Short Answer Questions-II (PYQ)

[3 Marks]

Q.1.

a. Write the importance of measuring the size of a population in a habitat or an ecosystem.
b. Explain with the help of an example how the percentage cover is a more meaningful measure of population size than mere numbers.

Ans.

a. By measuring the size of a population, following can be predicted:
   i. Status of the population in a habitat.
   ii. Outcome of competition with other species.
   iii. Impact of predator or pesticides.
   iv. Increase or decrease of population size.

[*Any two*]

b. **Example:** Banyan tree and *Parthenium* plants.
When 1 banyan tree is compared with 100 *Parthenium* plants, the population of banyan in terms of number is very much low as compared to *Parthenium*. But in terms of percentage cover or biomass, the banyan provides a much larger cover in comparison to 100 *Parthenium* plants. Thus, the percentage cover or biomass is a more meaningful measure of population size.

Q.2. How do organisms which cannot migrate, tend to overcome adverse environmental conditions? Explain taking one example each from vertebrates and angiosperms respectively.

Ans. Organisms which cannot migrate tend to overcome adverse environmental conditions by developing several methods/features. For example, some vertebrates escape the stress caused by unfavourable environmental conditions by escaping in time like bears go into hibernation during the winter months. In angiosperms, seeds and some other vegetative reproductive structures serve as means to tide over periods of stress. They reduce their metabolic activity and go into an inactive, *i.e.*, 'dormant' state. They germinate to form new plant when the favourable conditions return.

Q.3. How do organisms manage with stressful conditions existing in their habitat for short duration? Explain with the help of one example each.

OR

Explain with the help of suitable examples the three different ways by which organisms overcome their stressful conditions lasting for short duration.

Ans. If the stressful conditions remain for short duration, the organism has following alternatives, *i.e.*, either conform, migration, suspension.

i. **Conform:** In some animals called conformers, osmotic concentration of body fluids change with that of the ambient water osmotic concentration. For example, small animals have larger surface area relative to their volume. They lose body heat very fast in low temperature. So, they expand energy to generate body heat through metabolism.
ii. **Migration:** The temporary movement of organism from the stressful habitat to a more hospitable area and return when stressful period is over is called migration. For example, migratory birds from Siberia come to Keoladeo National Park (Bharatpur) in every winter.
iii. **Suspend:** Those animals who fail to migrate, might avoid the stress by escaping in time. Hibernation of bears during winter or aestivation of snails and fish to avoid in summer are examples of this phenomenon.

Q.4. How do organisms like fungi, zooplanktons and bears overcome the temporary short-lived climatic stressful conditions? Explain.

Ans. Fungi form thick-walled spores which help them survive in unfavourable conditions. On availability of suitable environment, these germinate.

Zooplanktons in lakes and ponds under unfavourable conditions, enter diapause, a stage of suspended development.

Bears in extreme low temperatures, escape winter time by hibernating.

Q.5. How do organisms cope with stressful external environmental conditions which are localised or of short duration?

Ans. The following methods are employed by organisms to cope with stressful conditions:

i. Migrate temporarily from the stressful habitat to a hospitable area,
ii. suspend activities, 3
iii. form thick walled spores,
iv. form dormant seeds,
v. hibernate during winter,
vi. aestivate during summer,
vii. planktons undergo diapause.

Q.6.

a. State how the constant internal/environment is beneficial to organisms.
b. Explain any two alternatives by which organisms can overcome stressful external conditions.

Ans.

a. Constant internal environment permits all biochemical reaction and physiological functions to proceed with maximal efficiency and thus enhance the overall fitness of the species.
b. Organisms can overcome stressful external conditions with the following ways:
    i. Regulation: Maintaining internal environment by maintaining constant body temperature or osmotic concentration.
    ii. Suspend (conform): By suspending metabolic activities through hibernation or aestivation diapause.
    iii. Migration: Organisms migrate temporarily to more hospitable areas.

Q.7. Different animals respond to changes in their surroundings in different ways. Taking one example each, explain "some animals undergo aestivation while some others hibernation". How do fungi respond to adverse climatic conditions?

Ans. Some animals go into aestivation to avoid summer problems like, heat and dessication. For example, snails and fish.

Some animals go into hibernation to avoid winter related problem like, extreme cold. For example, bear.

Fungi form thick walled spores and suspend their activities to respond to adverse climatic conditions.

