CHAPTER › 13

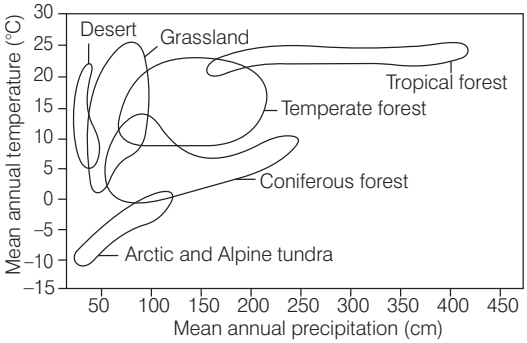
Organisms and Population

NEET KEY NOTES

- Ecology is the branch of biology which studies the interactions among organisms and between organism and its physical, i.e. abiotic environment. The term 'ecology' was first described by **Ernst Haeckel.**
- Ecology is basically concerned with four levels of organisation. These are
  - **Organisms** are the basic and living unit of ecology.
  - **Population** refers to the sum total of all organisms having similar features and potential to interbreed among themselves and produce fertile offspring.
  - **Communities** refer to the assemblage of all the populations of different species in a specific geographical area.
  - **Biome** is a large unit which consists of a major vegetation type and its associated fauna in a particular climatic zone, e.g. tropical rainforest, deciduous forest, etc.

Organism and its Environment

- Ecology at the organismic level is essentially physiological ecology, which studies the adaptations of organisms essential for survival and reproduction in any given environment.
- We know that the rotation of our planet around the sun and the tilt of its axis cause annual variations in the intensity and duration of temperature, resulting in distinct seasons.
- These variations together with annual variation in precipitation account for the formation of major biomes such as desert, rainforest and tundra.



Biome distribution with respect to annual temperature and precipitation

- Regional and local variations within each biome lead to the formation of a wide variety of habitats.
- **Habitat** is a place, where an organism lives and represents a particular set of environmental conditions suitable for its successful growth.
- Each organism has an invariably defined range of conditions (evolved through natural selection) that it can tolerate, diversity in the resources it utilises and a distinct functional role in the ecological system all these together comprise its **niche.**
- Ecological equivalents are the organisms which occupy a part of the same niche, but have different habitats.

Major Abiotic Factors

These are the non-living factors or components of the environment which influence the survival and reproductive functions of an organism.

Some important factors are

- **Temperature** It is the most ecologically relevant environmental factor. Organisms which can tolerate and thrive in wide range of temperature are called **eurythermal**, e.g. most mammals and birds, while organisms which can tolerate, a narrow range of temperature are called **stenothermal**, e.g. polar bear, amphibians.
- **Water** The life on earth is unsustainable without water. The productivity and distribution of plants are dependent on the availability of water.
  - Aquatic organisms survive in water and they are affected by pH, chemical composition, temperature and salinity of water.
  - Organisms which can tolerate a wide range of salinity are called **euryhaline**, e.g. salmon, while organisms which can be restricted to tolerate a narrow range of salinity are called **stenohaline**, e.g. shark.
- **Light** It is the source of energy used to prepare food by photosynthesis in plants to release oxygen.
  - It induces flowering in certain plants (photoperiodism), helps in transpiration, reproductive and migratory activities, etc.
  - The UV component of solar spectrum is harmful for living organisms, while visible spectrum (380-760 nm) is mainly utilised by plants. The availability of light on land is closely linked with that of temperature as the sun is source of both.
- **Soil** (edaphic factor) The nature and properties of soil is affected by climate, weathering process, whether soil is transported or sedimented and by soil development process.
  - Water holding capacity and percolation of the soil is determined by various characteristics, such as soil composition, grain size and aggregation.
  - Soil quality determines the vegetation in an area which inturn defines the type of fauna that can exist there.

Responses to Abiotic Factors

- The abiotic factors are highly variable. An organism can achieve consistency by regulating optimum temperature and osmotic concentration of body fluids, in accordance to external environmental conditions.
- The following methods help organisms to cope up with stressful conditions

1. Regulate

- Some organisms are able to maintain homeostasis by physiological and behavioural means to ensure a constant body temperature, constant osmotic concentration, etc., known as **regulators**.
- All birds, mammals, few lower vertebrates and invertebrates are **endotherms** as they have the mechanism of thermoregulation and osmoregulation for maintaining their homeostasis. Thus, regulators are endotherms.
- The mechanisms used for regulation in most mammals are similar to the ones used by humans who have a constant body temperature of 37°C, e.g. during summer, sweating occurs profusely and the evaporation brings down the temperature of the body to constant 37℃.
- During winter, shivering occurs (a kind of exercise that produces heat) and raises the body temperature again to 37°C.

2. Conform

- Organisms which cannot maintain a constant internal environment are called conformers, e.g. about 99% of animals and almost all plants. Their body temperature changes with the ambient temperature, i.e. they are **ectotherms**. Thus, conformers are ectotherms.
- A majority of aquatic animals change the osmotic concentration of their body fluids according to the environment (ambient water osmotic concentration). Such animals and plants are called **osmoconformers.**
- Since, small animals have a larger surface area relative to their volume, they tend to loose body heat very fast in cold environmental conditions.
- Then, they have to expend much energy to generate body heat through metabolism. Due to this reason, very small animals are rarely found in polar regions.
- During the course of evolution, some species have evolved the ability to regulate their environmental conditions but, only over a limited range, beyond which they simply conform. Such animals are called **partial regulators.**

3. Migrate

- If an organism moves away temporarily from a stressful habitat to a more hospitable area and return, when the stressful period is over, the process is called **migration**. Birds undertake long distance migrations during winter, e.g. the **Keoladeo National Park** in Bharatpur (Rajasthan) hosts thousands of migratory birds coming from Siberia and other extremely cold Northern regions every winter.

4. Suspend

- Some bacteria, fungi and lower plants under unfavourable conditions form thick-walled spores to overcome stressful conditions. These spores germinate on the onset of suitable environment.

- In higher plants, seeds and some other vegetative reproductive structures (propagules) help to pass over stress periods and dispersal. They do so by reducing their metabolic activity and entering into a state of dormancy. Under favourable moisture and temperature conditions, these germinate to form new plants.
- Some organisms are unable to migrate so they avoid stress by escaping in time. These organisms suspend their metabolic functions during the stressful period and resume their functions at the return of favourable conditions. For example, bear undergoes winter sleep called **hibernation** and certain animals like snails and fish undergo summer sleep known as **aestivation**.Under unfavourable conditions, many zooplanktons enter **diapause** (a stage of suspended development).

Adaptation

Any attribute of an organism (morphological, physiological or behavioural) that enables it to survive and reproduce in its habitat can be referred to as **adaptation**. It is of following types

Adaptations in Plants

- **Xerophytic plants** Roots grow very deep to explore any possibility of available underground water.
  - Many desert plants have a thick cuticle on their leaf surfaces and have their stomata arranged in deep pits to minimise water loss through transpiration. They also have a special photosynthetic pathway known as Crassulacean Acid Metabolism (CAM) that enables their stomata to remain closed during day time so as to minimise transpiration.
  - Some desert plants like *Opuntia,* have no leaves. Their leaves are reduced to spines and photosynthesis occurs in flattened stems.
- **Hydrophytic plants** Aquatic plants or hydrophytes have evolved aerenchyma for buoyancy and floating. They have covering of wax to avoid damage through water. Roots are generally absent in plants like *Hydrilla* and *Nymphaea.*
- **Halophytic plants** The plants of saline habitats or halophytes not only have the ability to tolerate high concentration of salts in their rooting medium but are also able to obtain their water supply from the same.
  - These are found in tidal marshes, coastal dunes, mangroves and saline soils. Certain green algae are also found in these areas, e.g. *Dunaliella*.
  - A number of plants possess small negatively geotropic vertical roots called **pneumatophores** (have lenticels for gaseous exchange), e.g. *Avicennia*, *Aegialitis*.

Adaptations in Animals

- **Kangaroo rat** The kangaroo rat of the North American deserts is capable of meeting all its water requirement by internal oxidation of its body fat (water is a byproduct).
  - It can also concentrate its urine, so that minimal volume of water is used to expel excretory products.
- **Desert lizards** They absorb heat from sun when the body temperature drops below the comfort zone and move into shade when the ambient temperature starts increasing. Some species burrow into the soil and escape from the above ground heat. These are behavioural responses.
- **Mammals** from colder climates generally have shorter ears and limbs to minimise heat loss. This is called **Allen's rule**. In polar regions, aquatic mammals like seals have a thick layer of fat (blubber) below their skin that acts as an insulator and reduces the loss of body heat.
- **At high altitudes in humans** At high altitude places like Rohtang Pass near Manali (> 3500 m) and Mansarovar (in China occupied Tibet) people suffer from **altitude sickness**.
  - The common symptoms include nausea, fatigue and heart palpitations. This is because at low atmospheric pressure of high altitudes, body does not get enough oxygen. The however gradually acclimatises.
  - The body copes up with this low oxygen stress by
    - increasing red blood cells production.
    - decreasing the binding affinity of haemoglobin.
    - increasing the breathing rate.
- **Antarctic fishes** Many fish thrive in Antarctic waters where the temperature is below zero as their body contains antifreeze glycoproteins to prevent the body fluid from freezing.
- A large variety of **marine invertebrates** and **fish** live at great depths of ocean where pressure is extremely high. These animals can survive only due to their small size, presence of more gelatin, less skeletal structures and absence of cavities which collapse under high pressure.

Adaptations in Other Organisms

- **Microbes** like archaebacteria flourish in deep sea hydrothermal vents and hot springs where temperature far exceeds 100ºC. This is possible as their cell membrane possesses branched chain lipids to reduce membrane fluidity. They also bear impermeable cell wall.

Population

A group of organisms living in a well-defined geographical area, sharing or competing for similar resources and can potentially interbreed, constitute a population.

Population Attributes

A population has certain attributes whereas, an individual organism does not. Thus, population attributes refers to the describing characteristics of the population.

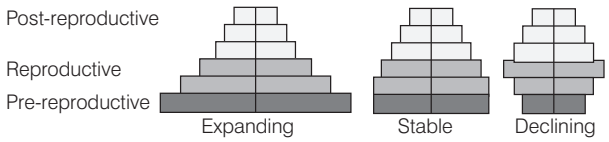
Main attributes of the population are as follows

- **Population density** The size of a population tells about its status in the habitat. The total number of individuals present in a unit area or volume at a specific time, is called its population density.

  It can be calculated using the following formula, $D = \frac{N}{S}$

  Where, D = Density, N = Total number of individuals in a region and S = Size of unit area in the region
- **Birth rate or Natality** It is the production of new individuals in a population over fixed time period.
- **Death rate or Mortality** Number of individual dying in a population over fixed time period is called death rate.
- **Sex ratio** An individual is either male or female. The number of females and males per 1000 individuals in a given time is called as sex ratio.
- **Age pyramid** Population at any given time is composed of individuals of different ages. When the age distribution (per cent individuals of a given age or age group) is plotted for the population, this is called age pyramid.
  - The age pyramids of human population generally show the age distribution of males and females.
  - The shape of pyramid reflects the growth status of the population as

(i)Expanding (ii) Stable (iii) Declining



Population Growth

- The size of a population for any species is not a static parameter as it keeps changing with time. It depends on factors such as food availability, predation pressure and adverse weather.
- The population growth can fluctuate due to the following four processes
  - **Natality** which refers to the number of births during a given period that are added to the initial density.
  - **Mortality** which defines the number of deaths during a given period.
  - **Immigration** which is the number of individuals of the same species that have come into the habitat from elsewhere during the time period under consideration.
  - **Emigration** which is the number of individuals of the population who left the habitat and moved somewhere else during the time period under consideration.

  So, if N is the population density at time t, then its density at time $t + 1$ is

$$N_{t+1} = N_t + [(B + I) - (D + E)]$$

where, N = Population density, t = Time,

B = Birth rate

I = Immigration

D = Death rate and

E = Emigration

From the above equation we can see that population density will increase, if $(B + I)$ is more than $(D + E)$.

Growth Models

To study the behaviour and pattern of different populations, the following two models of population growth are used.

1. Exponential Growth

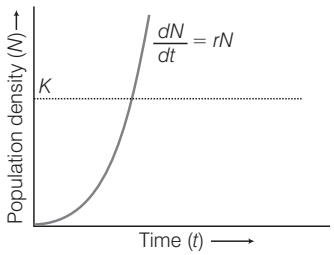
- Availability of resources (food and space) is essential for the growth of population. Unlimited availability of such resources results in exponential growth of population. The increase or decrease in population density during a unit time period (t) is calculated as

$$dN/dt = (b - d)N$$

Let $(b - d) = r$, then, $dN/dt = rN$

where, N is population size, b is birth per capita, d is death per capita, t is time period and r is intrinsic rate of natural increase.

- ***r*** is an important parameter that assesses the effects of biotic and abiotic factors on population growth. It is different for different organisms, e.g. its value is 0.015 for Norway rat and 0.12 for flour beetle. The above equation results in a J-shaped curve as shown in graph.



Population growth curve showing exponential growth

- Integral form of exponential growth equation is

$$N_t = N_0 e^{rt}$$

where, N_t = Population density after time t

N_0 = Population density at time zero

r = Intrinsic rate of natural increase

e = Base of natural logarithms (2.71828).

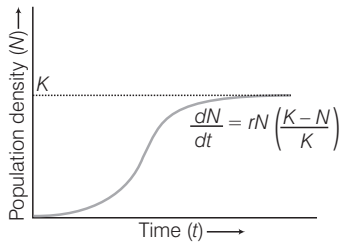
- Any species growing exponentially under unlimited resource conditions without any check, can reach enormous population densities in a short time.

2. Logistic Growth

- Practically, no population of any species in nature has unlimited resources at its disposal. This leads to competition among the individuals and the survival of the 'fittest'.
- Therefore, a given habitat has enough resources to support a maximum possible number, beyond which no further growth is possible.
- This is called the **carrying capacity** (K) for that species in that habitat.
- When N is plotted in relation to time t, the logistic growth shows sigmoid curve and this type of growth is called **Verhulst-Pearl Logistic Growth.** It is calculated as

$$dN/dt = rN\left(\frac{K-N}{K}\right)$$

Where, N is population density at time t, K is carrying capacity and r is intrinsic rate of natural increase.



