Organisms and Populations

Class 12 Biology · 24 NEET MCQs with answers & explanations

Organisms and Populations covers how organisms adapt to their environment (thermoregulation, dormancy), population attributes (birth rate, death rate, age pyramids) and population growth models (exponential vs logistic). NEET tests the growth equations, carrying capacity, and species interactions (mutualism, competition, parasitism, predation, commensalism, amensalism).

Key Ecology Concepts

Concept	Key Fact
Exponential growth	dN/dt = rN; J-shaped curve; unlimited resources
Logistic growth	dN/dt = rN(K-N)/K; S-shaped curve; K = carrying capacity
Mutualism	Both benefit (e.g. lichens: fungus + alga; mycorrhiza: fungus + plant roots)
Parasitism	+/– interaction; parasite benefits, host harmed (e.g. Cuscuta on hedge plants)
Competition	–/– interaction; competitive exclusion (Gause's principle)
Adaptations	Allen's rule (shorter extremities in cold); Bergmann's rule (larger body in cold)

Questions

Q1. An organism enters a population from another geographical area and successfully establishes there. Which population attribute has directly increased because of this event?

(A) Natality refers to births within the population
(B) Mortality decreases population density
(C) Immigration into the population
(D) Emigration out of the population

Q2. An orchid grows epiphytically on a mango tree, obtaining support and light access, while the mango tree is neither significantly benefited nor harmed. Which interaction does this represent?

(A) Mutualism both partners benefit
(B) Parasitism host is harmed
(C) Amensalism one species inhibited
(D) Commensalism one partner unaffected

Q3. A population has abundant pre-reproductive individuals, a relatively narrow reproductive group and a small post-reproductive group. Which conclusion is most appropriate?

(A) The population is declining
(B) The population is expanding
(C) The population reached carrying capacity
(D) The population has zero growth

Q4. Which ecological interaction benefits one species while the other is neither harmed nor benefited?

(A) Mutualism
(B) Commensalism
(C) Parasitism
(D) Amensalism

Q5. Which interaction involves one species deriving nutrition from another, harming but not immediately killing it?

(A) Mutualism
(B) Competition
(C) Parasitism
(D) Predation

Q6. Which type of mutualism involves partners that cannot survive independently without each other?

(A) Facultative mutualism
(B) Resource partitioning
(C) Proto-cooperation
(D) Obligate mutualism

Q7. Which term refers to the specific place where an organism lives and performs its functions?

(A) Habitat
(B) Niche
(C) Ecosystem
(D) Biosphere

Q8. Which abiotic factor most directly affects enzyme kinetics and metabolic activity in organisms?

(A) Light
(B) Temperature
(C) Soil pH
(D) Wind

Q9. Organisms capable of tolerating a wide range of temperature variations are called:

(A) Stenothermal
(B) Osmoconformers
(C) Eurythermal
(D) Thermophilic

Q10. Which statement correctly describes the carrying capacity of an environment?

(A) It is the maximum reproductive rate of an individual
(B) It is independent of resource availability
(C) It is the maximum population size that the environment can sustain with its available resources
(D) It is always equal to the initial population size

Q11. Which example represents mutualism rather than commensalism?

(A) Lichen association between alga and fungus
(B) Orchid growing on a mango tree
(C) Cattle egret feeding near grazing cattle
(D) Barnacle attached to a whale

Q12. A population has a broad-based age pyramid with the pre-reproductive group much larger than the reproductive and post-reproductive groups. What does this indicate?

(A) Expanding population
(B) Stable population
(C) Declining population
(D) Vanishing population

Q13. A population has unrestricted reproductive capacity under ideal conditions. Which term most precisely describes this potential for increase?

(A) Biotic potential
(B) Carrying capacity
(C) Environmental resistance
(D) Population density

Q14. Which equation correctly represents Verhulst-Pearl logistic growth for a population with carrying capacity K?

(A) $dN/dt = rN$
(B) $dN/dt = rN[(K-N)/K]$
(C) $dN/dt = K/rN$
(D) $dN/dt = rK$

Q15. Which pair is correctly associated with the ecological interaction represented?