Q.8. Water is very essential for life. Write any three features both for plants and animals which enable them to survive in water scarce environment.

Ans.

Plants: Ephemeral mode (complete life cycle in short period); deep tap roots; deciduous leaves; waxy cuticle; sunken stomata; succulence to store water; C_4 or CAM pathway of photosynthesis. (*Any three*)

Animals: No sweating; uricotelic; deposition of fat in sub-epidermal layer; burrowing nature; thick skin; body covered with scales. (*Any three*)

Q.9. How do kangaroo, rats and desert plants adapt themselves to survive in their extreme habitat? Explain.

Ans. Kangaroo rats are capable of meeting its water requirements through its internal fat oxidation in which water is a by product. It also has the ability to concentrate its urine so that minimal volume of water is used to remove excretory products.

Desert plants have a thick cuticle on their leaf surface and have their stomata arranged in deep pits to minimise water loss. They also have leaves reduced to spines and deep roots to tap water. They have a special photosynthetic pathway (CAM).

Q.10.

a. **List any three ways of measuring population density of a habitat.**
b. **Mention the essential information that can be obtained by studying the population density of an organism.**

Ans.

a. By physical counting, percent cover or total biomass, from relative density, counting pug marks, counting faecal pellets. (*Any three*)
b. Status of habitat, whether competition for survival exists or not, whether population is increasing or declining, natality, mortality, emigration, immigration.

Q.11.

a. **"Organisms may be conformers or regulators." Explain this statement and give one example of each.**
b. **Why are there more conformers than regulators in the animal world?**

Ans.

a. Conformers are organisms which cannot maintain a constant internal environment under varying external environmental conditions. They change body temperature and osmotic concentration with change in external environment. For example, all plants, fishes, amphibians etc.
   Regulators are organisms which can maintain homoeostasis (by physiological means or behavioural means) *i.e.*, they maintain constant body temperature and osmotic concentration. For example, birds and mammals.
b. Thermoregulation is energetically expensive for animals. Therefore, more conformers are found.

Q.12. Explain mutualism with the help of any two examples. How is it different from commensalism?

Ans. Mutualism

- Mutualism is referred to as the interspecific interaction in which both the interacting species are benefited.
- Some examples of mutualism

a. Lichens represent close association between fungus and photosynthetic algae or cyanobacteria, where the fungus helps in the absorption of nutrients and provides protection while algae or cyanobacterium prepares the food.
b. Mycorrhizae are close mutual association between fungi and the roots of higher plants, where fungi helps the plant for absorption of nutrients while the plant provides food for the fungus.

In commensalism, one species benefits and the other is neither benefitted nor harmed whereas in mutualism both the species are benefitted.

Q.13. When do you describe the relationship between two organisms as mutualistic, competitive and parasitic? Given one example of each type.

Ans. Mutualism is referred to as the interspecific interaction in which both the interacting species are benefited from each other. For example, lichens represent close association between fungus and photosynthetic bacteria.

Competition is a type of interaction due to limited resources between closely related species where they compete for the same resource and both species suffer. For example, In South American lakes, visiting flamingos and resident fishes compete for zooplanktons.

Parasitism is the mode of interaction between two species in which one species (parasite) depends on the other species (host) for food and shelter, and in the process damages the host. For example, human liver fluke depends on two hosts, a snail and a fish, to complete its life cycle.

Q.14. Name the type of interaction seen in each of the following examples:

Q. *Ascaris* worms living in the intestine of humans

Ans. Parasitism

Q. Wasp pollinating fig inflorescence

Ans. Mutualism

Q. Clown fish living among the tentacles of sea-anemone

Ans. Commensalism

Q. Mycorrhizae living on the roots of higher plants

Ans. Mutualism

Q. Orchid growing on a branch of a mango tree

Ans. Commensalism

Q.15. Predation is usually referred to as a detrimental association. State any three positive roles that a predator plays in an ecosystem.

OR

Mention any two significant roles predation plays in nature.

Ans.

i. They predators act as conduits for energy transfer across trophic levels.
ii. They keep prey populations under control.
iii. They help in maintaining species diversity in a community by reducing the intensity of competition among prey species.

Q.16. Explain co-evolution with reference to parasites and their hosts. Mention any four special adaptive features evolved in parasites for their parasitic mode of life.