Population growth curve showing logistic growth

- A population growing in a habitat with limited resources shows initially a **lag phase** followed by phases of **acceleration**, **deceleration** and finally an **asymptote phase**, when the population density reaches the carrying capacity (K).
- The integral form of logistic growth equation is

$$N_t = \frac{K}{1+\left[\frac{K-N_0}{N_0}\right]e^{-rt}}$$

- This model is more **realistic** in nature because no population growth can sustain exponential growth indefinitely as there will be competition for the basic needs due to finite resources.

Life History Variations

Populations evolve to maximise their reproductive fitness or Darwinian fitness (high r value) in the habitat where they live. Under a particular set of selection pressures, organisms evolve towards the most efficient reproductive strategy. Some organisms breed only once in their lifetime (e.g. pacific salmon fish, bamboo) while other breed many times during lifetime (most birds and mammals). Some produce a large number of small sized offsprings (oysters, pelagic fish), while others produce a small number of large sized offspring (birds, mammals). The rate of breeding varies from species to species.

Population Interactions

- In nature, living organisms such as animals, plants and microbes, cannot live in isolation and therefore, interact in various ways to form a biological community.
- Interspecific interactions occur between populations of two different species. These interactions could be beneficial (+), detrimental (–) or neutral (0) as shown in table below

Population interactions and their effects are as follows

Names of Interaction	Effects on Species A	Effects on Species B
Mutualism	+	+
Competition	–	–
Predation	+	–
Parasitism	+	–
Commensalism	+	0
Amensalism	–	0

- Various population interactions are as follows

1. Predation

- It is the interspecific interaction, in which an animal (predator) kills and consumes other weaker animal(s) (prey). It is a biological control method, e.g. tiger (predator) and deer (prey). Role of predators is to
  - provide population stability.
  - maintain species diversity in a community.
- Defences developed in prey species to avoid predation are as follows
  - Preys are cryptically coloured, i.e. camouflaged, e.g. insects and frogs.
  - They produce poisonous toxins, e.g. monarch butterfly secretes chemical during caterpillar stage and *Calotropis* secretes cardiac glycosides.
  - 25% of insects are phytophagous, i.e. feed on plant sap and other parts of plants. Therefore, plants evolved by developing various defences against herbivores, e.g. thorns in *Acacia* and cactus are the most common morphological means of defence. Many plants produce and store chemicals which when ingested can make the herbivore sick or even kill it.

2. Competition

- It is the interaction in which closely related species compete for the same resources which are limited.
- **Gause's competitive exclusion principle** states that two closely related species competing for the same resources cannot coexist indefinitely and the competitively inferior one will be eliminated eventually. This may hold true in case of limited resources.

- **Resource partitioning** is a mechanism evolved by competing species to ensure their coexistence. This refers to competitive coexistence.

3. 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 damages it. In this process, one organism is benefitted (parasite), while the other is being harmed (host).
- **Types of parasites** Parasites are broadly divided into the following main types
  - **Ectoparasites** are present on the external surface of the host organism for the uptake of food and shelter, e.g. lice on humans, ticks on dogs, copepods in marine fishes, etc.
  - **Endoparasites** live inside the host's body at different sites like liver, kidney, lungs, etc., for food and shelter, e.g. tapeworm, liver fluke, *Plasmodium*, etc. The life cycles of endoparasites are more complex because of their extreme specialisation.
  - **Brood parasitism** in birds is a fascinating example of parasitism in which the parasitic bird lays its egg in the nest of its host and lets the host incubate the eggs.

4. Commensalism

- It is the interaction between two species, where one species is benefitted and the other is neither harmed nor benefitted.
- Some examples of commensalism are
  - An orchid growing as an epiphyte on a mango tree gets shelter and nutrition from the mango tree.
  - Barnacles growing on the back of whale are benefitted by getting to move to different locations for food as well as shelter.

5. Mutualism

- It is the interaction that confers benefit to both the interacting species. It is an obligate association where two organisms often live together and cannot live separately. Some examples of mutualism are
  - Lichens represent an intimate mutualistic relationship between a fungus and photosynthesising algae or cyanobacteria.
  - Mycorrhizae show close mutual association between fungi and the roots of higher plants, e.g. *Glomus* genus.
  - Mediterranean orchid *Ophrys* employs 'sexual deceit' to get pollinated by a species of bee.

6. Amensalism

- It is the interaction between different species, in which one species is harmed and the other is neither benefitted nor harmed. The organism which inhibits the growth of the other is called amensal, e.g. *Penicillium*, a mould, secretes penicillin which kills bacteria, but the mould remains unaffected.

Mastering NCERT

MULTIPLE CHOICE QUESTIONS

TOPIC 1 *~ Organism and its Environment*

1 The correct sequence of levels of biological organisation is

(a) Macromolecules → Cells → Tissues → Organs → Individual organism → Population → Communities → Ecosystem → Biomes

(b) Macromolecules → Tissues → Cells → Organs → Population → Ecosystem → Communities → Biomes

(c) Micromolecules → Cells → Tissues → Organs → Individual organism → Communities → Population → Biomes → Ecosystem

(d) Macromolecules → Cells → Tissues → Organs → Individual organism → Biomes → Ecosystem → Population → Communities

2 The study of interactions among organisms and between the organism and its physical (abiotic) environment is

(a) ecosystem study (b) environmental study
(c) ecology (d) population study

3 Identify the basic levels of ecology.

I. Organisms II. Populations
III. Communities IV. Biomes
V. Human VI. Vertebrates

Choose the correct option.

(a) I, II and III (b) II, III and VI
(c) I, II, III and IV (d) I, II, III and V

4 Highest level of biological hierarchy in the given options is
(a) biome (b) ecosystem
(c) individual (d) species

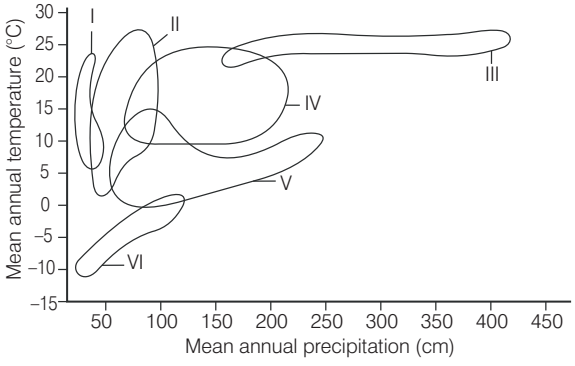
5 An association of individuals of different species living in the same habitat and having functional interaction ***CBSE-AIPMT 2015***
(a) ecological niche
(b) biotic community
(c) ecosystem
(d) population

6 Different organisms are adapted to their environment in terms of not only survival but also reproduction. This statement belongs to
(a) physiological ecology
(b) species ecology
(c) population ecology
(d) All of these

7 Major biomes of India include
I. Tropical rainforest II. Alpine region
III. Deciduous forest IV. Desert
V. Himalayan region VI. Sea coast
Choose the correct combination for given question.
(a) I, III, IV and V (b) I, II, III and IV
(c) II, III, IV and VI (d) I, III, IV and VI

8 Formation of major biomes such as desert, rainforest takes place by
(a) rotation of our planet around the sun
(b) tilting of our planet to its axis
(c) Both (a) and (b)
(d) seasonal periodicity

9 In the given graph, identify Coniferous forest, Arctic and Alpine tundra and Tropical forest, respectively.



(a) I, VI and III (b) V, VI and III
(c) IV, III and I (d) I, II and III

10 Formation of wide variety of habitats takes place by
(a) types of species inhabiting that area
(b) types of predation
(c) regional and local variation of environment conditions
(d) All of the above

11 Environmental factor(s) that characterise the habitat of an organism is/are
(a) abiotic components
(b) biotic components
(c) Both (a) and (b)
(d) temperature only

12 Forest floors, tree canopies and edges of a pond are an example of
(a) microhabitat (b) microclimate
(c) ecological niche (d) local biome

13 The key elements that lead to large variations in the physical and chemical conditions of different habitats are
(a) the physico-chemical (abiotic) components
(b) the biotic components like pathogens, parasites, predators and competitors
(c) Both (a) and (b)
(d) None of the above

14 A defined range of conditions that an organism can tolerate, diversity in the resources it utilises and a distinct functional role in the ecological system, together comprise
(a) habitat (b) niche
(c) biome (d) biosphere

15 The most ecologically relevant environmental factor is
(a) soil (b) water
(c) temperature (d) light

16 Average temperature of thermal springs and deep sea hydrothermal vents exceeds
(a) 50°C (b) 60°C
(c) 70°C (d) 100°C

17 Temperature is very significant to the living beings because
(a) kinetics of locomotion depend on temperature
(b) kinetics of enzymes depend on temperature
(c) high temperature facilitates digestion
(d) low temperature facilitates digestion

18 Organisms which are restricted to narrow range of temperature are called
(a) eurythermals (b) stenothermals
(c) amphithermals (d) mesothermals

19 Given below are some animals

I. Reptiles II. Snails
III. Killer whales IV. Green crab
V. Desert pupfish VI. Amphibians
VII. Humans

Identify eurythermals from the given examples.

(a) III, IV, V, and VII (b) II, III, IV and VI
(c) I, II, III and IV (d) VII, VI, V and I

20 The organism which tolerates wide range of salinity called …*A*… .

The organism which tolerates narrow range of salinity called …*B*… .

Choose the correct option for *A* and *B*.

(a) A–stenohaline, B–euryhaline
(b) A–euryhaline, B–stenohaline
(c) A–isohaline, B–euryhaline
(d) A–heterohaline, B–isohaline

21 Consider the name of the fishes given below.

I. Salmon II. Shark III. Sting ray

Which of them is/are stenohaline and euryhaline?

	Stenohaline	**Euryhaline**
(a)	I, III	II
(b)	I, II	III
(c)	II, III	I
(d)	I	II, III

22 Many fishes of freshwater cannot live in sea water and *vice-versa* because of

(a) nutrient (b) osmotic problems
(c) breathing problems (d) excretion problems

23 Sunlight is available as a source of energy and is important in

(a) chemosynthesis
(b) photosynthesis
(c) heterotrophic mode of nutrition
(d) All of the above

24 In the oceans, the environment is perpetually dark at

(a) more than 100 m (b) more than 500 m
(c) less than 100 m (d) less than 500 m

25 Nature and properties of soil in different places vary due to

(a) climate
(b) weathering process
(c) topography
(d) All of the above

26 Which characteristics determine the percolation and water holding capacity of soils?

(a) Soil composition (b) Grain size
(c) Aggregation (d) All of these

27 Factor which does not determine the large extent vegetation of any area is

(a) pH of soil
(b) mineral composition of the soil
(c) water holding capacity of soil
(d) weather condition

28 In aquatic environment, the types of benthic animals are determined by

(a) type of water
(b) type of sediment characteristics
(c) light availability
(d) nutrient availability

29 During the course of million of years of their existence most species should have evolved a relatively ...*A*... internal environment (within the body of organisms). This internal environment would permit all biochemical reactions and physiological functions to proceed with ...*B*... efficiency and therefore, increase the overall fitness of the species in terms of ...*C*... .

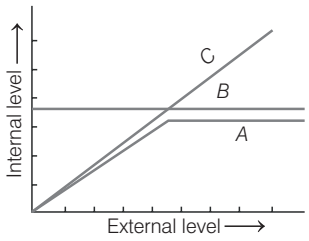
Choose the correct option for *A*, *B* and *C*.

(a) A–constant, B–minimal, C–thermoregulation
(b) A–constant, B–maximal, C–homeostasis
(c) A–variable, B–minimal, C–osmoregulation
(d) A–constant, B–versatile, C–homeostasis

30 Homeostasis is

(a) maintaining a constant internal environment
(b) maintaining a constant external environment
(c) Both (a) and (b)
(d) maintaining circulation of blood

31 Identify the lines present in the given graph *A*, *B* and *C*.



(a) A–Partial regulators, B–Regulators, C–Endotherms
(b) A–Partial regulators, B–Ectotherms, C–Endotherms
(c) A–Partial regulators, B–Regulators, C–Conformers
(d) A–Conformers, B–Ectotherms, C–Partial regulators

32 Regulators are the animals which

(a) does not maintain their body homeostasis
(b) can maintain their body homeostasis
(c) can regulate their heartbeat
(d) can regulate their circulation

33 ...*A*... regulators are able to maintain homeostasis by means which ensure constant body temperature, constant osmotic concentration, etc. All ...*B*... and ...*C*... are a very few lower vertebrates and invertebrate species are indeed capable of such regulation (thermoregulation and osmoregulation).

Evolutionary biologists believe that the 'success' of mammals is largely due to their ability to maintain a constant body ...*D*... and thrive whether they live in Antarctica or in the Sahara desert.

Choose the correct option for *A*, *B*, *C* and *D*.

(a) A–Behavioural, B–vertebrates, C–invertebrates, D–temperature
(b) A–Behavioural, B–bird, C–mammals, D–temperature
(c) A–Physiological, B–bird, C–mammals, D–temperature
(d) A–Behavioural, B–vertebrates, C–invertebrates, D–morphology

34 Regulators are also called

(a) endotherms (b) exotherms
(c) ectotherms (d) Either (b) or (c)

35 What percentage of animals on this earth are regulators and conformers, respectively?

(a) 2%, 98% (b) 7%, 93%
(c) 4%, 96% (d) 1%, 99%

36 Partial regulators are the organisms which

(a) can regulate body temperature to larger extent of environmental condition
(b) can regulate body temperature to limited extent of environmental condition
(c) can regulate body temperature only over a wide range of environmental condition
(d) None of the above

37 An overwhelming majority ...*A*... of animals and nearly all plants cannot maintain a constant internal environment. Their body temperature ...*B*... with the ambient temperature. In aquatic animals, the osmotic concentration of the body fluids ...*C*... with that of the ambient water osmotic concentration. These animals and plants are simply conformers.