(A) Mycorrhiza — parasitism
(B) Cuscuta — mutualism
(C) Lichen — competition
(D) Fig and wasp — mutualism

Q16. Which characteristic of a population cannot be applied meaningfully to an individual organism?

(A) Natality
(B) Growth
(C) Respiration
(D) Excretion

Q17. Population density is defined as:

(A) Total biomass of organisms in habitat
(B) Number of individuals per unit area or volume
(C) Total number of species in a habitat
(D) Total reproductive output of organisms

Q18. Which formula correctly represents change in population size over time?

(A) $N = B - D$
(B) $N = B - D + I$
(C) $N = (B + I) - (D + E)$
(D) $N = B + D + I + E$

Q19. In population ecology, the symbol 'r' represents:

(A) Intrinsic rate of natural increase
(B) Carrying capacity of habitat
(C) Current population density
(D) Environmental resistance

Q20. Which equation correctly represents exponential population growth under unlimited resources?

(A) dN/dt = rN[(K−N)/K]
(B) dN/dt = rN
(C) dN/dt = N/K
(D) dN/dt = r/K

Q21. The J-shaped population growth curve corresponds to which growth model?

(A) Logistic growth
(B) Arithmetic growth
(C) Exponential growth
(D) Linear growth

Q22. Animals that maintain relatively constant internal body temperature independent of environmental temperature are termed:

(A) Ectotherms
(B) Poikilotherms
(C) Stenothermal
(D) Endotherms

Q23. Which adaptation enables desert mammals such as kangaroo rats to conserve water efficiently?

(A) Production of highly concentrated urine
(B) Continuous sweating
(C) Large body surface area
(D) High evaporation rate

Q24. Which environmental signal mainly controls photoperiodic responses like flowering in plants?

(A) Temperature
(B) Day length
(C) Soil nutrients
(D) Mineral ions

Answer key

1-C	**2-D**	**3-B**	**4-B**	**5-C**	**6-D**	**7-A**	**8-B**
9-C	**10-C**	**11-A**	**12-A**	**13-A**	**14-B**	**15-D**	**16-A**
17-B	**18-C**	**19-A**	**20-B**	**21-C**	**22-D**	**23-A**	**24-B**

Answers with explanations

Q1 — Answer: (C) Immigration into the population
Immigration means movement of individuals into a population from outside and directly increases population density. Natality also increases density but refers specifically to births within the population. Mortality and emigration both decrease population density.

Q2 — Answer: (D) Commensalism one partner unaffected
The orchid obtains support and better light access while the host tree is essentially unaffected, giving the +/0 relationship of commensalism. Parasitism would require the mango to be harmed. Mutualism requires both to benefit. Amensalism requires one species to be harmed with no effect on the other.

Q3 — Answer: (B) The population is expanding
A broad pre-reproductive base indicates many individuals are yet to enter reproductive age, indicating an expanding population. A declining population has a narrower pre-reproductive base relative to older groups. Reaching carrying capacity or zero growth is not directly indicated by age-group proportions alone.

Q4 — Answer: (B) Commensalism
In commensalism, one species benefits and the other is completely unaffected — neither harmed nor helped. Mutualism benefits both; parasitism harms the host; amensalism harms one species.

Q5 — Answer: (C) Parasitism
Parasitism is defined by one organism (parasite) living on/in a host, deriving nutrients while harming it without immediate killing. Predation involves immediate killing of prey.

Q6 — Answer: (D) Obligate mutualism
In obligate mutualism, both species are entirely dependent on each other — e.g., lichens (alga + fungus). Facultative mutualism benefits both but neither partner is fully dependent.

Q7 — Answer: (A) Habitat
Habitat is the physical place where an organism lives and carries out its life activities. Niche describes the functional role of the organism within that habitat, not its location.

