UNIT – X : ECOLOGY AND ENVIRONMENT

Term-II

ORGANISMS AND POPULATIONS

Syllabus

➢ *Habitat and niche, abiotic factors and ecological adaptations; population interactions-mutualism, competition, predation, parasitism, population attributes-growth, birth rate and death rate, age distribution.*

STAND ALONE MCQs (1 Mark each)

Q. 1. Which of the following forest plants controls the light conditions at the ground?

(A) Climbers **(B)** Shrubs

(C) Tall trees **(D)** Herbs U

Ans. Option (C) is correct.

> ***Explanation :*** In a forest ecosystem, light is an important abiotic component that controls a number of life processes in organism. In forest, its intensity duration and quality at ground is controlled by tall trees.

Q. 2. According to Allen's rule, the mammals from colder climates have

(A) shorter ears and longer limbs

(B) longer ears and shorter limbs

(C) longer ears and longer limbs

(D) shorter ears and shorter limbs

Ans. Option (D) is correct.

> ***Explanation :*** According to Allen's rule, the mammals from colder climates or areas show shorter extremities like ears and limbs as compared to the mammals of warm region. This help to minimize heat loss and maintain homeostasis.

Q. 3. Snails escape from stressful time in summers by

(A) Hibernation **(B)** Aestivation

(C) Diapause **(D)** Homeostasis R

Ans. Option (B) is correct.

> ***Explanation :*** Snails undergo aestivation to avoid summers.

Q.4. 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. R

Ans. Option (B) is correct.

> ***Explanation :*** Autecology is the study of inter-relationship of the organisms of a species to biotic or abiotic environment.

Q.5. 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. R

Ans. Option (D) is correct.

> ***Explanation :*** Biosphere, one of the four layers that surround the Earth, is composed of all living organisms present on earth which interact with their physical environment. It is collectively used for all the ecosystems of world.

Q.6. Which one of the following organisms reproduces

sexually only once in its life time?

(A) Banana plant (B) Mango

(C) Tomato (D) Eucalyptus R

Ans. Option (A) is correct.

> ***Explanation :*** Banana plant is the largest herbaceous flowering plant. It is a monocarpic plant which reproduces sexually only once in its life time. Monocarpic plants are those plants which flower only once in their life and die after flowering and fruiting. These plants are generally annual (wheat, rice) or biennials (like carrot and radish).

Q.7. 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. R

Ans. Option (C) is correct.

> ***Explanation :*** Ecological niche is ecologically adapted zone, that is, the particular place of habitat occupied by individual of a species within its ecosystem. Ecological niche have specific characteristics, such as availability of nutrients, temperature, terrain, sunlight, and predators, which influences how populations affect and are affected by resources and enemies.

Q.8. 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. R

Ans. Option (C) is correct.

> ***Explanation :*** Ecotone is a transition zone between two communities. The adjacent biotic (natural) communities generally do not possess a fine demarcation line between them. Therefore, the adjacent of two communities is represented by population of both the communities, and this transition zone between two communities is referred as ecotone.

Q.9. Salt concentration (salinity) of the sea measured in parts per thousand is

(A) 10–15 (B) 30–70

(C) 0 – 5 (D) 30– 35 R

Ans. Option (D) is correct.

> ***Explanation :*** The salinity (measured in parts per thousand) is less than 5 in land water, 30–35 in sea water and > 100 in some hypersaline water bodies like lagoons. After temperature, water is an important abiotic factor which has a great influence on the life of an organism. In an oceanic ecosystem, organisms face many waters related problems like pH, salinity of water. The salinity (salt concentration) of sea is measured in parts per thousand units. It is about 30–35 ppt.

Q.10. 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. U

Ans. Option (C) is correct.

> ***Explanation :*** In forest ecosystem tall trees of forest plants controls the light condition, that is, intensity duration and quality of light at the ground. A well growing herbaceous plant in forest receive less intensity duration and quality of light, but when it is transplanted in a park outside its natural habitat, the light will be received uninterrupted. So, due to change in its microclimate, it may not survive.

Q. 11. 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 stabilize

(C) It will increase

(D) It will first decline and then stabilize U

Ans. Option (C) is correct.

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

Q. 12. 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 A

Ans. Option (D) is correct.

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

Q. 13. What would be the percent growth or birth rate per individual per hour for the same population mentioned in the previous question (Question 12)?

(A) 100 **(B)** 200

(C) 50 **(D)** 150 A

Ans. Option (B) is correct.

Explanation : Growth rate is 200% as one organism is producing two individuals at a time.

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

(A) Natality> mortality

(B) Immigration > emigration

(C) Mortality and emigration

(D) Natality and immigration U

Ans. Option (C) is correct.

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

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

(A) 128 **(B)** 24

(C) 64 **(D)** 32 A

Ans. Option (C) is correct.

