

Answers to end-of-chapter questions

Chapter 20: Organisms and their environment

- 1 a to make carbohydrates, fats and proteins
- b by photosynthesis; carbon dioxide from the air is used to make carbohydrates
- c They are given out from the plant as carbon dioxide.
- d They break down carbohydrates, fats, proteins and other carbon-containing materials in dead organisms or waste products from them; they then respire, giving out carbon dioxide to the atmosphere.
- 2 a A producer is an organism that makes its own organic food materials from inorganic ones; plants are producers, as they make organic nutrients by photosynthesis. A consumer is an organism that depends on organic nutrients made by producers; animals and fungi are consumers.
- b A primary consumer obtains its energy by feeding on plants; it is a herbivore. A secondary consumer obtains its energy by feeding on primary consumers; it is a carnivore.
- c A community is all the organisms, of all the different species, living together in the same place at the same time. A population is all the organisms of one species, living together in the same place at the same time and able to breed with one another.
- d A food chain shows how energy is transferred from one organism to another, showing only one species at each trophic level. A food web shows many interlinking food chains, with more than one species shown at each trophic level.
- e A pyramid of biomass is a type of graph that uses the sizes of bars to represent the biomass of all the organisms at each trophic level. A pyramid of numbers is a type of graph that uses the sizes of bars to represent the numbers of all the organisms at each trophic level. In both cases, the bars are stacked centrally on each other, with producers at the base and top consumers at the apex.
- 3 a to make amino acids, and therefore proteins
- b Nitrogen gas in the air is in the form N_2 , and is highly unreactive. The gas simply diffuses into their bodies and out again without ever getting involved in any metabolic reactions or becoming part of their bodies.
- c the conversion of unreactive N_2 to a more reactive form, such as nitrate, NO_3^-
- d Some live in root nodules of leguminous plants; others live free in the soil.
- e by eating plants or other animals, and getting proteins from them
- f They convert ammonia NH_3 to nitrate NO_3^- .
- g denitrifying bacteria
- 4 a i nitrates
- ii nitrogen gas
- iii proteins
- b There are many different ways the diagram could be constructed, but it should show:
- N_2 in the air and dissolved in water
 - blue-green algae instead of bacteria carrying out nitrogen fixation
 - proteins in blue-green algae instead of in plants
 - a marine animal instead of the cow
 - reference to sea water or sediments instead of soil.

- 5 a The lower curve represents ladybirds and the higher curve aphids.
- b Ladybirds are predators, so are present in smaller numbers than their prey.
- c The population size of each organism affects that of the other. When the aphid population rises, this provides more food for ladybirds, so their population rises too. This reduces the aphid population, which falls, so the ladybird population also falls.
- d There is a time lag between the change in one population and the other, so the two curves are not quite in synchrony with each other.
- 6 a i sunlight; [1]
ii chemical energy; [1]
- b i respiration; [1]
ii movement / muscle contraction;
active transport;
generating heat to keep the body warm;
transmission of nerve impulses;
building large molecules from small ones; [max 3]
- c i the food web should show an arrow going from the wildebeest to ticks, another arrow going from the ticks to the oxpeckers; and an arrow going from the wildebeest to the oxpeckers; [1]
ii energy is lost between trophic levels;
90 % of energy lost / only 10 % of energy passed on;
lost, in respiration / as heat;
so fewer organisms can be supported at each trophic level; [max 3]
- 7 a carbon;
hydrogen;
oxygen;
nitrogen;
sulfur; [max 4]
- b nitrogen-fixing bacteria;
convert nitrogen from the air;
to ammonium ions / NH_4^+ ;
which can be used to make amino acids; [max 3]
- c decomposers;
break down proteins in the plant;
to amino acids;
then to, urea / ammonia;
nitrifying bacteria;
convert ammonia to nitrate ions; [6]
- d light intensity;
water;
temperature;
carbon dioxide concentration; [max 3]
- e only a few aphids present at first, so even when they reproduced they produced only a small number of offspring;
soya plants still small at start;
so not much food for the aphids;
aphids have to become adult before they can start to breed; [max 3]