Choose the correct option for *A*, *B* and *C*.

(a) A–98%, B–changes, C–constant
(b) A–97%, B–constant, C–changes
(c) A–96%, B–changes, C–constant
(d) A–99%, B–changes, C–changes

38 Conformers are inactive in adverse conditions due to

(a) inability to move
(b) inability to digest properly
(c) inability to maintain homeostasis
(d) ability to maintain homeostasis

39 It can be said that some animals in their evolutionary development preferred to be conformers than regulators. Which of the following can be the best suited reason for it?

(a) The metabolic reactions of these organisms can occur at a very wide range of temperature
(b) Maintaining homeostasis is an energetically expensive process
(c) The enzymes of these organisms are functional at high temperatures
(d) Both (b) and (c)

40 Conformers are also called

(a) endotherms
(b) ectotherms
(c) Both (a) and (b)
(d) isotherms

41 Very small animals are rarely found in polar region because

(a) small animals have a larger surface area relative to their volume, so they lose body heat very fast when it is cold outside
(b) small animals have a smaller surface area relative to their volume, so they lose body heat very fast when it is cold outside
(c) small body volume makes internal heat production very difficult
(d) None of the above

42 Every winter the famous ...*A*... (Bharatpur) in Rajasthan host thousands of migratory birds coming from ...*B*... and other extremely cold ...*C*... regions.

Fill in the blanks *A*, *B* and *C*.

(a) A–Keolado National Park, B–America, C–West
(b) A–Keolado National Park, B–Mexico, C–Eastern
(c) A–Keolado National Park, B–Siberia, C–Northern
(d) A–Keolado National Park, B–Siberia, C–Southern

43 In bacteria, fungi and lower plants, various of thick-walled ...*A*... are formed, which help them to survive ...*B*... conditions-these germinate on availability of suitable environment. In higher plants, ...*C*... and some other vegetative reproductive structures serve as means to tide over periods of stress besides helping in dispersal-they germinate to form new plants under favourable moisture and temperature conditions.

Choose the correct option for *A*, *B* and *C*.

(a) A–spores, B–unfavourable, C–seeds
(b) A–seeds, B–unfavourable, C–spores
(c) A–seeds, B–favourable, C–spores
(d) A–spores, B–favourable, C–seeds

44 Animals like snail and fish go into …… to avoid summer related problem and animal like bear go into …… to avoid winter related stress.
(a) aestivation, migration (b) migration, hibernation
(c) aestivation, hibernation (d) hibernation, aestivation

45 Diapause is a
(a) stage of development
(b) stage of suspended development
(c) stage of delayed morphology
(d) rapid developmental stage

46 Which of the following is an incorrect match?
(a) Bacteria — Thick-walled resting spores
(b) Bear — Hibernation
(c) Lizard — Diapause
(d) Fish — Aestivation

47 Attribute of the organisms (morphological, physiological and behavioural) that enable organisms to survive and reproduce in its habitat are called
(a) phenotypic plasticity (b) adaptations
(c) mimicry (d) surviving abilities

48 In the absence of an external source of water, Kangaroo rat in North American desert is capable of meeting all its water requirements through
(a) internal fat oxidation (b) taking liquid food
(c) reducing his activities (d) hibernation

49 Which is the characteristic of desert plant adaptation?
(a) Thick cuticle on their leaf surface
(b) Stomata arranged in deep pits
(c) Stomata remain closed during day (CAM)
(d) All of the above

50 An adaptation in *Opuntia* is that, it performs photosynthesis by
(a) flower (b) stem
(c) roots (d) shoot

51 …… rule states that mammals from colder climates generally have shorter ears and limbs to minimise heat loss.
(a) Allen's rule
(b) Bergmann's rule
(c) Rensch's rule
(d) Jordan's rule

52 How seals can survive in polar climate where the temperature prevails below 0°C?
(a) They have long hairs on their body surface
(b) They have thick layer of fat below their skin
(c) Both (a) and (b)
(d) They have genetic regulation for avoiding cold climate

53 Altitude sickness occurs at high mountains. This sickness have symptoms like
(a) nausea (b) fatigue
(c) heart palpitations (d) All of these

54 At high altitude, we feel sick and nauseated. The reason for this sickness may be
(a) low atmospheric pressure
(b) high atmospheric pressure
(c) high temperature
(d) low temperature

55 Body compensates for low oxygen availability at due to the altitudes sickness by
(a) increasing RBC
(b) decreasing binding affinity of haemoglobin
(c) increasing breathing rate
(d) All of the above

56 In most animals, the metabolic reactions proceed in a ...*A*... temperature range (in humans, it is 37°C). But there are microbes (archaebacteria) that flourish in hot springs and deep sea hydrothermal vents where temperatures far exceed ...*B*... .
Choose the correct option for *A* and *B*.
(a) A–narrow, B–100°C
(b) A–broad, B–100°C
(c) A–median, B–100°C
(d) A–broad, B–40°C

57 Which of the following problems does the frequent deep sea diving organisms like whales may face?
(a) Compression of tissues surrounding air-filled cavities
(b) High blood nitrogen levels
(c) Lack of oxygen
(d) All of the above

58 Whales can resist tissue compression during deep sea diving because they have
(a) special proteins that prevent air absorption
(b) extensive blood vasculature which swells up to reduce the size of air-filled cavities
(c) thick coat of fat around body that works as an insulator
(d) None of the above

59 Desert lizards lack the ...*A*... ability that mammals have to deal with the ...*B*... temperatures of their habitat, but manage to keep their body temperature fairly constant by ...*C*... means.
Choose the correct option for *A*, *B* and *C*.
(a) A–morphological, B–high, C–behavioural
(b) A–physiological, B–high, C–behavioural
(c) A–behavioural, B–high, C–physiological
(d) A–physiological, B–high, C–morphological

TOPIC 2 ~ *Population Attributes*

60 Population is the total number of
(a) interbreeding individuals of a species found in a geographical area
(b) interbreeding individuals of a species found in different geographical area
(c) Both (a) and (b)
(d) None of the above

61 If in a pond, there are 20 lotus plants of last year and through reproduction 8 new plants are added. Then, the birth rate is
(a) 0.8 offspring per lotus per year
(b) 0.2 offspring per lotus per year
(c) 0.4 offspring per lotus per year
(d) 0.6 offspring per lotus per year

62 Individuals alive at the beginning of 1 year to 2 years age interval is 800. During this interval 200 individuals die. Then find out the death rate.
(a) 200 (b) 800
(c) 0.4 (d) 0.25

63 Sex ratio is the
(a) ratio of females to males
(b) ratio of males to females
(c) Both (a) and (b)
(d) ratio of infant girl to infant boy

64 If birth rate is 100, death rate is 10 and number of individuals in population group is 1000, then what will be the percentage of natural growth rate?
(a) 0.09% (b) 9.0%
(c) 0.9% (d) 90%

65 If the age distribution is plotted for a population, the resulting structure is called as
(a) age graph (b) age curve
(c) age pyramid (d) age diagram

66 Ecological age groups of populations are
I. Pre-reproductive
II. Reproductive
III. Post-reproductive
IV. Old-age group
V. Adolescent age group
VI. Infertile age group

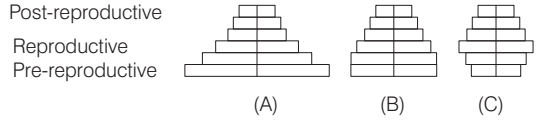
Choose the correct combination.
(a) I, II and III (b) III, IV and V
(c) IV, V and VI (d) I, V and VI

67 The age structure of a population represents
(a) relative number of individuals at each age
(b) number of newborns each year
(c) number of individuals reaching puberty each year
(d) relative number of deaths at each age

68 Age structure of a population influences population growth because
(a) different age groups have different reproductive capabilities
(b) different age groups have same reproductive capabilities
(c) more young individuals indicate decreasing population
(d) All of the above

69 Under normal conditions positive growth or rapid increase in the population is indicated by
(a) less number of young individuals
(b) large number of young individuals
(c) large number of old individuals
(d) large number of childbirth

70 The age pyramid with broad base indicates
(a) high percentage of young individuals
(b) low percentage of young individuals
(c) high percentage of old individuals
(d) All of the above

71 

Select the correct option with respect to age pyramids. ***AIIMS 2019***
(a) A–Expanding, B–Stable, C–Declining
(b) A–Stable, B–Expanding, C–Declining
(c) A–Stable, B–Declining, C–Expanding
(d) A–Declining, B–Stable, C–Expanding

72 In a growing population of a country, ***NEET 2018***
(a) reproductive and pre-reproductive individuals are equal in number
(b) reproductive individuals are less than the post-reproductive individuals
(c) pre-reproductive individuals are more than the reproductive individuals
(d) pre-reproductive individuals are less than the reproductive individuals

73 Bell-shaped age pyramid indicates that
(a) number of pre-reproductive and reproductive individual is almost equal
(b) post-reproductive individuals are comparatively fewer
(c) the population size remains stable
(d) All of the above

74 Zero growth of population is indicated by
(a) less number of childbirth
(b) less number of reproductive females
(c) reproductive individuals are equal to pre-reproductive individuals
(d) less number of males than females

75 When there is a large number of post-reproductive or older individuals and lesser number of pre-reproductive individuals then that population is
(a) growing (b) declining
(c) stable (d) None of these

76 Population size is more technically called
(a) population density (b) demography
(c) population growth (d) population dynamics

77 In some cases, population density is measured in terms of biomass rather than in terms of number because
(a) it is more meaningful measure when the considered organisms vary greatly in size
(b) it is more convenient when population is huge and counting is impossible or very time consuming
(c) it is relatively constant measure
(d) Both (a) and (b)

78 Which of the following is not an example of using relative density to measure population density in a certain area?
(a) Counting pugmarks of tigers to find population density of tigers in a forest
(b) Counting the number of fishes caught in a trap to find population density of fishes in a lake
(c) Measuring biomass of bacterial culture to find out population density of bacteria in a petri dish
(d) Both (a) and (c)

79 For which of the following cases, population density can be easily determined by utilising non-biological parameter?
(a) Fish density
(b) Density of bacteria in culture plate
(c) Siberian cranes in Bharatpur wetlands
(d) Tiger census

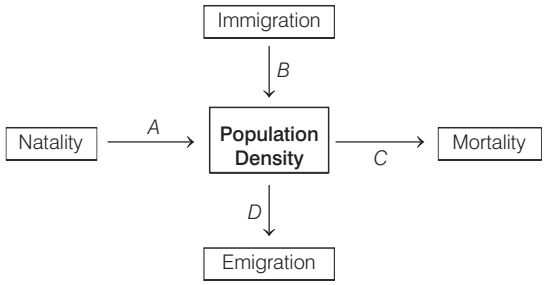
80 Population of any species is
(a) a static phenomena (b) a dynamic phenomena
(c) Neither (a) nor (b) (d) Both (a) and (b)

81 Population density of a population in a given habitat during a given period fluctuates due to the change in
(a) natality and mortality (b) immigration
(c) emigration (d) All of these

82 Natality refers to ***NEET 2018***
(a) number of individuals leaving the habitat
(b) birth rate
(c) death rate
(d) number of individuals entering a habitat

83 A biologist studied the population of rats in a barn. He found that the average natality was 250, average mortality 240, immigration 20 and emigration 30. The net increase in population is ***NEET 2013***
(a) 10 (b) 15
(c) 05 (d) zero

84 Study the figure and identify *A* to *D*.



(a) A–Increase, B–Decrease, C–Increase, D–Decrease
(b) A–Decrease, B–Increase, C–Decrease, D–Increase
(c) A–Increase, B–Increase, C–Decrease, D–Decrease
(d) A–Decrease, B–Decrease, C–Increase, D–Increase

85 $A \xrightarrow{\oplus}$ Population density $\xleftarrow{\ominus} B$.
If *A* increases population density and *B* decreases it then choose the correct option of *A* and *B*.
(a) A can be mortality which brings positive change in population density
(b) B can be emigration which brings negative change in population density
(c) values of A and B can never be equal
(d) Both (b) and (c)

86 If natality is represented by $-B$
If mortality is represented by $-D$
If immigration is represented by $-I$
If emigration is represented by $-E$
If population density is represented by $-N$
Then, population density at time t+1 is represented by
(a) $N_{t+1} = N_t - [(B + I) - (D + E)]$
(b) $N_{t+1} = N_t + [(B + I) - (D + E)]$
(c) $N_{t+1} = N_t + [(B + I) + (D + E)]$
(d) $N_{t+1} = N_t - [(B + I) + (D + E)]$

87 Under normal condition, ...*A*... and ...*B*... are the most important factors influencing population density, ...*C*... and ...*D*... assuming importance only under special condition.
Choose the correct option for *A*, *B*, *C* and *D*.
(a) A–mortality, B–natality, C–emigration, D–immigration
(b) A–immigration, B–natality, C–emigration, D–mortality
(c) A–emigration, B–natality, C–mortality, D–immigration
(d) A–emigration, B–immigration, C–mortality, D–natality

88 Ratio between natality and mortality is called
(a) population ratio (b) vital index
(c) density co-efficient (d) census ratio

89 Who stated that human population grows geometrically?
(a) Malthus (b) Darwin
(c) Cannon (d) Lamarck

90 Geometric representation of age structure is a characteristic of

(a) biotic community (b) population
(c) landscape (d) ecosystem

91 Exponential growth occurs when

(a) there is only sexual reproduction
(b) there is only asexual reproduction
(c) there is a fixed carrying capacity
(d) no inhibition from crowding

92 If b represents → Birth rate

If d represents → Death rate

If dN represents → Increase or Decrease in population size

Then, exponential growth is represented by

(a) $dN/dt = (b + d) \times N$
(b) $dN/dt = (b - d) \times N$
(c) $dN/dt = (d - b) \times N$
(d) $dN/dt = (d - b)^N$

93 In the exponential growth equation, if $b - d$ is represented by r, then 'r' may be called as

(a) intrinsic rate of natural increase
(b) extrinsic rate of natural increase
(c) morphological rate of natural increase
(d) phenotypical rate of natural increase

94 Population A–has the intrinsic rate of natural increase is 0.2.

Population B–has the intrinsic rate of natural increase is 0.3.