Explanation : Binary fission is a mode of asexual reproduction in protozoan through which it produces two offsprings from parent individual. So,
In 1st generation : there are 2 protozoans.
In 2nd generation : there are $2 \times 2 = 4$ protozoans
In 3rd generation : there are $4 \times 2 = 8$ protozoans
In 4th generation : there are total 16 protozoans.
In 5th generation : there are total 32 protozoans
In 6th generation : there are 64 protozoans.
Thus, the population of protozoan will be 64, after six generations.

Q. 16. 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. R

Ans. Option (C) is correct.

Explanation : Amensalism is an association between two organisms in which one species is benefitted or unaffected while the other organism is destroyed or inhibited.

Q. 17. Lichens are the associations of

(A) bacteria and fungus

(B) algae and bacterium

(C) fungus and algae

(D) fungus and virus R

Ans. Option (C) is correct.

Explanation : Lichens is an organism that is formed by the symbiotic association of a fungus and an alga or cyanobacterium. It occurs as crusty patches or bushy growths on tree trunks, bare ground, etc. and represents a positive (beneficial) interaction between two different species.

Q. 18. Select the statement which explains best parasitism.

(A) One organism is benefited

(B) Both the organisms are benefited

(C) One organism is benefited, other is not affected

(D) One organism is benefited, other is affected U

Ans. Option (D) is correct.

Explanation : Parasitism is an interaction between two species in which one species (parasite) derives benefit while the other species (host) is harmed. For example, ticks and lice (parasites) present on the human body represent this interaction where in the parasites receive benefit (as they derive nourishment by feeding on the blood of humans). On the other hand, these parasites reduce host fitness and cause harm to the human body.

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

(A) Sandal wood **(B)** Mistletoe

(C) Orobanche **(D)** Ganoderma

Ans. Option (A) is correct.

Explanation : Sandal wood tree (*Santalum album*) is an example of partial root parasite. It grows on the roots of *Dalbergia, Albizzia and Eucalyptus*. The sucking roots of the plants attack the roots of the host trees and from them nutrients are absorbed. Mistletoe (*Viscum*) is considered as hemiparasite which derives a part of nourishment from host plant. Orobanche is an obligate holoparasite which attack strategic food crops, such as legumes and vegetables, Ganoderma mushrooms are known as king of herbs for its wonderful medicinal properties. They are commonly known as *reishi* mushroom. They are widely distributed, shelf like or knob like fungi that feed either as saprobes on dead wood or as parasites on the live wood of hardwood trees.

Q. 20. What parameters are used for tiger census in our country's national parks sanctuaries?

(A) Pug marks only

(B) Pug marks and faecal pellets

(C) Faecal pellets only

(D) Actual head counts R

Ans. Option (B) is correct.

> ***Explanation :*** Foot prints (pug marks) and faecal pallets of conserved animals are some parameters which can be used for tiger census in our country's National park and sanctuaries.

ASSERTION AND REASON BASED MCQs (1 Mark each)

Directions : In the following questions a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as :

(A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(B) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(C) Assertion (A) is true but reason (R) is false.

(D) Assertion (A) is false but reason (R) is true.

Q. 1. Assertion (A) : Ecology is concerned with four levels of biological organisation.

Reason (R) : Organisms, populations, communities and biomes are four levels of biological organisation.

Ans. Option (A) is correct.

> ***Explanation :*** Ecology include six level of organization that are organism, population, community, ecosystem, biosphere and biome.

Q. 2. Assertion (A) : Different habitats had different physical and chemical conditions.

Reason (R) : Physicochemical (abiotic) components characterize the habitat of an organism.

Ans. Option (B) is correct.

> ***Explanation :*** Habitat is governed by the both abiotic and biotic components.

Q. 3. Assertion (A) : Small animals are rarely found in polar regions.

Reason (R) : Heat loss or heat gain is a function of surface area. Large surface area great loss of heat.

Ans. Option (A) is correct.

> ***Explanation :*** Small animals have a large surface area with respect to their volume, so they lose body heat fast if it is cold outside, small animals are rarely found in polar regions.

Q.4. Assertion (A) : A community with more species is more stable than that with less species. Reason(R) : More the number of species, lesser the variation in the total biomass production year after year.

Ans. Option (A) is correct.

> ***Explanation :*** Communities with more species tend to be more stable than those with less species because they are able to resist occasional disturbance . David Tilman's long term experiments showed the plots with more species, experience less year to year variation in total biomass.

Q. 5. Assertion (A) : Many freshwater animals cannot live for long in sea water.

Reason (R) : Freshwater animals face osmotic problems in sea water.

Ans. Option (A) is correct.

> ***Explanation :*** When freshwater animals move into sea, water continuously moves out of the animal's body through the process of osmosis.