Q8 — Answer: (B) Temperature
Temperature directly controls the rate of enzymatic reactions by affecting molecular kinetic energy and enzyme conformation. Light drives photosynthesis but does not directly regulate enzyme kinetics across all metabolic pathways.

Q9 — Answer: (C) Eurythermal
Eurythermal organisms survive across a wide temperature range; stenothermal organisms tolerate only a narrow range. Thermophilic organisms specifically thrive at high temperatures and are not a tolerance-range category.

Q10 — Answer: (C) It is the maximum population size that the environment can sustain with its available resources
Carrying capacity (K) is the maximum population size that a particular environment can sustain with its available resources and conditions. It is an environmental property. It is not an individual reproductive rate, not independent of resources, and not fixed at the initial population size.

Q11 — Answer: (A) Lichen association between alga and fungus
Lichen represents mutualism because both the alga and the fungus benefit from the association. Orchids on trees, cattle egret near grazing cattle, and barnacles on whales are standard examples of commensalism in which one partner benefits while the other is not significantly affected.

Q12 — Answer: (A) Expanding population
A broad base means a high proportion of young pre-reproductive individuals. As these individuals mature and enter the reproductive group, the population has the potential to expand rapidly. A stable population shows equal proportions across groups. A declining population has a narrow base.

Q13 — Answer: (A) Biotic potential
Biotic potential is the maximum reproductive capacity of a population under ideal environmental conditions with no limiting factors. Carrying capacity represents the maximum population an environment can sustain. Environmental resistance opposes population expansion and reduces realised growth below biotic potential.

Q14 — Answer: (B) dN/dt = rN[(K-N)/K]
Logistic growth incorporates environmental resistance through the factor (K minus N) divided by K. When N approaches K this factor approaches zero and population growth levels off. The exponential equation rN lacks any carrying capacity term and allows unlimited growth.

Q15 — Answer: (D) Fig and wasp — mutualism
Fig-wasp is a classic mutualistic association in which the fig provides a site and resource for the wasp while the wasp pollinates the fig. Mycorrhiza is mutualism not parasitism. Cuscuta is a parasite not mutualistic. Lichen is mutualism not competition.

Q16 — Answer: (A) Natality
Natality (birth rate) is a property of a group and has no meaning for a single individual; an individual cannot have a birth rate. Growth, respiration, and excretion are all properties of individual organisms.

Q17 — Answer: (B) Number of individuals per unit area or volume
Population density measures the number of individuals of a species per unit area (terrestrial) or volume (aquatic). Total species count describes species richness, not density of one population.

Q18 — Answer: (C) N = (B + I) − (D + E)
Population size is determined by four processes: births (B) and immigration (I) add individuals; deaths (D) and emigration (E) remove them — giving N = (B + I) − (D + E). Option D incorrectly adds all four, which would always inflate population size.

Q19 — Answer: (A) Intrinsic rate of natural increase
'r' is the intrinsic rate of natural increase — per capita growth rate under ideal, unlimited conditions. It is not carrying capacity (K) or environmental resistance, which oppose growth.

Q20 — Answer: (B) dN/dt = rN
Exponential growth is expressed as dN/dt = rN, where growth is proportional to population size with no resource limitation. Option A is the logistic equation, which includes carrying capacity K.

Q21 — Answer: (C) Exponential growth
Exponential growth under unlimited resources produces a J-shaped curve with continuously accelerating growth. Logistic growth produces an S-shaped (sigmoid) curve, not J-shaped.

Q22 — Answer: (D) Endotherms
Endotherms generate metabolic heat to maintain a stable core temperature regardless of external conditions. Ectotherms and poikilotherms depend on environmental heat sources and show variable body temperatures.

Q23 — Answer: (A) Production of highly concentrated urine
Kangaroo rats produce highly concentrated urine and dry feces, minimizing water loss in arid habitats. Sweating and high evaporation would cause fatal dehydration in desert conditions.

Q24 — Answer: (B) Day length
Photoperiodism is the response to the relative duration of light and dark periods (day length), not total light intensity or temperature. Soil nutrients and minerals have no role in triggering photoperiodic responses.

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