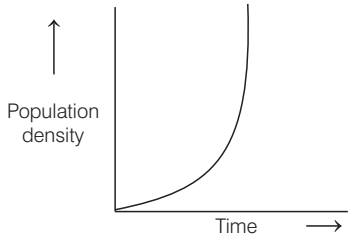
Population C–has the intrinsic rate of natural increase is 0.4.

Population D–has the intrinsic rate of natural increase is 0.5.

Which population will increase fastest among all of the given population?

(a) D (b) C
(c) B (d) A

95 Below diagram indicates



(a) exponential growth curve
(b) logistic growth pattern
(c) J-shaped curve
(d) Both (a) and (c)

96 No population of any species in nature has at its disposal …A… resources to permit exponential growth. This leads to competition between individuals for …B… resources. Eventually, the …C… individual will survive and reproduce.

Choose the correct option for A, B and C.

(a) A–limited, B–limited, C–fittest
(b) A–limited, B–unlimited, C–fittest
(c) A–unlimited, B–limited, C–fittest
(d) A–unlimited, B–unlimited, C–fittest

97 Carrying capacity is the capacity of

(a) habitat that has resources to sustain certain number of individuals
(b) population to reproduce and competitiveness
(c) population to reproduce
(d) individuals to fit among the natural environment

98 Logistic growth is represented by which equation?

(a) $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$ (b) $\frac{dN}{dt} = rN\left(\frac{K-N}{N}\right)$
(c) $\frac{dN}{dt} = rN\left(\frac{K+N}{K}\right)$ (d) $\frac{dN}{dt} = rN\left(\frac{K}{K+N}\right)$

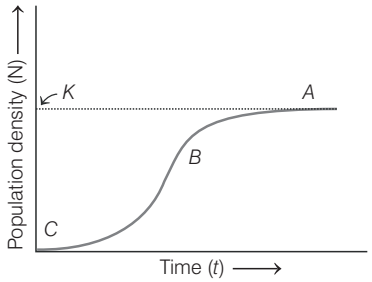
99 Logistic growth occurs when there is

(a) no resistance from increasing population
(b) unlimited food
(c) fixed carrying capacity
(d) All of the above

100 Which of the following is true regarding exponential growth?

(a) No population can grow exponentially for long
(b) Exponential growth slows down as the population nears its log phase
(c) Bacterial colonies have been observed to maintain exponential growth always
(d) Exponential growth is a commonly observed in large, slow-growing species such as humans and elephants

101 Given population growth curve represents the logistic growth curve. In this curve, find out what do A, B and C indicate.



(a) A–Lag phase, B–Log phase, C–Stationary phase
(b) A–Log phase, B–Lag phase, C–Stationary phase
(c) A–Stationary phase, B–Log phase, C–Lag phase
(d) A–Stationary phase, B–Lag phase, C–Log phase

102 If $b = 65$ and d is $= 45$, $N = 100$ then find out dN/dt

(a) 2000 (b) 1000
(c) 200 (d) 100

103 When does the growth rate of a population following the logistic model equal zero? The logistic model is given as $dN/dt = rN(1\text{-}N/K)$ ***NEET 2016***

(a) when N nears the carrying capacity of the habitat
(b) when N/K equals zero
(c) when death rate is greater than birth rate
(d) when N/K is exactly one

104 Which model is considered a more realistic one?

(a) Logistic model
(b) Exponential model
(c) Geometric model
(d) J-shaped model

105 Asymptote in a logistic growth curve is obtained, when ***NEET 2017***

(a) The value of 'r' approaches zero
(b) $K = N$
(c) $K > N$
(d) $K < N$

106 Populations evolve to maximise their reproductive fitness are also called

(a) Mendel's fitness
(b) Darwinian fitness
(c) Lamarck's fitness
(d) Individual fitness

107 Life history traits of organisms have evolved in relation to the constraints imposed by which components of habitat?

(a) Organic components
(b) Abiotic components
(c) Biotic components
(d) Both (b) and (c)

108 Choose the incorrect match for life history variations in various organisms.

(a) Breeds only once in their life – Pacific salmon fish, bamboo
(b) Breeds many times during lifetime – Most birds, mammals
(c) Produces large number of small-sized offspring – Birds
(d) Produces large number of large-sized offspring – Mammals

TOPIC 3 ~ *Population Interactions*

109 Even a plant species, which makes its own food, cannot survive alone, it needs soil microbes to breakdown the …*A*… matter in soil and return the …*B*… nutrients for absorption. And then, how will the plant manage pollination without an animal agent? It is obvious that in nature, animals, plants and microbes cannot live in …*C*… but interact in various ways to form a biological community.

Choose the correct option for *A*, *B* and *C*.

(a) A–inorganic, B–organic, C–isolation
(b) A–organic, B–inorganic, C–isolation
(c) A–organic, B–inorganic, C–community
(d) A–inorganic, B–organic, C–community

110 Interspecific interactions arise from the interaction of

(a) population of two different species
(b) population of same species
(c) two individuals of same species
(d) two individuals of different area

111 Interspecific interaction could be

(a) beneficial (b) detrimental
(c) neutral (d) All of these

112 If '+' sign is assigned to beneficial interaction, '–' sign to detrimental and '0' sign to neutral interaction, then the population interaction represented by '+' '–' refers to ***NEET 2016***

(a) mutualism (b) amensalism
(c) commensalism (d) parasitism

113 Population interactions

Organisms A	Organisms B	Names of interaction
+	+	Mutualism
–	–	*A*
+	–	Predation
+	–	*B*
+	0	Commensalism
–	0	*C*

'+' sign for beneficial interaction.
'–' sign for harmful (detrimental) interaction.
'0' sign for neutral interaction.
Find out what could be *A, B* and *C*.

(a) A–Amensalism, B–Parasitism, C–Competition
(b) A–Competition, B–Parasitism, C–Amensalism
(c) A–Competition, B–Amensalism, C–Parasitism
(d) A–Amensalism, B–Competition, C–Competition

114 The population interaction in which free-living organism that catches, kills and devours individuals of other species called prey is called

(a) parasitism (b) predation
(c) amensalism (d) commensalism

115 Predation is

(a) an unnatural way of transferring of energy to higher trophic level
(b) a natural way of transferring of energy to higher trophic level
(c) harmful to the natural balance
(d) All of the above

116 Animals eating plants are categorised separately as …*A*…, they are in a broad ecological context, not very different from …*B*… .

Choose the correct option *A* and *B*.

(a) A–herbivores; B–predator
(b) A–herbivores; B–omnivores
(c) A–omnivores; B–herbivores
(d) A–omnivores; B–predator

117 Exotic species are also called

I. introduced species
II. alien species
III. non-indigenous species
IV. non-native species

Choose the correct combination.

(a) I, II and III (b) II, III and IV
(c) I, III and IV (d) I, II, III and IV

118 Exotic species sometimes become invasive and starts spreading fast because of

(a) natural predators
(b) abundant natural competitor
(c) invaded land not having its natural predators
(d) mutation in their genome

119 The prickly pear cactus becomes unusually abundant after its introduction in Australia because it

(a) does not have its predator
(b) formed new mycorrhizal association
(c) lost its thorns
(d) All of the above

120 Prickly pear cactus (an exotic species) can be brought under control (in Australia) by using

(a) babul eating predators (b) kikar eating predators
(c) cactus feeding predators (d) intensive herbicides

121 Predators also help in …*A*… species diversity in a community, by …*B*… the intensity of competition among competing prey species. Here, *A* and *B* can be

(a) A–exceeding; B–increasing
(b) A–maintaining; B–reducing
(c) A–reducing; B–maintaining
(d) A–maintaining; B–increasing

122 Starfish pisaster is the important predator in intertidal communities of

(a) American pacific coast (b) Indian pacific coast
(c) Middle pacific coast (d) East Indian lakes

123 'Cryptically-coloured' (camouflaged) is a technique through which prey can

(a) feed abundantly
(b) lessen the impact of predator
(c) increase their number
(d) increase their reproductive fitness

124 Monarch butterflies are highly distasteful to predator due to

(a) its ugly look
(b) a special chemical present in his body
(c) Both (a) and (b)
(d) a poison secreted by their special glands

125 You never see any cattle or goat browsing on *Calotropis* due to

(a) its appearance
(b) production of foul odour
(c) production of cardiac glycosides
(d) distastefulness of its leaves

126 Which of the following is not an example of a defence used by plants against herbivores?

(a) Production of caffeine, tannins and quinine
(b) More production of non-woody tissues
(c) Production of hairs, thorns, spines
(d) Production of hormone-like chemicals that interfere with insect metamorphosis

127 Which of the following is not an example of prey-predator relationship?

(a) Tiger eating deer
(b) Plant *Nepenthes* trapping an insect
(c) Bacteria decomposing organic matter
(d) Crocodile killing a man

128 In which of the following interactions both partners are adversely affected? ***CBSE-AIPMT 2015***

(a) Competition (b) Predation
(c) Parasitism (d) Mutualism

129 On the rocky sea coasts of Scotland, the larger and competitively superior barnacle *Balanus* dominates the intertidal areas and excludes the smaller barnacle *Chathamalus* from that zone.
Which kind of interaction is being depicted by this example?

(a) Predator (b) Parasitism
(c) Commensalism (d) Competition

130 Level of competition between species depends on

(a) availability of resources
(b) population density
(c) group interaction of organism
(d) All of the above

131 When Darwin spoke of the struggle for the existence and survival of the fittest in the nature, he was convinced that

(a) intraspecific competition is a potent force in organic evolution
(b) interspecific competition is a potent force in organic evolution
(c) intensive reproduction is the potent force in organic evolution
(d) intensive predation is the potent force in organic evolution

132 Competition is best defined as a process in which the fitness of one species (measured in terms of its '*r*' the intrinsic rate of increase) is significantly
(a) lower in the presence of another superior species
(b) higher in the presence of another superior species
(c) equal in the presence of another superior species
(d) equal in the presence of their own species

133 A species whose distribution is restricted to a small geographical area because of the presence of a competitively superior species is found to expand its distributional range dramatically when the competing species is experimentally removed. This is called as
(a) competitive exclusion (b) competitive release
(c) predation (d) mutualism

134 The principle of competitive exclusion was stated by
(a) C Darwin (b) GF Gause ***NEET 2016***
(c) MacArthur (d) Verhulst and Pearl

135 Gause's principle of competitive exclusion states that ***NEET 2016***
(a) competition for the same resources excludes species having different food preferences
(b) no two species can occupy the same niche indefinitely for the same limiting resources
(c) larger organisms exclude smaller ones through competition
(d) more abundant species will exclude the less abundant species through competition

136 Species facing competition might evolve mechanism that promotes coexistence rather than exclusion. One such mechanism is
(a) competitive release
(b) resource partitioning
(c) coevolution
(d) None of the above

137 Read the following reasons for the adaptation in parasites.
I. loss of unnecessary organs.
II. presence of adhesive organs.
III. origin of suckers to cling to host.
IV. loss of digestive system.
V. high reproductive capacity.
Choose the correct option.
(a) I, III and IV (b) II, IV and V
(c) I, IV and V (d) I, II, III, IV and V

138 Parasite that feed on the external surface of the host organism is called
(a) endoparasite (b) ectoparasite
(c) brood parasite (d) None of these

139 ....*A*... parasite have simple life cycle and ....*B*.... parasite have complex life cycle.
(a) A–Ecto, B–endo (b) A–Endo, B–brood
(c) A–Brood, B–endo (d) A–Brood, B–ecto

140 An interaction in which one organism is benefitted and other is unaffected ***JIPMER 2019***
(a) predation (b) commensalism
(c) mutualism (d) parasitism

141 Between which among the following, the relationship is not an example of commensalism? ***NEET (Odisha) 2019***
(a) Orchid and the tree on which it grows
(b) Cattle egret and grazing cattle
(c) Sea anemone and clown fish
(d) Female wasp and fig species

142 Which of the following is correct for *r*-selected species? ***NEET 2016***
(a) Large number of progeny with small size
(b) Large number of progeny with large size
(c) Small number of progeny with small size
(d) Small number of progeny with large size

143 Lichen is an example of
(a) parasitism (b) predation
(c) commensailism (d) mutualism

144 Lichens represent an intimate mutualistic relationship between
(a) fungus and bacteria
(b) fungus and photosynthetic algae
(c) fungus and archaebacteria
(d) fungus and plants

145 Mycorrhiza represents an intimate mutualistic relationship between
(a) fungi and stem of higher plants
(b) fungi and roots of higher plants
(c) fungi and leaves of higher plants
(d) fungi and leaflets of higher plants

146 Which one of the following plants shows a very close relationship with a species of moth, where none of the two can complete its life cycle without the other? ***NEET 2018***
(a) Banana (b) *Yucca* (c) *Hydrilla* (d) *Viola*

147 Pseudocopulation occurs in
(a) maize (b) *Ophrys* (c) mango (d) papaya

148 The plant-animal interaction often involve coevolution of the mutualists, so that
(a) the mutually beneficial system could be safeguarded against cheaters
(b) a given plant species can be pollinated only by its partner animal species and no other species
(c) the animal utilises plant not only for oviposition but also to pollinate the plant
(d) All of the above

149 The interdependent evolution of the flowering plants and pollinating insects together is known as
(a) mutualism (b) coevolution
(c) commensalism (d) cooperation

150 In …… one species is harmed whereas the other is unaffected.
(a) predation
(b) amensalism
(c) commensalism
(d) parasitism

151 Which one of the following population interactions is widely used in medical science for the production of antibiotics?
(a) Parasitism (b) Mutualism
(c) Commensalism (d) Amensalism

NEET

SPECIAL TYPES QUESTIONS

I. Assertion and Reason

■ **Direction** (Q. No. 152-161) *In each of the following questions, a statement of Assertion (A) is given followed by corresponding statement of Reason (R). Of the statements, mark the correct answer as*

(a) If both A and R are true and R is the correct explanation of A
(b) If both A and R are true, but R is not the correct explanation of A
(c) If A is true, but R is false
(d) If A is false, but R is true

152 **Assertion** (A) Species are groups of potentially interbreeding natural populations that are isolated from other such groups.
Reason (R) Reproductive isolation brings about distinctive morphological characters.

