Holdfasts/peduncle _____

Ans.

- a. Sandy,
- b. Muddy,
- c. Rocky.

Q.13. Categorise the following plants into hydrophytes, xerophytes, halophytes and mesophytes. Write the type of plant against the following examples.

- a. **Salvinia**
- b. **Opuntia**
- c. **Rhizophora**
- d. **Mangifera**

Ans.

- a. Hydrophyte
- b. Xerophyte
- c. Halophyte
- d. Mesophyte

Q.14. 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.

- a. *Hydrilla*,
- b. *Typha*,
- c. *Nymphaea*,
- d. *Lemna*,
- e. *Vallisneria*

Ans.

- a. Submerged
- b. Rooted emergent
- c. Rooted with floating leave
- d. free-floating
- e. Rooted Submerged

Q.15. 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. Grass**
- c. Banyan**
- d. Deer**
- e. Fish**

Ans.

- a. Numbers/volume
- b. Coverage/area
- c. Biomass/area
- d. Numbers/area
- e. Weight/area