

ORGANISMS, POPULATIONS AND COMMUNITIES ANSWERS

1. (a) The study of the interrelationships between living organisms and their environment, both abiotic and biotic. (b) Living (c) Non-living or physical (d) All the biotic organisms and abiotic factors in a certain area (e) The physical area in which an organism can be found (f) The particular part of the habitat that a species uses and the way that it uses it (g) All the organisms in a certain area (h) The number of individuals of a given species that inhabit a certain area (i) The number of organisms of a given species per unit area (j) A population of a given species which moves from place to place (k) The maximum numbers of individuals in a population that can be supported at any time (l) A characteristic that enables an organism to survive or function more effectively in its environment.

2. Structural adaptation e.g. hollow bones of birds give them a lighter mass better suited for flying.

Physiological adaptation e.g. hibernating bears can drop their body temperatures to just above the surrounding temperature and reduce their metabolic rates through the winter when food is scarce and mobility is hampered by unfavourable weather conditions.

Behavioural adaptation e.g. Peacocks will fan their plumage to attract a suitable mate.

3. (a) physiological (b) behavioural (c) structural (d) behavioural

4. Availability of food, water, oxygen and nesting sites; predation; disease; weather conditions; migration; birth and death.

5. The “weeds” are better adapted to the habitat by having a higher metabolic rate, more effective root system and so on. The expensive nursery plants may be exotic plants that do not normally grow in this habitat and are less adapted to the physical conditions.

6. The root hairs will be more capable of absorbing water for photosynthesis and other body processes if the plant roots grow more rapidly. They may be able to grow laterally to absorb more water after rain, or more deeply to take in more water from the water table.

7. The characteristics of these organisms will not be passed to successive generations. This may be advantageous if the characteristic is not suited to survival in the environment.

8. B=Birth; I=Immigration into the area; D=Death; E=Emigration out of the area.

Population is increased by more development of more offspring, and by new organisms entering the area. Population is decreased by deaths and organisms moving out of the area. The difference between them is the overall population change.

9. Population change = $(870 + 240) - (1700 + 601) = -1191$

The population has been reduced by 1191 individuals.

10. (a) Sampling Quadrats is a method used mainly for terrestrial habitats. The individuals in a square whose side may vary from 1 metre to 10 metres are counted and position recorded. Then that number is multiplied by a scale factor to estimate the total population in the larger area.

10. (b) Mark-release-recapture method is better suited for aquatic habitats where animals move too fast to be counted. Catch a large number of the individuals in an area and mark them appropriately e.g. by tagging, painting. Then release them back into the area. Some days later, again catch a large number of individuals and calculate the proportion of marked individuals. Then estimate the total number of individuals in the area.

11. 8 kangaroos per square kilometre

12. Communities are named by the dominant species or other obvious feature e.g. river redgum community, coral reef community, freshwater community.

13. Yes. The species present would change with the change of night as nocturnal animals emerge and day as the diurnal animals are active, with the seasons as animals migrate to warmer climates in the winter, with the tides affecting the activity of animals in the inter-tidal zone, and so forth.

14. (a) mostly terrestrial, humid, shaded, protected from extremes of weather (b) inter-tidal zone, varies in amounts of saltwater oxygen sunlight temperature food, exposed to extremes of weather and waves much of the time (c) marine, dark, high water pressure

15. (a) Seasons occur because the earth is tilted on its axis as it revolves around the sun, and this causes variable night and daylight hours.

15. (b) Tides are caused by the gravitational pull of the moon and the sun on the earth's oceans. Spring tides occur when the sun, earth and moon are in alignment and cause extremely high high-tides and extremely low low-tides. Neap tides occur when the sun, earth and moon are at right angles to each other, and this forms low high-tides and high low-tides.

16. Diurnal animals are active in the daytime e.g. most birds. Nocturnal animals are active at night e.g. possums.

17. Both environments have similar abiotic factors. It is the amount of these that varies.

(a) Amounts of oxygen carbon dioxide and water; wind velocity; soil type, nutrient levels and pH; temperature; relative humidity; litter depth; soil and litter moisture content; light intensity.

(b) Amounts of dissolved salts such as nitrates and phosphates, oxygen and carbon dioxide; waves and currents; water pressure; temperature; pH; turbidity; B.O.D.