153 **Assertion** (A) Ecological equivalents possess similar types of adaptations.
Reason (R) Ecological niche is the total interaction of a species with environment.

154 **Assertion** (A) Biotic community has higher position than the population in ecological hierarchy.
Reason (R) Population of similar individuals remain isolated in the community.

155 **Assertion** (A) Predation is an interspecific interaction with a feeding strategy.
Reason (R) Predators and their prey maintain fairly stable population through time and rarely one population become abundant or scarce.

156 **Assertion** (A) The prickly pear cactus introduced into Australia in early 1920s caused havoc by spreading rapidly into millions of hectares of rangeland.
Reason (R) When certain exotic species are introduced into a geographical area, they become invasive and start spreading first because the invaded land does not have its natural predators.

157 **Assertion** (A) In commensalism, one organism is benefitted and other is unaffected.
Reason (R) Cattle egret bird and cattle is an example of commensalism. ***AIIMS 2019***

158 **Assertion** (A) Plants need the help of insects and animals for pollinating their flowers and dispersing their seeds.
Reason (R) Plants offer rewards in the form of pollen and nectar for pollinators and juicy and nutritious fruits for seed dispersers.

159 **Assertion** (A) Living organisms are considered closed systems.
Reason (R) Living organisms exchange energy and materials with the environment.

160 **Assertion** (A) In tropical rainforests, O-horizon and A-horizon of soil profile are shallow an nutrient poor.
Reason (R) Excessive growth of microorganisms in the soil deplete its organic content.

161 **Assertion** (A) A mangrove tree growing in marshy place does not have pneumatophores.
Reason (R) Pneumatophores help in taking in air from atmosphere deficient saline soil.

II. Statement Based Questions

162 Read the following statements.
I. The levels of thermal tolerance of different species determinate a large extent their geographical distribution.
II. Life on earth originated in water and is unsustainable without water.
III. The salt concentrations (measused or salinity in parts pre thousand) is less than 5 in inland waters, 30-35 in the sea and > 100 in some hypersaline lagoons.
IV. Many animals use the diurnal and seasonal variations in light intensity and duration as cues for timing their foraging, reproductive and migratory activities.

Which of the given above statements are correct?

(a) I, II and III (b) II, III and IV
(c) I, III and IV (d) I, II, III and IV

163 Consider the following statements about regulation in humans.

I. In summer, we sweat profusely causing evaporative cooling brings down the body temperature.
II. In winters, we shiver which is an exercise that produces heat and raises the body temperature.

Choose the correct option.

(a) Statement I is true, but II is false
(b) Statement II is true, but I is false
(c) Both statements are true
(d) Both statements are false

164 Read the following statements and choose the correct statement.

(a) Species ability to adapt is over a limited range of environment
(b) If stressful external conditions are localised or remain only for a short duration the organism regulate for survival
(c) Migration is moving away permanently from the stressful habitat to more hospitable area and return when stressful period is over
(d) All of the above

165 I. Desert lizard bask in the sun and absorbs heat when their body temperature drops below the comfort zone, but move into shade when the ambient temperature starts increasing.
II. Some species like rabbits and ground hog are capable of burrowing into the soil to hide and escape from the above ground heat.

Above statements are the examples of

(a) cursorial adaptation (b) behavioural adaptation
(c) fossorial adaptation (d) scansorial adaptation

166 I. Many xerophytic plants have thick cuticle on leaf epidermis and sunken stomata.
II. Some xerophytic plants have special photosynthetic pathway (CAM) that enables their stomata close during day.
III. *Opuntia* has spines (modified leaves), photosynthetic phylloclade (stem).
IV. Adaptations are genetically fixed in organisms.

Choose the correct statements.

(a) I, II, III and IV (b) II, III and IV
(c) III, IV, and I (d) I, II and III

167 Consider the following statements.

I. The number of individuals of the same species that have come into the habitat from elsewhere during the time period under consideration is called emigration.
II. The number of individuals of the population who left the habitat and gone elsewhere during the time period under consideration is called immigration.

Choose the correct option.

(a) Statement I is true and II is false
(b) Statement I is false and II is true
(c) Both the statements are true
(d) Both the statements are false

168 Read the following statements.

I. Any species growing exponentially under unlimited resource condition can reach enormous population densities in short time.
II. Darwin showed how even a slow growing animal like element could reach enormous numbers in the absence of check.
III. If there are non-limiting or unlimited conditions are provided then natality and mortality decrease within a population.

Choose the correct option.

(a) Statements I and II are correct
(b) Statements I and III are correct
(c) Statements II and III are incorrect
(d) All statements are incorrect

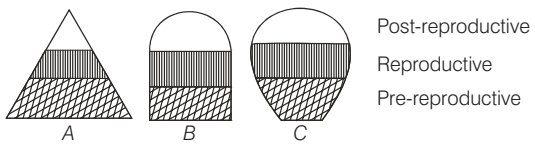
169 Read the following statements.

I. In a population, birth rate and death rate refer to per capita births and deaths, respectively.
II. In nature, we rarely find isolated single individuals of any species.
III. The size of population for any species is stable phenomena.
IV. Ecological effects of any factors on a population growth are generally reflected in its size/population density.

Choose the correct statements.

(a) I and II (b) II and III
(c) I, II and III (d) I, II and IV

170 Read the following statements and choose the correct one.



(a) A is a triangular age pyramid, where pre-reproductive stage is very large as compared to the reproductive and post-reproductive stages of the population. This type of age structure indicates that the population would increase rapidly
(b) B is an inverted bell-shaped age pyramid where number of pre-reproductive and reproductive individuals is almost equal. This type of age structure indicates that the population is stable
(c) C is an urn-shaped age pyramid where more number of reproductive individuals are present. This type of age structure indicates that the population is declining
(d) All of the above

171 For a situation when food and space for a population are unlimited, which of the following statements given below represent incorrect features?

I. Each species has the ability to realise fully its inherited potential to grow.
II. Then, it is equal to $dN/dt = rN$.
III. It is described by J-shaped curve.
IV. It is described by S-shaped curve.
V. That it has greater intrinsic rate for resources.
VI. There are more competition among themself.

(a) I, II and III (b) II, III and IV
(c) IV and VI (d) IV, V and VI

172 Which one is the correct statement for logistic model of population growth?

I. Population growth rate increases as the size of population approaches the carrying capacity.
II. All individuals have same effect on population growth.
III. There are unlimited natural resources.
IV. As population increases the competition goes on increasing.

(a) I and II (b) Only IV
(c) IV and III (d) I and III

173 In an area, there are 200 *Parthenium* and a single banyan tree. For the information given above which of the following conclusive statement(s) is/are correct?

I. Population density of banyan is high.
II. Population cover area of banyan is high.
III. In above case, the percentage of cover area or biomass is more meaningful than population size.

(a) Only I (b) I and II
(c) II and III (d) I, II and III

174 I. Populations evolve to maximise their reproductive fitness, also called Darwinian fitness (higher r value), in the habitat in which they live.
II. The population growth rate r is inversely related to generation time.
III. The housefly, which has a short lifespan and produces a large number of eggs, could be considered as a 'K' selected species.
IV. Under a particular set of selection pressures, organisms evolve towards the most efficient reproductive strategies.
V. Life history traits of organisms have evolved in relation to the constraints imposed by biotic and abiotic factors in their habitat.

Select the correct option from the statements given above.

(a) I, II and III (b) I, III and IV
(c) III, IV and V (d) All except III

175 Consider the following statements.

I. Brood parasitism in birds is an example of parasitism in which the parasitic bird lays its eggs in the nest of its host and host incubates them.
II. During the course of evolution, the eggs of the parasite bird have evolved to resemble the host's eggs in size and colour to reduce the chances of the host bird detecting the foreign eggs and removing them from the nest.

(a) Statement I is true, but II is false
(b) Statement I is false, but II is true
(c) Both statements are true
(d) Both statements are false

176 Read the following statements.

I. Parasite that feed on the external surface of the host organism.
II. Lice on humans and ticks on dogs.
III. Marine fish infested with copepods.
IV. *Cuscuta* growing on hedge plant.
V. Parasite that lives inside the host body at different sites to derive benefit.
VI. Liver fluke living inside the animal body.

Choose the correct option.

	Endoparasite	Ectoparasite
(a)	I, II, III	IV, V, VI
(b)	V, VI	I, II, III, IV
(c)	I, II, VI	III, IV, V
(d)	III, IV, V	I, II, VI

177 Read the following statements about 'recent studies supporting competition' as suggested in 'Gause's competitive exclusion principle'.

I. Gause's hypothesis says if two species compete for same resources then one will be eliminated by another species.
II. More recent studies point out that species facing competition might evolve mechanisms that promote coexistence rather than exclusion.
III. Gause's competitive exclusion principle is effective when resources are in excess.
IV. Unlimited resources give better opportunity for adaptation.

Choose the correct combination of statements.

(a) I and II (b) I, II and IV
(c) III and IV (d) I and IV

178 I. The human liverfluke, a nematode parasite, depends on two intermediate hosts (snail and fish) to complete its life cycle.
II. The malaria parasite needs a vector (mosquito) to spread to other hosts.
III. The female mosquito is not considered parasite, however it needs our blood for reproduction.

IV. In case of brood parasitism, the eggs of parasitic birds (e.g. cuckoo) are not detected and ejected from the nest because of parasite's eggs resemble the hosts eggs in morphology and colour.

V. A population of frogs protected from all predators would increase indefinitely with unlimited food resources.

Which statements are correct?

(a) I and II (b) II and III
(c) III, IV and V (d) I, II, III and IV

179 Which of the following statements are incorrect?

(a) Host is an organism which provides food and shelter to another organism
(b) Amensalism is a relationship in which one species is benefitted, whereas the other is unaffected
(c) Predator is an organism that catches and kills other organism for food
(d) Parasite is an organism which always lives inside or on the body of other organism and may kill it

180 Which of the following statements regarding species interdependence are true?

(a) An association of two species where one is benefitted and other remains unaffected is called mutualism
(b) An interspecific association where both partners derive benefit from each other is called commensalism
(c) A direct food relation between two species of animals in which one animal kills and feeds on another is referred as parasitism
(d) A relationship between two organisms of different species where both the organisms are benefitted from each other is called symbiosis

181 Choose the incorrect statement.

(a) Mutualistic relationships evolve when benefit of both species out weights the costs
(b) Mutualistic relationship evolves when benefits of both species under weight the costs
(c) Humans cause ecological imbalance by eradicating common parasites
(d) Humans cause altering competition between species

182 Choose the incorrect statement.

(a) Parasite might render the host more vulnerable to predation by making it physically weak
(b) Majority of the parasites harm the host and reduce the population density
(c) Ideal parasite should be able to thrive within host without harming it
(d) Malarial parasite does not need a vector (mosquito) to spread to other host

183 Choose the incorrect statement.

(a) Two closely related species may not live in same habitat
(b) The more dissimilar the niches of two species the stronger is their competition
(c) Two species cannot occupy the same niche in geographical area
(d) Two species may occupy the same ecosystem

184 Which one of the following is incorrect?

(a) Eutrophic lakes are rich in nutrient and has high biological productivity
(b) Animals do not respond to photoperiods, but plants do so
(c) Oligotrophic lakes are poor in nutrients, clear and with low biological productivity
(d) Mesotrophic lakes have properties in between eutrophic and oligotrophic lakes

185 Which of the following is correct?

(a) Antarctic fishes can survive below O°C as these have antifreeze solutes in their body
(b) Archaebacteria can flourish in hot springs and deep sea hydrothermal vents where temperature is above 100°C
(c) Desert lizard lacks the physiological ability to cope with extreme temperature, but manage the body temperature by behavioural means
(d) All of the above

186 Which of the following is correct?

(a) Parasites do not tend to coevolve with the host
(b) 'Brood parasitism' is absent in cuckoo
(c) In general, herbivores and plants appear to be more adversely affected by competition than carnivores
(d) The life cycle of parasites is often very simple involving one intermediate host or vector

187 Choose the correct statement.

(a) Among the red, green and brown algae, the red algae are found in the deepest ocean
(b) Animals restricted to a narrow range of salinity are euryhaline
(c) Every winter, the famous Keoladeo National Park (Odisha) hosts thousands of migratory birds
(d) The mammals of colder climates generally have longer extremities to minimise heat loss

188 Which of the following is correct?

(a) Logistic growth model is more realistic than exponential growth model
(b) *r*-selected species have low fecundity, large body size and late maturity
(c) K-selected species have high fecundity, small body size and early maturity
(d) Altruistic behaviour is common in dogs

III. Matching Type Questions

189 Match the following columns.

	Column I (Plants)		Column II (Habitats)
A.	Hydrophytes	1.	Dry habitat
B.	Mesophytes	2.	Wet habitat
C.	Xerophytes	3.	Moist habitat

Codes

	A	B	C		A	B	C
(a)	2	3	1	(b)	1	2	3
(c)	3	2	1	(d)	2	1	3

190 Match the following columns.

	Column I (Animals)		Column II (Habits)
A.	Diurnal	1.	Active during dusk
B.	Nocturnal	2.	Active at dawn
C.	Arboral	3.	Active during night
D.	Vespersal	4.	Active during day time

Codes

	A	B	C	D		A	B	C	D
(a)	4	3	2	1	(b)	4	3	1	2
(c)	4	2	1	3	(d)	1	2	3	4

191 Match the following columns.

	Column I (Adaptations)		Column II (Animals)
A.	Hibernation	1.	Monarch butterfly
B.	Aestivation	2.	Leaf-like grasshopper
C.	Cryptic appearance	3.	Northern ground squirrel
D.	Mimicry	4.	Ground squirrel

Codes

	A	B	C	D
(a)	4	3	2	1
(b)	3	4	1	2
(c)	4	3	1	2
(d)	3	4	2	1

192 Match the following columns.

	Column I (Animals)		Column II (Adaptations)
A.	Pink cotton bollworm	1.	Diapause
B.	Zooplankton	2.	Hibernation
C.	Snail	3.	Aestivation
D.	Polar bears		

Codes

	A	B	C	D		A	B	C	D
(a)	1	3	1	2	(b)	1	1	3	2
(c)	3	2	1	1	(d)	2	3	1	2

193 Match the following columns.

	Column I (Attributes of population growth)		Column II (Features)
A.	Mortality	1.	Individuals of same species going out from population.
B.	Immigration	2.	Individuals of same species coming in population.
C.	Emigration	3.	Numbers of deaths in population during given period.