Ans. If the host evolves special mechanism for rejecting or resisting the parasite, they both live in a relationship called co-evolution. The parasite has to (simultaneously) evolve/co-evolve the mechanism to counter act and neutralise them.

a. **Parasitic adaptation in Animals**
    i. The parasite have evolved to be host-specific in such a manner that both host and parasite tend to co-evolve.
    ii. Loss of unnecessary sense organs.
    iii. Presence of adhesive organs or suckers.
    iv. Loss of digestive system.
    v. High reproductive capacity.
b. **Parasitic adaptation in plants**
    i. Haustoria in *Cuscuta*
    ii. Loss of chlorophyll
    iii. Loss of leaves/foliage

Q.17. Differentiate between mutualism, parasitism and commensalism. Provide one example for each of them.

Ans.

i. **Parasitism**
- It is the mode of interaction between two species in which one species (parasite) depends on the other species (host) for food and shelter, and in this process damages the host. In this process one organism is benefited (parasite) while the other is being harmed (host).
- The life cycles of some parasites are complex where one or more intermediate host or vectors to facilitate parasitisation are present.
- The human liver fluke depends on two intermediate hosts, a snail and a fish, to complete its life cycle.

ii. **Commensalism**
- Commensalism is referred to as the interaction between two species where one species is benefited and the other is neither harmed nor benefited.
- **Example of commensalism:**
- An orchid growing as an epiphyte on a mango tree. The orchid gets shelter and nutrition from mango tree while the mango tree is neither benefited nor harmed.

iii. **Mutualism**

- Mutualism is referred to as the interspecific interaction in which both the interacting species are benefited.
- **Example of mutualism**
- Lichens represent close association between fungus and photosynthetic algae or cyanobacteria, where the fungus helps in the absorption of nutrients and provides protection while algae or cyanobacterium prepares the food.

Q.18. Differentiate between commensalism and mutualism by taking one example each from plants only.

Ans.

S. No.	Mutualism	Commensalism
(*i*)	It is an interspecific interaction in which both the species (individuals) are mutually benefited.	It is an interspecific interaction in which one species is benefited and other is neither harmed nor benefited.
(*ii*)	The two individuals may be physically or physiologically associated.	The two individuals may be physically associated.
(*iii*)	*E.g.*, Rhizobium and the legume plants.	*E.g.*, Sucker fish and shark.

Q.19. Differentiate between parasitism and competition, giving one example of each. State the common characteristic they share.

Ans.

	Parasitism	Competition
(i)	It is the interaction in which one species is benefited and the other is harmed.	It is the interaction in which both species are harmed.
(ii)	For example, tapeworm in humans, ticks on dogs.	For example, herbivores and plants in an area.

Common characteristic: Species facing competition might evolve mechanisms that promote co-existence. Similarly, in parasitism both host and parasite tend to co-evolve.

Q.20.

a. **Explain any two defence mechanisms plants evolved against their predators.**
b. **How does predation differ from parasitism?**

Ans.

a. Plants developed the following defence mechanisms:
    i. Thorns as means of defence.
    ii. Plants may produce chemicals such as nicotine, caffeine, quinine, strychnine, opium for defence.

b.

Parasitism	Predation
1. The parasite lives and feeds on the host. 2. The parasite is host specific. 3. The parasite coevolves with the host.	1. The predator only feeds on prey. 2. The predator is not prey specific. 3. The predator keeps a check on prey population.

Q.21. Highlight the differences and a similarity between the following population interactions: competition, predation and commensalism.

Ans. Differences:

Competition	Predation	Commensalism
1. In this type of interaction boththe species suffer.	1. In this type of interaction the predator kills and consumes the prey	1. In this type of interaction one species is benefited and the other is neither harmed nor benefited.
2. It occurs due to limited resources between closely related species.	2. It is the nature's way of transferring energy to higher trophic level.	2. It is not particularly for any gain of energy or resources.
3. For *e.g*., In American lakes visiting flamingos and resident fish.	3. For *e.g*., tiger (predator) and deer (prey).	3. For *e.g.*, sucker fish andshark.

Similarity: All these interactions leads to evolution as the fittest organism survives.

Q.22. Highlight the differences between the population interactions given below. Given an example of each.

a. Parasitism
b. Amensalism
c. Mutualism

Ans.