Q. 6. Assertion (A) : The term interbreeding implies sexual reproduction.

Reason (R) : Interbreeding result in variation among species.

Ans. Option (A) is correct.

> ***Explanation :*** Interbreeding implies sexual reproduction which involve the fusion of two gametes of different species which bring variation among the species.

Q. 7. Assertion (A) : Population has certain attributes which an individual organism does not have.

Reason (R) : Population is a groups of people living in well defined area, at a particular time.

Ans. Option (B) is correct.

> ***Explanation :*** Population is a group of people therefore it's attributes are different from an individual organism.

AI **Q. 8. Assertion (A) :** Natality contributes to the increase in population density.

Reason (R) : Natality refers to the number of births during a given period in the population which is

Q. 9. Assertion (A) : Clown fish maintains a commensalistic relation with the sea anemone.
Reason (R) : In this interaction, one species benefits and the other is neither harmed nor benefited.

Ans. Option (A) is correct.

> *Explanation :* Clown fish maintain a commensalistic relation with the sea anemone. In this interaction, one species benefits and the other is neither harmed nor benefited. Sea anemone has stinging tentacles that provide protection to Clown fish from predators. The sea anemone does not appear to derive any benefit from the clown fish.

Q. 10. Assertion (A) : The human population represents the logistic growth curve.
Reason (R) : When the resources are limited leading to competition between individuals and survival of fittest, the population tends to grow in a logistic manner.

Ans. Option (A) is correct.

> *Explanation :* The human population represents the logistic growth curve as the numbers of human beings are increasing rapidly but available resources are not increasing at the same pace. Such a growth pattern is not sustainable because at one point the human population would reach a place where there would not be enough resources for everyone.

CASE-BASED MCQs

Attempt any four sub-parts from each question. Each sub-part carries 1 mark.

I. Read the following text and answer the following questions on the basis of the same:

Growth of a population with time shows specific and predictable patterns. Two types of growth pattern of population are exponential and logistic growth. When resources in the habitat are unlimited each species has the ability to realize fully its innate potential to grow in number. Then the population grows in exponential fashion. When the resources are limited growth curve shows an initial slow rate and then it accelerates and finally slows giving the growth curve which is sigmoid.

Q. 1. Identify the incorrect statement:

(A) Exponential growth occurs in organism such as lemmings.

(B) Logistic growth is more realistic.

(C) Exponential growth has two phases lag and log.

(D) In logistic growth, population passes well beyond the carrying capacity of ecosystem.

Ans. Option (D) is correct.

> *Explanation :* In logistic growth population seldom grows beyond the carrying capacity of ecosystem.

Q. 2. Identify the correct equation that represents the exponential population growth curve:

(A) dN/dt = IN

(B) dN/dt = rN (K-N/K)

(C) $N_t = N_0 e^{rt}$

(D) Both (A) and (C)

Ans. Option (D) is correct.

> *Explanation :* If any species is flourishing under unlimited resources, it would reach exponential growth which can be depicted by equation: dN/dt =rN
> Where, N= population density at time t; r = intrinsic rate of natural increase.
> If we derive the integral form of the exponential growth equation, it can be written as: $N_t = N_0 e^{rt}$
> Where,Where N_t, = population density after time t; $N_o$is population density at time zero; r = intrinsic rate of natural increase; e is the base of natural logarithm.

Q. 3. The equations correctly represents Verhulst-Pearl logistic growth is:

(A) dN/dt = rN(K-N)/K

(B) dN/dt = rN/K

(C) dN/dt = N(K-N)/K

(D) dN/dt = r(K-N)/K

Ans. Option (A) is correct.

> *Explanation :* The equations correctly represents Verhulst-Pearl logistic growth is dN/dt = rN(K-N)/K

Q. 4. The population growth is generally described by the following equation:

dN/dt = rN(K-N)/K

What does 'r' represent in the given equation?

(A) Population density at time Y

(B) Intrinsic rate of natural increase

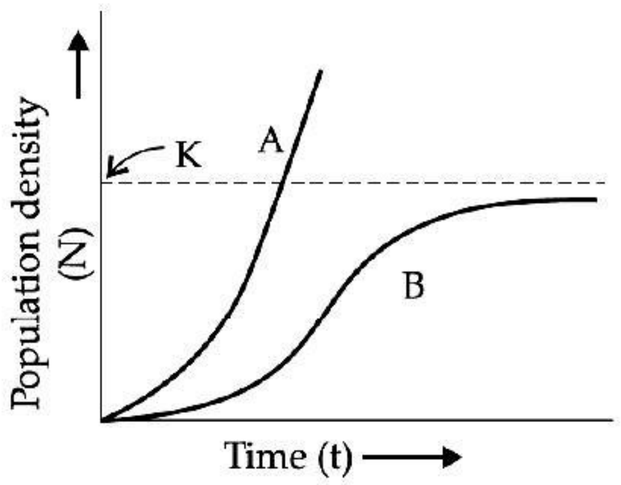
(C) Carrying capacity

(D) The base of natural logarithm

Ans. Option (B) is correct.