Codes

	A	B	C		A	B	C
(a)	1	3	2	(b)	2	3	1
(c)	3	2	1	(d)	2	1	3

194 Match the following columns.

	Column I (Population growth models)		Column II (Features)
A.	Logistic growth	1.	Sigmoid growth
B.	Exponential growth	2.	Verhulst-Pearl logistic growth
		3.	Geometric growth
		4.	J-shaped growth

Codes

	A	B		A	B
(a)	3, 4	1, 2	(b)	1, 2	3, 4
(c)	1, 3, 4	2	(d)	1,	2, 3, 4

195 Match the following columns.

	Column I (Population interaction)		Column II (Examples)
A.	Mutualism	1.	Ticks on dogs
B.	Commensalism	2.	*Balanus* and *Chthamalus*
C.	Parasitism	3.	Sparrow and any seed
D.	Competition	4.	Epiphyte on a mango branch
E.	Predation	5.	Orchid, *Ophrys* and bee

Codes

	A	B	C	D	E
(a)	1	5	4	3	2
(b)	2	1	5	4	3
(c)	3	2	1	5	4
(d)	5	4	1	2	3

196 Match the following columns.

	Column I (Parasitism)		Column II (Examples)
A.	Ectoparasite	1.	Cuckoo
B.	Endoparasite	2.	Lice
C.	Brood parasite	3.	*Ascaris*

Codes

	A	B	C		A	B	C
(a)	3	1	2	(b)	2	1	3
(c)	3	2	1	(d)	2	3	1

197 Match the following columns.

	Column I		Column II
A.	Epiphytes	1.	Cattle egret
B.	Grazing cattle	2.	*Orchid* on mango tree
C.	Sea anemone	3.	Clown fish

Codes

	A	B	C
(a)	1	2	3
(b)	1	3	2
(c)	2	1	3
(d)	2	3	1

198 Match the following columns.

	Column I (Examples)		Column II (Types of parasites)
A.	*Rafflesia*	1.	Endoparasite
B.	Rat flea	2.	Ectoparasite
C.	Lice	3.	Hyperparasite
D.	*Taenia*	4.	Phytoparasite

Codes

	A	B	C	D
(a)	4	3	2	1
(b)	4	2	3	1
(c)	4	1	2	3
(d)	1	2	3	4

NCERT & NCERT Exemplar

MULTIPLE CHOICE QUESTIONS

NCERT

199 Hibernation is shown by
(a) frog
(b) rabbit
(c) earthworm
(d) None of the above

200 The cause of death of marine fish kept in freshwater aquarium is
(a) marine fish does not live in freshwater
(b) endosmosis will occur and it will swell
(c) Both (a) and (b)
(d) None of the above

201 The attributes of population but not of the individual are
(a) birth rate (b) death rate
(c) sex ratio (d) All of these

202 Select the statement which explains best parasitism.
(a) One organism is benefitted
(b) Both the organisms are benefitted
(c) One organism is benefitted, other is not affected
(d) One organism is benefitted, other is harmed

NCERT Exemplar

203 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

204 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

205 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

206 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

207 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

208 Salt concentration (salinity) of the sea measured in parts per thousand is
(a) 10-15 (b) 30-70
(c) 0-5 (d) 30-35

209 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

210 Which of the following forest plants controls the light conditions at the ground?
(a) Lianas and climbers (b) Shrubs
(c) Tall trees (d) Herbs

211 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 microclimate
(d) It grows very well because the plant gets more sunlight

212 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

213 What would be the per cent growth or birth rate per individual per hour for the same population mentioned in the previous question?
(a) 100 (b) 200 (c) 50 (d) 150

214 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

215 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

216 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

217 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

218 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

219 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

220 Lichens are the associations of
(a) bacteria and fungus
(b) algae and bacterium
(c) fungus and algae
(d) fungus and virus

221 Which of the following is a partial root parasite?
(a) Sandal wood
(b) Mistletoe
(c) *Orobanche*
(d) *Ganoderma*

222 Which one of the following organisms reproduces sexually only once in its lifetime?
(a) Banana plant
(b) Mango
(c) Tomato
(d) *Eucalyptus*

Answers

Mastering NCERT with MCQs

1 (a) 2 (c) 3 (c) 4 (a) 5 (b) 6 (a) 7 (d) 8 (c) 9 (b) 10 (c) 11 (c) 12 (a) 13 (c) 14 (b) 15 (c)
16 (d) 17 (b) 18 (b) 19 (a) 20 (b) 21 (c) 22 (b) 23 (b) 24 (b) 25 (d) 26 (d) 27 (d) 28 (b) 29 (b) 30 (a)
31 (c) 32 (b) 33 (c) 34 (a) 35 (d) 36 (b) 37 (d) 38 (c) 39 (c) 40 (b) 41 (a) 42 (c) 43 (a) 44 (c) 45 (b)
46 (c) 47 (b) 48 (a) 49 (d) 50 (b) 51 (a) 52 (b) 53 (d) 54 (a) 55 (d) 56 (a) 57 (d) 58 (b) 59 (b) 60 (a)
61 (c) 62 (d) 63 (b) 64 (b) 65 (c) 66 (a) 67 (a) 68 (a) 69 (b) 70 (a) 71 (a) 72 (c) 73 (d) 74 (c) 75 (b)
76 (a) 77 (d) 78 (d) 79 (d) 80 (b) 81 (d) 82 (b) 83 (d) 84 (c) 85 (d) 86 (b) 87 (a) 88 (b) 89 (a) 90 (b)
91 (d) 92 (b) 93 (a) 94 (a) 95 (d) 96 (c) 97 (a) 98 (a) 99 (c) 100 (a) 101 (c) 102 (a) 103 (d) 104 (a) 105 (b)
106 (b) 107 (d) 108 (c) 109 (b) 110 (a) 111 (d) 112 (d) 113 (b) 114 (b) 115 (b) 116 (a) 117 (d) 118 (c) 119 (a) 120 (c)
121 (b) 122 (a) 123 (b) 124 (b) 125 (c) 126 (b) 127 (c) 128 (a) 129 (d) 130 (d) 131 (b) 132 (a) 133 (a) 134 (b) 135 (b)
136 (b) 137 (d) 138 (b) 139 (a) 140 (b) 141 (d) 142 (a) 143 (d) 144 (b) 145 (b) 146 (b) 147 (b) 148 (d) 149 (b) 150 (b)
151 (d)

NEET Special Types Questions

152 (c) 153 (b) 154 (c) 155 (a) 156 (a) 157 (b) 158 (b) 159 (d) 160 (c) 161 (d) 162 (d) 163 (c) 164 (b) 165 (b) 166 (a)
167 (d) 168 (a) 169 (d) 170 (d) 171 (c) 172 (b) 173 (c) 174 (d) 175 (c) 176 (b) 177 (a) 178 (d) 179 (b) 180 (d) 181 (b)
182 (d) 183 (b) 184 (b) 185 (d) 186 (c) 187 (a) 188 (a) 189 (a) 190 (a) 191 (d) 192 (b) 193 (c) 194 (b) 195 (d) 196 (d)
197 (c) 198 (a)

NCERT & NCERT Exemplar Questions

199 (a) 200 (b) 201 (d) 202 (d) 203 (b) 204 (c) 205 (d) 206 (c) 207 (d) 208 (d) 209 (a) 210 (c) 211 (c) 212 (d) 213 (b)
214 (c) 215 (b) 216 (c) 217 (c) 218 (b) 219 (b) 220 (c) 221 (a) 222 (a)

Answers & Explanations

3 (*c*) Option (c) represents the group of basic levels of ecology. Ecology is mainly concerned with four levels of biological organisation, which are

- organisms (basic living unit)
- populations (individuals of a species)
- communities (different sets of population)
- biomes (several biological communities with their associated vegetation or flora).

4 (*a*) Among the given options, biome is the highest level of biological hierarchy. It is a large regional unit delimited by a specific climatic zone having a particular major vegetation zone associated with fauna, e.g. ocean, tropical rainforest.

6 (*a*) Ecology at the organism level is essentially called physiological ecology, which tries to understand how different organisms are adapted to their environments in terms of both survival and reproduction.

8 (*c*) Rotation of our planet around the sun and tilt of its axis cause annual variations in the intensity and duration of temperature, resulting in distinct seasons. These variations along with annual variation in precipitation lead to the formation of major biomes like deserts, rainforests and tundra.

9 (*b*) In the given graph, coniferous forest, Arctic and Alpine tundra and tropical forest are indicated by the parts labelled as V, VI and III, respectively.

Coniferous forests have a mean annual temperature of 6ºC-15ºC and mean annual rainfall of 50-170 cm.

- Arctic and Alpine tundra regions have a mean annual temperature of -10ºC to 10ºC and mean annual rainfall of about 20-30 cm.
- Tropical rainforests have a mean annual temperature of 22ºC-32ºC and mean annual rainfall of 90-350 cm.

11 (*c*) Both biotic and abiotic components of an environment characterise the habitat of an organism. The most important abiotic components which influence the habitat of organisms are temperature, water, light and soil. Also, biotic components like pathogens, parasites, predators and competitors of the organisms of an ecosystem interact and influence their habitat.

12 (*a*) Forest floors, tree canopies and edges of a pond are examples of microhabitat. A microhabitat can be defined as a small part of the habitat with its own characteristic environment features (i.e. a smaller habitat within a habitat).

15 (*c*) Temperature is the degree of hotness or coldness, which is the most relevant environmental factor. It varies seasonally and ranges from subzero levels in polar areas and high altitudes to more than 50°C in tropical deserts. In certain habitats like thermal springs and deep sea vents averge temperature exceeds 100ºC.

17 (*b*)Temperature is very significant to the living beings because the kinetics of enzymes depends on it. Enzymes are very sensitive towards the temperature. A slight decrease or increase in temperature can cause their inactivation or denaturation of enzymes and consequently alter the metabolic activity and physiological functions of an organism.

18 (*b*) Stenothermal organisms are those organisms, which cannot tolerate a wide range of temperature and thus live within a narrow (low) range of temperature because of their requirement of nearly constant temperature throughout the year, e.g. amphibians, reptiles, snails, mango plant, etc.

19 (*a*) Killer whales, green crab, desert pupfish and humans are all eurythermal. Eurytherms are the organisms which can survive and thrive over a wide range of temperatures.

20 (*b*) The organisms which are tolerant to wide range of salt concentration in their aquatic habitats called euryhaline. On the other hand, the organisms which tolerates a narrow range of salinity are called stenohalines.

22 (*b*) Many freshwater animals cannot live for long in sea water and *vice-versa* because of the osmotic problems, they would face. Freshwater fishes will loose water because of the high salt concentration in water, because of hypertonic environment. Salt water fishes would swell up and die through bursting of cells due to water uptake in hypotonic environment.

23 (*b*) Sunlight is essential for photosynthesis. The amount of photosynthesis depends upon the quality, intensity and duration of light. Photosynthetic yield is maximum on equator and tropical areas as these regions have high light intensity.

24 (*b*) At a depth of more than 500 m in the oceans, the environment is perpetually dark and its inhabitants are not aware of the existence of the celestial source of light from the sun.

25 (*d*) The nature and properties of soil in different places vary as it depends on the climate of the region, the weathering process (i.e. breakdown of large rocks to fine powder due to mechanical forces chemical changes, etc). and topography (i.e. sufrace features of a land area).

26 (*d*) Various characteristics of the soil such as soil composition, grain size and aggregation determine the percolation and water holding capacity of the soil. These characteristics along with parameters such as pH, mineral composition and topography determine the large extent of vegetation in any area.

27 (*d*) Weather changes have a little to no impact on the vegetation of an area because it is the short term property of the atmosphere and it changes from place to place.

28 (*b*) Benthic animals are those animals which live at the bottom of water. Their diversity and distribution are determined by the type of sediment characteristics like rocky or soil surface.

30 (*a*) Homeostasis is the phenomenon of maintaining a constant internal environment despite the changes occurring in external environment. Endothermal animals show temperature homeostasis.

32 (*b*) Some organisms are able to maintain a constant body temperature and constant osmotic concentration despite changes in external environment (i.e. homeostasis). Such organisms are called as regulators. Only birds, mammals, a few vertebrates and invertebrates belong to the category of regulators. Regulators are also called endotherms.

35 (*d*) About 99% of animals and nearly all plants do not have a mechanism to maintain a constant internal body environment and are called conformers as their body temperature changes with the surrounding temperature. Thus, the rest, i.e. only 1% of them are regulators.

36 (*b*) Some organisms are partial regulators as they have the ability to regulate their body temperature up to a certain limit.

40 (*b*) Conformers are also called ectotherns. These are the animals and plants in which the osmotic concentration and temperature of the body change according to ambient conditions of external environment.

41 (*a*) Small animals have a larger surface area relative to their volume, so they tend to lose body heat very fast when it is cold outside. Then they have to expended much energy to generate body heat through metabolism. This is the main reason why very small animals are rarely found in polar regions.

44 (*c*) During the unfavourable conditions of environment, most living organisms suspend their metabolic activities and development to tide over the period of stress. Animals like snails and fish go into aestivation (summer sleep) to avoid heat and desiccation, while bear goes into hibernation (winter sleep) to survive the cold, dark winters and avoid the stress of foraging in extreme cold.

