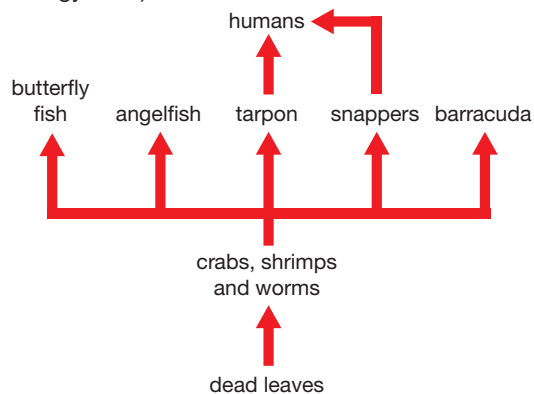


- b** Plants = producers; animals = consumers; decomposers = breakdown of dead material.
- 6 ▶ a** **i** Plankton. **ii** Krill.
b Quaternary consumer / top carnivore.
c Very large amounts of photosynthesis / production by the plankton can support this number of trophic levels.
- 7 ▶ a** Any two from:
 • trees → moths → small birds → owls
 • trees → moths → small birds → weasels
 • trees → moths → small birds → shrews
 • trees → moths → beetles → shrews
b Vole or small bird.
c Reduction in dead leaves means there will be fewer earthworms and beetles, so less food for shrews.
d In the pyramid of numbers there are only 200 trees, but each tree has a very large mass, and the pyramid of biomass shows the total mass of the trees.
- 8 ▶ a** X = ammonia; Y = nitrate; Z = decomposer.
b Active transport.
c Bacteria that convert nitrogen gas into ammonia.
d In urine / faeces and in death.
- 9 ▶ a** $(125/3050) \times 100 = 4.1\%$.
b As urine / faeces, and as heat from metabolic processes / respiration.
c Eaten by other herbivores, or ends up in dead matter / passes to decomposers.
- 10 ▶ a** (For simplicity, crabs, shrimps and worms can be put together. Arrows should point in the direction of energy flow.)



- b** Any suitable food chain with four organisms, such as:
 • dead leaves → crabs → tarpon → humans
 • dead leaves → shrimps → snappers → humans
- c** **i** Carbon dioxide.
ii Decomposers feed on the detritus; their respiration produces carbon dioxide as a waste product.

- 6 ▶ a** The concentration of carbon dioxide is increasing.
b The increase is due to increased burning of fossil fuels.
c In the summer there is more photosynthesis, which lowers the concentration of carbon dioxide. In the winter there is less photosynthesis, so carbon dioxide levels increase.
- 7 ▶ a** Any two: carbon dioxide, methane, water vapour, CFCs
b Without a greenhouse effect, the temperature on the Earth's surface would be much colder than it is now, and life would not be able to exist. (One estimate is that the average temperature would be 30°C lower.)
c Malaria is spread by mosquitoes, which are found in warmer regions of the world. If global warming occurs, mosquitoes will spread to more northerly parts of Europe.
- 8 ▶ a** Rain washes fertiliser into the pond, causing the algae to grow.
b Rain washes the fertiliser down hill away from the pond.
c Algae are photosynthetic organisms (protocists). An increased temperature increases their rate of photosynthesis, so they grow faster.
- 9 ▶** Sewage causes growth of bacteria in the water. The bacteria need oxygen for growth, using up the oxygen in the water, so that the fish suffocate / die.
- 10 ▶ a** Pesticides kill pests (insects etc.) so less crop eaten; fertilisers supply minerals that increase the growth of crops.
b Use manure as fertiliser. After the crop has been harvested, dig in remains of plants, allowing them to decay and release nutrients. Use crop rotation including leguminous plants to produce nitrates. Use biological control methods to reduce pests.

END OF UNIT 4 QUESTIONS

- 1 ▶ a** **i** Any of the following for 1 mark:
 • plankton → sea butterfly → arrow worm → herring
 • plankton → small crustaceans → large crustaceans → herring
 • plankton → copepods → sand eel → herring
ii Primary consumer = sea butterfly / small crustaceans / copepods (1 mark for correct organism from food chain used).
 Secondary consumer = arrow worm / large crustaceans / sand eel (1 mark for correct organism from food chain used).
iii Herring (1). It is a secondary consumer when it feeds on other small crustaceans, and a tertiary consumer when it feeds on sand eels or arrow worms (1).
- b** **i** Pyramid drawn correctly, with relative amounts of energy at each trophic level approximately correct (1).
ii $(892/8869) \times 100 = 10.1\%$ (1 for correct values in calculation, 1 for answer).
iii $(91/892) \times 100 = 10.2\%$ (1 for correct values in calculation, 1 for answer).

CHAPTER 15

- 1 ▶** B **2 ▶** A **3 ▶** A **4 ▶** C
- 5 ▶** Because of the great increase in the human population, the need to produce food to sustain the population, and the industrial revolution and growth of technology.