Explanation : 'r' represents Intrinsic rate of natural increase.

Q. 5. Study the population growth curves (A and B) in the given graph and select the incorrect statement:



(A) Curve 'A' shows exponential growth, represented by equation dN/dt=rN

(B) Curve 'B' shows logistic growth, represented by equation dN/dt = r(K-N)/K

(C) Exponential growth curve is considered as more realistic than the logistic growth curve

(D) Curve 'A' can also be represented by equation $N_t = N_0e^{rt}$

Ans. Option (C) is correct.

Explanation : Since resources of growth for most animal populations are finite and become limiting sooner or later, so the logistic growth model is considered as more realistic.

II. Read the following text and answer the following questions on the basis of the same :

All biomes of the earth constitute the earth's ecosystem. All flora and fauna occur in the lithosphere, atmosphere and hydrosphere along with their environments. Air, water, soil, biota, temperature and light are the major environmental factors that directly affect the flora and fauna in different geological areas of the earth.

Q. 1. Climate of an area depends upon :

(A) Altitude of the area **(B)** Latitude of the area

(C) Topography **(D)** Both (A) and (B).

Ans. Option (D) is correct.

Explanation : The altitude of an area can impact like climate that are mostly rainy and have low temperature while the altitude of an area impact the ultimate with respect to equator and poles.

Q. 2. Hydrological cycle is concerned with :

(A) Lithosphere **(B)** Hydrosphere

(C) Atmosphere **(D)** All of these.

Ans. Option (D) is correct.

Explanation : Lithosphere is concerned with land, hydrosphere with water bodies and atmosphere is concerned of space. Hydrological cycle circulates in all these three subsystem.

Q. 3. Soil aeration is inversely proportional to :

(A) Soil pore spaces

(B) Diameter of soil particles

(C) Water holding capacity of soil

(D) None of the above.

Ans. Option (C) is correct.

Explanation : More will be the water holding capacity soil, less will be the air spaces less soil aeration.

Q. 4. Edaphology is concerned with study of :

(A) Soil **(B)** Climate

(C) Biota **(D)** Topography

Ans. Option (A) is correct.

Explanation : Edaphology is the study of soil useful for plant growth.

Directions : In the following questions a statement of Assertion (A) is followed by a statement of reason (R). Mark the correct choice as :

(A) Both Assertion (A) and reason (R) are true and reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and reason (R) are true but reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true but reason (R) is false.

(D) Assertion (A) is false but reason (R) is true.

Q. 5. Assertion (A) : Some organisms like Salmon are known as Euryhaline.

Reason (R) : Euryhalines can tolerate a wide range of salinities.

Ans. Option (B) is correct.

Explanation : Euryhaline animals like salmon can adopt wide range of selinity as they are found in areas where river and sea meets.

III. Population is a group of individuals of a single species living in a given area. It includes spatial arrangement, genetic variation and the dynamics including natality, mortality, biotic potential, carrying capacity, etc. Population structure includes features as density, abundance, spacing, genetic variations. The genetic structure reveals genetic variations and population size.

Q. 1. _____ is the study of the ecology of population.

(A) Autocology **(B)** Demecology

(C) Endaphology **(D)** None of the above

Ans. Option (B) is correct.

> ***Explanation :*** Autocology is the study of species ecology and Edaphology is the study of soil.

Q. 2. _____ species inhabit different geographical areas. Allopatric. **1**

(A) Sympatic **(B)** Allopatric

(C) Both (A) and (B) **(D)** None of these

Ans. Option (B) is correct.

> ***Explanation :*** Allopatric is the evolving of separate species from an arrcestrol population.

Q. 3. Increase in population does not increase in :

(A) Health facilities **(B)** Unemployment

(C) Food resources **(D)** Per capita income.

Ans. Option (B) is correct.

> ***Explanation :*** Unemployment is the unavailability of suitable job can be overcome by developing skill an creating opportunity. So, it does not impacted by increase in population.

Q. 4. Which Indian state has the least population growth?

(A) Kerala **(B)** U.P.

(C) A.P. **(D)** Assam.

Ans. Option (A) is correct.

> ***Explanation :*** Kerala has the least population growth, which has the highest population growth.

Q. 5. There is more competition for survival between :

(A) Different animals of same niche

(B) Same animals of same niche

(C) Different animals of different niche

(D) Same animals of different niche.

Ans. Option (B) is correct.

> ***Explanation :*** Same animals under the niche have limited food resource. So, same animals would have same food habit and there is more competition for survival.