45 (*b*) Diapause is the stage of suspended development in certain animals under unfavourable or adverse conditions of the environment such as harsh climate changes, reduced food supply, etc.

During this phase, an organism is considered as physiologically dormant.

46 (*c*) Option (c) is the incorrect match. It can corrected as Diapause occurs mostly in zooplanktons in winter when temperature is too low to survive.

Rest of the matches are correct.

47 (*b*) Adaptations develop due to natural selection of suitable variations appearing in living beings through mutation and recombination. These enable an organism to survive and reproduce in its habitat by undergoing behavioural, morphological and/ or physiological changes.

48 (*a*) In the absence of an external source of water, the kangaroo rat in North America deserts meets all its water requirements through internal fat oxidation (in which water is a byproduct). It also has the ability to concentrate its urine, so that minimal volume of water is used to remove excretory products.

49 (*d*) Desert plants also called xerophytic plants normally have thick cuticle on their leaf surface and stomata arranged in deep pits, which remain closed during day to reduce the rate of water loss by transpiration as an adaptation towards dry habitat and high heat.

50 (*b*) In *Opuntia*, a desert plant an adaptation undertaken during the course of evolution is that leaves get modified into spines in order to reduce the rate of transpiration. Thus, they have no leaves and the photosynthetic function is performed by flattened green stems.

51 (*a*) The mammals from colder climatic regions have extremities (ear, snout, tail, legs) shorter than those of warmer regions, this is called as Allen's rule. For other options,

- Rensch's rule states that birds have narrow wings in cold areas as compared to those of warmer regions.
- Bergman's rule states that warm blooded animals (birds, mammals) of colder region are of larger size as compared to those of warmer areas.
- Jordan's rule states that fishes in areas of low temperature tend to have more vertebrae as compared to those in warm water.

52 (*b*) Seals present in the polar seas can survive in polar climate where the temperature usually prevails below 0°C. This is because they have a thick layer of fat called blubber below their skin which acts as an insulator and minimises the loss of heat from their body.

54 (*a*) The low atmospheric pressure at high altitude makes us feel sick and nauseated. This occurs due to low oxygen availability at high altitudes. Sometimes people also experience fatigue and heart palpitations.

55 (*d*) Body compensates for low oxygen availability at high altitude by increasing RBC production, decreasing the binding affinity of haemoglobin and increasing the breathing rate.

60 (*a*) Population is the total number of interbreeding individuals of a species found in a geographical area who share and compete for similar resources. Both sexually reproducing and asexually reproducing individuals are included in a population.

61 (*c*) The birth rate would be 0.4 offspring per lotus per year. It can be calculated in the following way
Last year lotus plants = 20

New plants added = 8

$$\text{Birth Rate} = \frac{8}{20} = 0.4 \text{ offspring per lotus per year.}$$

62 (*d*) The death rate would be 0.25. It can be calculated in the following way,

$$\text{Death rate} = \frac{\text{Dead individual}}{\text{Total individual}} = \frac{200}{800} = \frac{1}{4} = 0.25$$

64 (*b*) The natural growth rate percentage would be 9%. It can be calculated as

Birth rate = 100

Death rate = 10

Number of individuals in population = 1000

$$\text{Natural growth rate} = \left[\begin{matrix}\text{Birth} \\ \text{rate}\end{matrix} - \begin{matrix}\text{Death} \\ \text{rate}\end{matrix}\right] = 100 - 10 = 90$$

So, percentage of growth rate

$$= \frac{90}{1000} \times 100 = 9\%$$

68 (*a*) Different age groups have different reproductive capabilities due to which population growth is influenced. For example, when pre-reproductive age group is more than the reproductive and post-reproductive. Then, this type of population is expanding population.

69 (*b*) A population having large number of young individuals will show rapid increase in population under normal conditions. It is called positive growth.

70 (*a*) Base of the age pyramid indicates pre-reproductive age consisting of young individuals. Thus, age pyramid with broad base indicates high percentage of young individuals.

71 (*a*) Option (a) is correct.

Figure labelled as (A) indicates expanding/triangular age pyramid which designates the large proportion of pre-reproductive age group in comparison with other two age groups.

Figure labelled as (B) indicates stable/bell-shaped age pyramid which symbolises that the pre-reproductive age group is proportionate with the reproductive age group, therefore in the future, the population size of species will remain constant or same.

Figure labelled as (C) represents declining/spindle-shaped age pyramid which shows that the proportion of pre-reproductive age group individuals is quite less than that of the reproductive age group.

72 (*c*) In a growing population, the size of younger population (pre-reproductive individuals) is larger than that of reproductive individuals. Such population is represented by a triangular-shaped age pyramid.

74 (*c*) Zero growth of population is indicated when reproductive individuals are not reproducing and are present in equal number to pre-reproductive individuals.

75 (*b*) A population with a large number of post-reproductive or older individuals and lesser number of pre-reproductive individuals will show a negative growth rate or decline growth.

76 (*a*) Population size is more technically called population density (designated as *N*). It is measured as the total number of individuals at a time at a place.

77 (*d*) Both options (a) and (b) are correct as

Although, the total number is the most appropriate measure of population density, in some cases, it is difficult to determine. In a forest area, suppose there are 200 *Parthenium* plants but only a single huge banyan tree with a large canopy is present. Thus, stating that the population density of banyan is low relative to that of *Parthenium* amount to under estimating the great role of the banyan in that forest community. In such cases, the per cent cover or biomass is a more meaningful measure of the population size. If the population is huge and counting is impossible or very time consuming, the total number is not easily measured, e.g. for a dense laboratory culture of bacteria in a petri dish only the biomass can be used as a measure of its population density.

78 (*d*) Both options (a) and (c) are not examples of using relative density to measure population density in a certain area.

Sometimes, for certain ecological investigations there is no need to know the absolute population densities. Relative densities serve the purpose equally well. In this case, population size is indirectly estimated without actually counting them. For example, the number of fishes caught per trap is good enough measure of its total population density in the lake. The tiger census in our national parks and tiger reserves is often based on pug marks is an example of indirect count method. Also, measuring the biomass of bacterial culture to find out the population density of bacteria in a petri dish is an example of biomass or per cent cover method.

79 (*d*) Tiger census is done by utilising non-biological parameter is pug marks and fecal pellets. Biological parameter includes physical counting of each tiger.

80 (*b*) Population keeps on changing due to various factors like immigration, emigration, natality and mortality. Hence, it is dynamic rather than being a stable phenomena.

81 *(d)* Population density of a population in a given habitat during a given period fluctuates due to the change in natatily, mortality, immigration and emigration.

82 (*b*) Natality is birth rate. It refers to the number of births during a given period in the population that are added to the initial density.

83 (*d*) The net increase in population would be zero. It can be calculated in the following way.

Increase in population = (Natality + Immigration) – (Mortality + emigration) = $(250+20)-(240+30)$

$= 0\,(\text{zero})$

85 (*d*) Both options (b) and (c) are correct as 'A' can be natality and/or immigration (brings positive change in population density) and 'B' can be mortality and/or emigration (brings negative change in population density). Values of A and B can never be equal as at a given place and time natality and mortality or immigration and emigration can never be equal.

86 (*b*) Option (b) gives the correct representation for population density at time $t + 1$. '*N*' is the population density at time *t* then its density at time $t + 1$ is

$$N_{t+1} = N_t + [(B + I) - (D + E)]$$

We can see from the above equation that population density increases if the number of birth plus number of immigrants ($B+I$) is more than the number of death plus the number of emigrants ($D+E$).

88 (*b*) Vital index represents the ratio between natality (birth rate) and mortality (death rate). It determines the normal rate of growth of population and can be given by the following formula.

$$\text{Vital index} = \frac{\text{Natality}}{\text{Mortality}} \times 100$$

89 (*a*) Malthus proposed that human population grows geometrically. He calculated that the number of organisms can increase geometrically (1, 2, 4, 8, 16, …) and their food supply increases arithmetically (1, 2, 3, 4 ……).

90 (*b*) Geometric representation of age structure is a characteristic of population. In most populations, individuals are of different ages. The proportion of individuals in each age group is called age structure of that population.

91 (*d*) Exponential growth model occurs when the resource availability is unlimited in the habitat. As resources are unlimited then there is no inhibition from crowding.

92 (*b*) Option (b) is correct. The equation is;

$dN/dt = (b - d)\ \text{x}N$ [b = Birth rate, d = Death rate].

N =Population density, $\frac{dN}{dt}$ = Rate of change of population

Let $(b - d) = r$, then the equation is, $dN/dt = rN$

r = Intrinsic rate of natural increase.

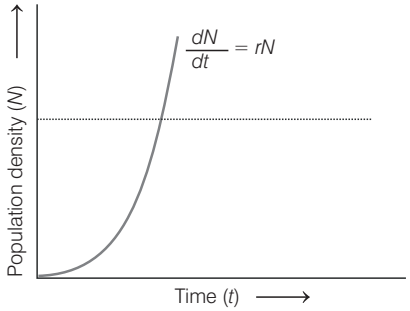
When a population shows exponential growth, the curve plotted with N in relation to time, assume J-shape.

In this, there is no fix carrying capacity.

93 (*a*) '*r*' is the intrinsic rate of natural increase and is very important parameter chosen for assessing impacts of any biotic or abiotic factor on population growth.

94 (*a*) Intrinsic rate of natural increase can be defined as the number of births minus the number of deaths. Thus, a population having highest intrinsic rate will increase fastest among all of the given populations.

95 (*d*) In the given graph, the growth of the population is unlimited and increasing. It is the distinguish feature of exponential growth model or curve. As, it has the J-shaped appearance so, it is also called J-shaped curve.



Population growth curve is, when resources are not limiting. The curve is called exponential or geometrical or J-shaped curve.

97 (*a*) A given habitat has limited resources to support a certain number of individuals of a population beyond which no further growth is possible. This limit is called as the nature's carrying capacity (*K*) for that species.

99 (*c*) Logistic growth models have fixed carrying capacity due to limited number of resources.
It is described by the equation

$$\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$$

N = Population density at time t
r = Intrinsic rate of natural increase
K = Carrying capacity.

100 (*a*) Option (a) is true for exponential growth.
Rest of the options are incorrect and can be corrected as

- Exponential growth starts to increase as it nears its log phase.
- Bacterial colonies have not been observed to maintain exponential growth always.
- Algal populations have been observed to show exponential growth.

101 (*c*) Option (c) is correct.

- 'A' represents stationary phase which is the third phase in which the population reach at the carrying capacity level and population get stationary position. No. of birth = No. of death.
- 'B' represents log phase which is the second phase in which a population use its resources maximally and increases their number exponentially.
  Number of birth >> Number of death
- 'C' represents lag phase which is the initial phase in which a population adapt themself according to the environment and starts to increase their number.

102 (*a*) Option (a) is correct. Let us take the equation,

$$\frac{dN}{dt} = (b-d)\,N$$

$$\frac{dN}{dt} = (65-45)\,100$$

$$\frac{dN}{dt} = 20\times100$$

$$\frac{dN}{dt} = 2000$$

103 (*d*) Growth rate of a population following logistic model equals zero, when N/K is exactly one. In logistic growth model, population growth equation is described as

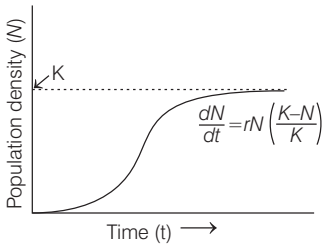
$$\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$$

Thus when, $\frac{N}{K} = 1$ then $\frac{K-N}{K} = 0$

$$\frac{dN}{dt} = 0$$

104 (*a*) Logistic growth is more realistic than the exponential growth curve as
No population have the unlimited resources to survive and reproduction. Every population in nature has given a certain amount of natural resources that is limited.

105 (*b*) When $K = N$ in a logistic growth curve, it is asymptote.
It means a population growing in a habitat with limited resources show initially a lag phase, followed by phase of acceleration and deceleration and finally an asymptote, i.e. when the population density (N) reaches the carrying capacity (K)



Population growth curve is logistic,
when responses are limiting the growth,
Here, K is carrying capacity and N is population density.

107 (*d*) Life history traits of organisms have evolved to the constraints imposed by biotic and abiotic components of habitat in which they live.

108 (*c*) Option (c) is a incorrect match. It can be corrected as Oysters and pelagic fishes produce large number of small-sized offspring. Birds produce small number of large-sized offspring.
Rest of the matches are correct.

111 (*d*) The interspecific interactions arise from the interaction between population of two different species. These could be beneficial, detrimental or neutral to one of the species or both.

112 (*d*) Parasitism is the relationship between two living organisms of different species in which one organism, i.e. parasite obtains its food directly from the host.

In this relationship, the parasite is benefitted (+) and the host is harmed (–). So, this type of population interaction is represented by '+' '–'.

115 (*b*) Predation is a natural way of transferring of energy to higher trophic level. It is the interaction between members of two species in which members of one species capture, kill and eat up members of other species. The former are called predators, while the later are called preys.

117 (*d*) Exotic species are also called as introduced, alien, non-indigenous or non-native species. It is because these species live outside (exotic) their native distributional range, having arrived thereby human activity, either deliberately or accidentally.

118 (*c*) When certain exotic species are introduced into a geographical area, they become invasive and start spreading fast because the invaded land does not have its natural predators.

119 (*a*) Natural predators are important in the population as they do not allow a species to be invasive. Thus, in the absence of natural predator, the prickly pear cactus became abundant when introduced in Australia.

120 (*c*) Cactus feeders can prey on prickly pear cactus (prey). When prickly pear cactus became invasive and becomes abundant their natural predators can be introduced in the area to normalise their population density.

122 (*a*) In the rocky intertidal communities of the American Pacific coast, starfish pisaster is an important predator.

In a field experiment, when all the starfish were removed from an enclosed intertidal area more than 10 species of invertebrates becomes extinct within a year, because of interspecific competition. Thus, predators help in maintaining species diversity.