Parasitism	Amensalism	Mutualism

1. In this interaction one species (parasite) depends on the other species (host) for food and shelter.	1. In this interaction one species is harmed and the other is neither benefited nor harmed.	1. In this interaction both the interacting species are benefited.
2. The interacting species coevolve.	2. No evolution is observed.	2. The interacting species co-evolve.
3. For *e.g.*, Cuscuta is commonly found growing on hedge plants.	3. For *e.g.*, the mould *Penicillium* secretes penicillin which kills bacteria but the mould is unaffected.	3. For *e.g.*, Rhizobium and the legume plants.

Q.23. Answer the following questions:

Q. List the biotic components an organism interacts with in its natural habitat.

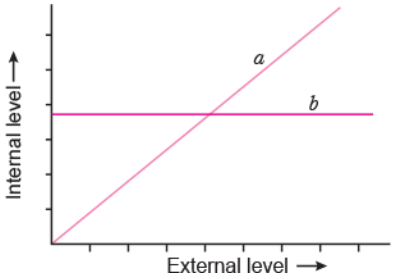
Ans. Plants, animals and microorganisms.

Q. Mention how have organisms optimised their survival and reproduction in a habitat.

Ans.

i. Some organisms regulate to maintain homeostasis by physiological and behavioural means.
ii. In some animals and plants the osmotic concentration of the body fluids change with that of the ambient water osmotic concentration (Conform).
iii. Some animals migrate to avoid unfavourable conditions.
iv. Some bacteria, fungi and lower plants, under unfavourable conditions slow down metabolic rate and form a thick-walled spore to overcome stressful conditions (Suspend).

Q.24. The following graph represents the organismic response to a certain environmental condition (*e.g.*, temperature):



i. Which one of these, '*a*' or '*b*', depicts conformers?
ii. What does the other line graph depict?
iii. How do these organisms differ from each other with reference to homeostasis?
iv. Mention the category to which humans belong.

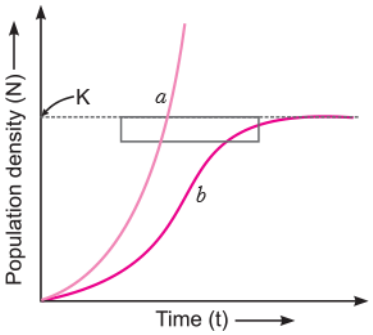
Ans.

i. 'a' depicts conformers.
ii. The other line depicts response of the regulators.
iii.

Conformers	Regulators
Aquatic animals and plants in which the osmotic concentration/body temperature of body fluids changes according to the ambient conditions/ environment of water/environment are called conformers.	Some organisms are able to maintain homeostasis by physiological means which ensures constant body temperature, constant osmotic concentration, etc.

iv. Regulators.

Q.25. Study the graph given below and answer the questions which follow:



(i) The curve '*b*' is described by the following equation:

What does 'K' stand for in this equation? Mention its significance.

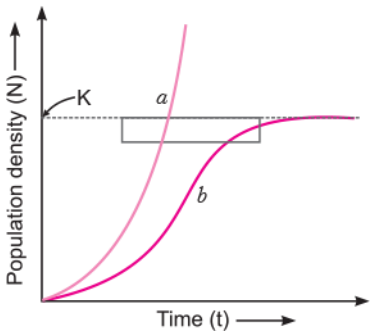
(ii) Which one of the two curves is considered a more realistic one for most of the animal populations?

(iii) Which curve would depict the population of a species of deer if there are no predators in the habitat? Why is it so?

Ans.

i. 'K' stands for carrying capacity. Carrying capacity is defined as the maximum number of individuals of a population that can be sustained by the given habitat/environment.
ii. Curve '*b*' is more realistic.
iii. Curve '*a*'. When the predators are absent, the prey population grows exponentially.

Q.26. Study the population growth curves in the graph given below and answer the questions that follow:



(i) Identify the growth curves ‘a’ and ‘b’.

(ii) Which one of them is considered a more realistic one and why?

(iii) If $\frac{dN}{dt} = rN\left\{\frac{K-N}{K}\right\}$ is the equation of the logistic growth curve, what does K stand for?

(iv) What is symbolised by N?

Ans.

i. *a* is exponential growth curve or J-shaped curve.
b is logistic growth curve or S-shaped curve.
ii. Logistic growth curve (*b*) is considered more realistic because unlimited resources are never available in an ecosystem or in a habitat.
iii. K stands for carrying capacity.
iv. N indicates population density, which is the number of species of a population per unit area.