18. The seedling in the open field is exposed to sunlight and extremes of weather more so than the forest seedling which has less light and more humidity. The open paddock seedling is more obvious to predators, but there are more animals including predators in a forest so the forest seedling though less obvious may be exposed to more predators. The seedling in the open paddock does not compete with nearby plants for soil nutrients and water as does the forest seedling. The open paddock may be benefited or adversely affected by the fertilisers and pesticides that may have been used in the paddock, whereas the effects of these on the forest will be less. In general, more information about the types of plants and their individual requirements and the conditions in these areas is needed to make a judgement.

19. (a) The solutes are the coffee and sugar, the solvent is the hot water, and the solution is the whole coffee drink.

19. (b) The concentration of salts inside a freshwater organism is less than the surrounding saltwater, therefore salts will diffuse into the organism. Also the proportion of water inside the freshwater organism is greater than the surrounding saltwater, so water will diffuse out of the organism and it will shrink (plasmolysis).

If a marine organism is placed in freshwater, the concentration of salts inside the organism is greater than the freshwater so salts will move out of the organism. Also the proportion of water inside the marine organism is less than the freshwater, so water will diffuse into the organism causing swelling (turgor).

20. Each organism has limits to the amounts or concentrations of abiotic factors it can withstand. If the amounts or concentrations are lower or higher than these, disease or death may result or the organism may migrate to a more favourable environment. For example, an aquatic animal will not survive in a terrestrial environment as the amounts of oxygen and water differ too greatly from that they can tolerate.

21. (a) The relationship where organisms of two different species require the same resource such as food e.g. sheep and kangaroos compete for grass (b) The relationship where one organism, the predator, hunts and eats its prey e.g. lion hunts and feeds on antelope (c) The relationship where organisms of two different species live in close proximity for a long period of time (d) A form of symbiosis where one organism feeds directly from another which does not usually die e.g. ticks are the parasites which feed off a dog which is the host (e) A form of symbiosis where both organisms benefit e.g. a remora fish feeds by cleaning the skin of a shark and is protected from predation by its close proximity to the shark (f) A form of symbiosis where only one organism benefits from the relationship but the other is neither harmed nor benefited e.g. barnacles move through the water feeding as they go on the backs of whales.

22. Food, water, oxygen, nesting sites or burrows, hunting territories, mates.

23. (a) parasitism (b) commensalism (c) mutualism

24. (a) An organism which can manufacture complex organic compounds from simpler compounds such as carbon dioxide and water e.g. green plants (b) An organism which cannot synthesise its own food from simpler compounds and therefore must live at the expense of autotrophs or upon decaying matter e.g. most animals and fungi (c) An autotroph such as a green plant which is usually the start of a food chain.

24. (d) A heterotroph which eats either a producer or another consumer (e) Plant-eater (f) Meat-eater (g) A heterotroph that feeds on both plant and animal matter (h) A heterotroph which lives on or in a host and feeds directly on its blood or sap (i) A heterotroph which feeds on the remains of dead animals and plants. Two types of detritivores are scavengers and decomposers. (j) A detritivore which feeds directly on dead plants and animals e.g. eagles, ravens, ants, blowfly larvae and worms (k) A detritivore which digests dead remains outside of its body e.g. micro-organisms such as bacteria, protozoa and fungi (l) A sequence of organisms through which energy is transferred from its ultimate source in a plant, by the process of eating (m) A network of food chains (n) Each level within a food chain e.g. producer, first order consumer (o) The amount at each trophic level in a food chain

25. The first step in most food chains is the producer, usually a green plant which converts the energy of sunlight into carbohydrates which are then consumed by other organisms. Since there is a loss of energy at each trophic level, the supply of sunlight energy must be continuous.

26. (a) The dead plant material provides the nutrients such as carbohydrates needed for the fungi and so on.

26. (b) Plant material → Mould → Cave cricket → Cave frog

26. (c) The first order consumer is the mould, and the second order consumer is the cave cricket.

26. (d) The numbers of cave crickets would increase rapidly to a peak where they would stagnate in numbers due to insufficient food in the form of cave crickets, whose numbers would rapidly decrease.

26. (e) These introduced animals would compete successfully with the cave frogs, and the cave frog numbers would decline. For a time the numbers of cave crickets would also rapidly decline as they are prey for two types of organisms.

27.

28. The biomass tends to decrease at each trophic level.

29. Succession is the progression of organisms which inhabit new land over time e.g. plant succession on sand dunes is by spinifex which binds the sand and increases humidity while decreasing temperature, pigface and then shrubs such as wattle which further stabilise and enrich the sand providing shade, banksia trees which provide more shade stability and humidity, and finally tall eucalypt trees which are the last or climax community.

30. Nurserymen place the seeds in boiling water for a few minutes and then sow them in soil.