123 (*b*) Prey species have evolved various defences to lessen the impact of predation. Some species of insect and frogs are cryptically-coloured (camouflaged) to avoid being easily detected by predator.

124 (*b*) Monarch butterfly is highly distasteful to its predator because of special poisonous and foul smelling chemical present in his body. The butterfly acquires this chemical during its caterpillar stage by feeding on poisonous weeds.

125 (*c*) *Calotropis* produces a highly poisonous cardiac glycosides. That is why it is rare to see any cattle browsing on this plant.

127 (*c*) Bacteria decompose the organic matter which is not really living. Hence, it cannot be considered as a prey-predator relationship.

128 (*a*) Competition is the negative interaction that occurs among organisms whenever two or more organisms require the same limited reasource. Thus, it adversely affects both the partners involved.

129 (*d*) Competition keeps the population of inferior species under check. The superior barnacle, species *Balanus* nearly excluded the smaller barnacle, *Chthamalus*, due to competition.

131 (*b*) It is generally believed that competition occurs when closely related species compete for same resources which are limited. But this is not true as unrelated species also compete for the same resources. This is called interspecific competition. Darwin was convinced that it was a potent force in organic evolution.

132 (*a*) Competition is best defined by the fitness of one species as compared to an other competitive species. It is the process in which the fitness of one species is significantly lower in the presence of another superior competiting species.

134 (*b*) The principle of competitive exclusion was stated by GF Gause. He studied the effects of interspecific competition between two closely related species.

He stated that, two species competing for the same food resource cannot coexist at the same place indefinitely and the competitively inferior one will be eventually eliminated.

136 (*b*) Some time species facing interspecific competition might evolve mechanisms that promote coexistence rather than exclusion. One such mechanism is resource partitioning. In this mechanism, two species competing for the same resource, avoid competition by choosing different times for feeding or different foraging patterns.

139 (*a*) Ectoparasites have a simple life cycle because they live on the host organism and derive nutrition from them. Endoparasites have complex life cycle because they live inside the host. This complex life cycle is because of their extreme specialisation to survive inside the host organism.

140 (*b*) Commensalism is a type of interaction where one organism is benefitted and other remain unaffected.

For other options,

- In predation, one organism feeds on another organism.
- Mutualism is a type of positive interaction in which all individuals are benefitted by one another.
- In parasitism, one organism (parasite) gets the benefit at the expense of the host.

141 (*d*) Among the given examples, relationship between female wasp and fig species does not show commensalism. In commensalism, one species derives the benefit and other neither harmed nor benefitted.

Wasp and fig tree show mutualism. Here, the fig flower is pollinated by wasp and wasp lays its egg into fruit and leaves them there for development.

Other options show examples of commensalism.

142 (*a*) *r*-selected species have the ability to produce a large number of progeny (offspring) with a small body size. The population growth of these species is a function of biotic potential.

144 (*b*) Lichens represent an intimate mutualistic relation between a fungus and photosynthetic algae or cyanobacteria. It is the interaction conferring benefit to both the interacting species and is called mutualism.

145 (*b*) Mycorrhiza represent association between fungi and roots of higher plants. The fungi help the plant in the

absorption of essential nutrients from soil, while the plant in return provides carbohydrates and shelter to the fungi.

146 (*b*) *Yucca gloriosa* has developed an obligate symbiotic relationship with *Pronuba yuccasella* moth. The moth cannot complete its life cycle with the association of *Yucca* flowers and in turn *Yucca* has no other pollinator.

147 (*b*) Pseudocopulation occurs in *Ophrys* (orchids). Orchids (*Ophrys*), have a strange relationship with pollinator insects. The mediterranean orchid *(Ophrys)* employs sexual deceit to get pollination done by a species of bee. One petal of its flower bears an uncanny resemblance to the female bee in size, colour and markings. The male bee is attracted to what it perceives as a female, thus pseudocopulates with the flower.

151 (*d*) Amensalism is widely used in medical science for the production of antibiotics.

It involves the secretion of chemicals called allochemics by one microbial group to harm other microbes, e.g. *Penicillium* secretes chemicals to inhibit the growth of *Staphylococcus* bacteria. These chemicals can then be used in medical science for the production of antibiotics.

On the other hand, no such chemicals are secreted in either parasitism, mutualism or commensalism.

152 (*c*) Assertion is true, but Reason is false.

Reason can be corrected as

Reproductive isolation prevents members of one species to mate and produce offspring with another species. Thus, it prevents the bringing of distinctive morphological characters.

Species are groups of potentially interbreeding natural populations that are isolated (rather than being reproductively isolated) from other such groups.

153 (*b*) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion. The correct explanation is as follows

Ecological equivalents are unrelated species who possess similar types of adaptations as they live in similar ecological niche.

For example, sharks (fishes) and dolphin (mammals) live in oceans (niche) and have same marine adaptations. Ecological niche is the total interaction of a species with environment or the habitat of a species within an ecosystem.

154 (*c*) Assertion is true, but Reason is false and can be corrected as

Populations of similar individuals of a community do not remain isolated as they show interactions and interdependence.

155 (*a*) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

Predation is an interspecific interaction with a feeding strategy. The number of predator usually depends upon the population of prey, but later is also controlled by predators.

Thus, predator and prey maintain a fairly stable population through time and rarely one population becomes scarce or abundant.

156 (*a*) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

When certain exotic species are introduced into a geographical area, they become invasive and start spreading rapidly due to the absence of their natural predators.

Hence, when prickly pear cactus were introduced into Australia in the early 1920s, these plants caused havoc by spreading rapidly into millions of hectares of range land.

157 (*b*) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion. The correct explanation is as follows

In commensalism type of community interaction, one organism is benefitted and other is neither benefitted nor harmed, such as in the case of cattle egret bird and the cattle. The egrets are benefitted by obtaining the insect as food, which gets exposed due to the grazing action of cattle, but the cattle remains unaffected, i.e. it is neither benefitted from the presence of egret nor harmed.

158 (*b*) Both Assertion and Reason are true, but Reason is not the correct explanation for Assertion. The correct explan ation is as follows

Plants need the help of insects and animals for pollinating their flowers and dispersing their seeds because plants are immobile and require a medium to transfer their pollen to enable reproduction.

159 (*d*) Assertion is false, but Reason is true. Assertion can be corrected as

Living organisms are considered as open systems as they exchange energy and materials with the environment.

160 (*c*) Assertion is true, but Reason is false. It can be corrected as

Excessive leaching (washing away by water) of the soil depletes its organic content.

161 (*d*) Assertion is false, but Reason is true. Assertion can be corrected as

A mangrove tree growing in a marshy place bears pneumatophores.

164 (*b*) The statement given in option (b) is correct. Rest of the statements are incorrect and can be corrected as

- Species ability to adapt is over a wide range of environment.
- Migration is the temporary movement of organisms from stressful habitat to a more hospitable area and return of the animal back to the area when the stressful period is over.

167 (*d*) Both the statements are false and can be corrected as

- Immigration is the number of individuals of the same species that have come into the habitat from some where else during the time period under consideration.

- Emigration is the number of individuals of the population who left the habitat and gone some where else during the time period under consideration.

168 (*a*) Statements I and II are correct. But statement III is incorrect and can be corrected as

If unlimited conditions are provided to a population then the population will grow quickly by increasing their birth rate (natality) and decreasing its death rate (mortality).

169 (*d*) Statements I, II and IV are correct. Statement III is incorrect and can be corrected as

Size of population keeps on changing due to various factors or phenomena like birth rate, death rate, emigration or immigration. So, it is a dynamic phenomena rather than stable.

171 (*c*) Statements IV and VI are incorrect for the situation in which food and space for a population are unlimited. These can be corrected as

- The population is not described by S-shaped curve. It is described by J-shaped curve.
- There is no competition among the species of the population.

Rest of the statements are correct.

172 (*b*) Statement IV is correct for logistic model of population growth, while statements I, II and III are incorrect and can be corrected as

- Population growth rate decreases as the size of population approaches the carrying capacity.
- All individuals have different effects on population growth.
- There are limited natural resources.

173 (*c*) Statements II and III are correct for the given information. Statement I is incorrect and can be corrected as

- Population density of banyan is low.

174 (*d*) Statements I, II, IV, and V are correct.

Statement III is incorrect and can be corrected as

The housefly, which has a short lifespan and produces a large number of eggs could be considered as '*r*' selected species.

177 (*a*) Statements I and II are correct.

Statements III and IV are incorrect and can be corrected as

- Gause's competitive exclusion principle is effective when resources are limited.
- Limited resources give better opportunity for adaptation.

178 (*d*) Statements I, II, III and IV are correct.

Statement V is incorrect and can be corrected as

A population of frogs protected from all predators would not increase indefinitely because nature's resources are limited.

179 (b) The statement in option (b) is incorrect and can be corrected as

Amensalism is the relationship in which one organism is harmed and the other remains unaffected.

Rest of the statements are correct.

180 (*d*) The statement in option (d) is correct. Rest of the statements are incorrect and can be corrected as

- An association of two species where both of the organisms are benefitted is called mutualism.
- An interspecific association where one partner is benefitted and the other remains unaffected is called commensalism.
- A direct food relation between two animal species in which one animal kills and feeds on the other is called predation.

181 (*b*) Statement in option (b) is incorrect and can be corrected as

Mutualistic relationship evolves when benefit is more than the cost.

Rest of the statements are correct.

182 (*d*) The statement in option (d) is incorrect and can be corrected as

The malarial parasite needs a vector *Anopheles* female mosquito to spread to other host.

Rest of the statements are correct.

183 (*b*) The statement in option (b) is incorrect and can be corrected as

The more dissimilar the niches of two species the lesser is the competition between them.

Rest of the statements are correct.

184 (*b*) The statement in option (b) is incorrect and can be corrected as

Both animals and plants respond to photoperiods.

Rest of the statements are correct.

186 (*c*) The statement in option (c) is correct. Rest of the statements are incorrect and can be corrected as

- Parasites tend to coevolve with the host.
- Brood parasitism is present in cuckoo.
- The life cycle of parasites is often very complex involving one or more intermediate hosts or vectors.

187 (*a*) The statement in option (a) is correct. Rest of the statements are incorrect and can be corrected as

- Animals having a wide range of salinity are euryhaline.
- Every winter the famous Keoladeo National Park (Bharatpur) in Rajasthan, hosts thousands of migratory birds.
- The mammals of colder climates generally have shorter extremities to minimise heat loss.

188 (*a*) The statement in option (a) is correct. Rest of the statements are incorrect and can be corrected as

- *r*-related species have high fecundity, small body size and early maturity.
- *K*-related species have low fecundity, large body size and late maturity.
- Altruistic behaviour is not observed in dogs.

199 (*a*) Hibernation is winter sleep. Animals like frog and bear hibernate to overcome the extreme of cold temperature. Thus, out of the given options, frog shows hibernation.

200 (*b*) Marine fishes are adapted to live in water bodies containing high salt concentration. Thus, these fishes cannot survive in freshwater due to endosmosis as it will cause the fish to swell-up and ultimately cause its death.

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

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

206 (*c*) Ecological niche of an organism represents the range of conditions it can tolerate (physical position) the resources it utilises and its functional role in an ecological system. Thus, option (c) is correct.

207 (*d*) According to Allen's rule, the mammals who live in colder climates or areas show shorter extremities like ears and limbs as compared to the mammals of warm region.

The shorter extermities of mammals in colder region help to minimise heat loss and maintains homeostasis.

209 (*a*) Formation of tropical forests needs annual temperature of about 18-25°C and annual rainfall (precipitation) of above 140 cm, usually between 150-400 cm that reaches up to 1000 cm/year.

210 (*c*) In a forest ecosystem, tall trees control the light condition, i.e. intensity, duration and quality of light at the ground.

211 (*c*)A well growing herbaceous plant in forest receives light of less intensity, duration and quality. But when it is transplanted in a park outside its natural habitat, its light supply will be uninterrupted which will be harmful for it.
So, due to change in its microclimate, it may not survive.

212 (*d*) Growth rate per hour can be calculated by the following formula,

$$\text{Growth rate} = \frac{\text{Final population} - \text{Initial population}}{\text{Hour}}$$

$$= \frac{150-50}{1} = 100$$

Thus, the growth rate of the population would be 100 per hour.

213 (*b*) Per cent growth or birth rate per individual per hour is

$$= \frac{\text{Final population} - \text{Initial population}}{\text{Initial population}} \times 100$$

$$= \frac{150-50}{50} \times 100 = \frac{100}{50} \times 100 = 200$$

Thus, the per cent growth or birth rate per individuals per hour would be 200.

214 (*c*) A population of more young individuals than older individuals, will show positive growth in future, i.e. it will increase after some time.

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

216 (*c*) Mortality and emigration would necessarily decrease the density of a population. Organisms die due to non-availability of resources, old age, etc., leading to mortality. Other organisms move to different locations to increase their chances of survival and reproduction and this leads to emigration.

217 (*c*) Binary fission, a mode of asexual reproduction in protozoan produces two offspring from the parent. Thus, the population of protozoan after six generations will be

$$(2)^n = (2)^6 = 64$$

218 (*b*) Exponential equation is, $\frac{dN}{dt} = rN$ in which $r = b - d$.

Thus,

$$dN/dt = (b - d) \times N$$

$$dN/10 = (0.028 - 0.008) \times 14$$

$$dN/10 = .28$$

$$dN = 0.28 \times 10$$

$$dN = 2.8$$

$$= 14 \text{ millions} + 2.8 \text{ millions}$$

$$= 16.8 \text{ millions} = 17 \text{ millions}$$

So, the number of people present in 2015 can be predicted to be 17 million.

219 (*b*) When one species is harmed and other is neither harmed nor benefitted (it remains unaffected), then such an association is called amensalism.

220 (*c*) Lichens represent a positive (beneficial) association called mutualism or symbiosis between two different species, i.e. a fungus and an alga.

222 (*a*) Monocarpic plants are those plants which flower once in their life and die. Thus, banana is a monocarpic plant as it reproduces sexually once in its life and then dies.