

## ECOSYSTEMS ANSWERS

1. (a) A natural unit of living and non-living parts that interact to produce a stable system in which the exchange of materials between living and non-living parts follows a circular path (b) A large, easily differentiated community unit arising as a result of complex interactions of climate, other physical factors and biotic factors (c) The sum of all the biomes on the earth
2. (a) In the process of photosynthesis, cyanobacteria convert carbon dioxide to carbohydrates. Bacteria which respire convert carbohydrates into carbon dioxide. Decay bacteria break down the carbon compounds of dead plants and animals to carbon dioxide.

2. (b) Nitrogen-fixing bacteria such as the cyanobacteria *Nostoc* and the soil bacteria *Azotobacter* and *Clostridium* can fix atmospheric nitrogen into organic nitrogenous compounds such as amino acids. Other bacteria called *Rhizobium* can also fix nitrogen when they are in combination with cells from the roots of legumes such as peas and beans. When the bodies of the nitrogen-fixing bacteria are acted on by decay bacteria, the amino acids are converted to ammonia. Decay bacteria can also convert dead plants and animals and their excreta to ammonia. Most of the ammonia is converted by nitrite bacteria to nitrites and is then converted to nitrates by nitrate bacteria. Denitrifying bacteria can convert some of the ammonia to atmospheric nitrogen.
3. The phosphorus cycle is not completely balanced because phosphates are being carried into the sediments at the bottom of the sea faster than they are being returned by the defaecation of sea birds and fish.
4. Yes. Carbon atoms are continually converted into one form or another, and carbon dioxide gas can be transferred to other locations by wind.
5. (a) Producers take soil nutrients, water and carbon dioxide from the ecosystem, and contribute oxygen and energy in the form of carbohydrates for consumers and other compounds for decomposers. Also they contribute shelter, shade, support and humid environments for other organisms.

5. (b) Consumers take oxygen from the atmosphere, and food and water from other organisms on which they feed, and contribute carbon dioxide, nitrogenous excreta and heat to the environment.
6. No. Photosynthesis and respiration and their gas exchange are just two other processes by which organisms interact indirectly.
7. There is a loss of energy at each trophic level. The loss of energy is caused by three factors :
- \*the inefficiency of the organisms at capturing and digesting available food
  - \* the use of organic material to supply energy for maintenance, growth and reproduction by the organisms at each trophic level
  - \* the loss of energy as heat during the breakdown of organic material to supply energy for maintenance, growth and reproduction.
8. Bare ground
9. The white ice sheets reflect large quantities of light. This would affect regional temperatures.
10. There is merit in this idea in that there would be fewer trophic levels and subsequent reduction in overall energy loss. The refrigeration and cooking energy required for plant matter would be less than that for meat. However humans do require certain essential nutrients that can only be obtained from animal products.
11. (a) Biological magnification - Certain chemicals such as DDT and heavy metals cannot be excreted from the body after ingestion. They increase with each amount ingested and increase further at each trophic level of the food chain. If the higher order consumers accumulate a toxic level of these chemicals, they may die.
11. (b) Biological control - Instead of using chemicals such as pesticides to control pest numbers, predators of those pests may be introduced e.g. *Cactoblastis* moths were introduced to control the prickly pear plant. Also diseases which cause death specifically of the pest may be used
- e.g. release of the Myxomatosis virus to kill many of the rabbit population.

12. \*Rainforest - High rainfall, tropical and temperate areas, canopy of evergreen tall trees densely spaced, deep litter layer with little grass.

\* Wet sclerophyll forest - Moderate rainfall, warm temperate areas, medium tall trees, eucalypts common, shrubs and ferns on floor.

\* Dry sclerophyll forest - Rainfall between 700 and 900 mm, warm temperate areas, trees not as tall as wet sclerophyll forests, eucalypts common, fewer shrubs and ferns, some drought-resistant shrubs.

\* Woodland - Rainfall between 500 and 750 mm, temperate to tropical areas, scattered trees shrubs and grasses, Eucalypts casuarinas acacias and pines common, Savannah woodland has more grass than shrubs.

\* Scrubland - Low rainfall, high temperatures, scattered low trees or tall shrubs e.g. mallee and mulga, well developed grasses.

\* Grassland - Low rainfall, tropical and temperate areas, hardy grasses e.g. spinifex, no trees.

\* Desert - Low and infrequent rainfall, high temperatures, hardy grasses in places, saltbush and bluebush.

\* Monsoon forest - High rainfall, high temperatures, jungle-like forests with eucalypts and palms.

13. Rainfall and temperature

14. Natural ecosystems have constant recycling of most materials which are bio-degradable, continuous input by sunlight, and greater diversity of organisms which show adaptations to the area. Agricultural ecosystems based on a monoculture have little diversity of organisms which are introduced to the area, continuous input by sunlight fertilisers and pesticides (which may not be bio-degradable or which may have a non-specific effect on more organisms than those for which they are intended to control), and the effects of overgrazing and logging may cause problems with salinisation and erosion.

15. Eutrophication is caused by the excessive growth of algae due to excess nitrates and phosphates which have found their way into streams and lakes.

16. (a) Chlorofluorocarbons used in spray cans refrigerators and air-conditioners react with ozone in the atmosphere causing more thinning of the ozone layer which should reflect harmful ultraviolet radiation away from the earth.

16. (b) Phosphates that find their way into sewage eventually end up in streams and lakes causing eutrophication.

16. (c) Plastic shopping bags are not bio-degradable, and also remain a danger to aquatic animals which may ingest them.

16. (d) Food containing preservatives inhibits growth of decomposing bacteria. They take many years to decay compared with unpreserved foods.

16. (e) Sulphur dioxide when mixed with atmospheric water causes acid rain which causes leaf damage.

17. Before the introduction of exotic plants or animals into Australia, they must proven to be an integral part of the ecosystem so that they do not become pests. An example of introduced species that have proliferated to pest proportions are lantana plants, prickly pear, rabbits and cane toads. Also imported goods may carry pathogenic micro-organisms.

18. The problem may be salinisation ( an increase in the concentration of salts in the soil). Removal of native vegetation reduces the amount of water cycled through transpiration so that more water flows through hillsides, dissolving salt (leaching) and carrying it to the underground water table. Underground water becomes more saline, and because trees are not using water, the water table rises, bringing the salty water near the surface.

19. The “standard of living” probably indicates an increase in electrical appliances in the home and workplace causing excessive pollution through inefficient burning of fossil fuels for their manufacture and use, the increased use of motor vehicles with resultant acid rain from their exhaust emissions, and the increase of non-biodegradable sewage and garbage.

20. The millions of tonnes of zooplankton and phytoplankton respire and produce the Greenhouse gas, carbon dioxide. However only phytoplankton photosynthesise taking carbon dioxide out of the atmosphere.

21. An endangered species is one which is few in number and may die out if their habitats or the conditions required for continued existence are not met. An extinct species is one which has died out.