

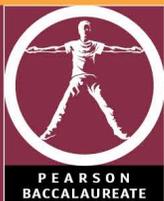
# Biology

HIGHER LEVEL

## Worksheet 5.1

### Fifteen summary facts

- 1 Ecology is the study of relationships between living organisms and between organisms and their environment.
- 2 Populations of species live in communities which occupy a specific habitat – these populations live in and interact with their environment, thus constituting ecosystems.
- 3 Food chains and food webs use a series of arrows to show the ecological relationships between organisms – here, the term ‘relationship’ can be thought of as ‘who eats whom’.
- 4 Trophic levels are used to enumerate the steps taken as energy is passed along a food chain: the first trophic level is occupied by the producers (autotrophs), the second level is occupied by the primary consumer (some type of herbivore), the third trophic level is occupied by a secondary consumer (a heterotroph which eats the herbivore), etc.
- 5 While water and minerals are constantly recycled, energy is not – in a typical food chain, energy starts as sunlight, is transformed into chemical energy by autotrophs and flows through the food chain. However, the system is highly inefficient and most energy is lost rather than passed on. This can be seen in a pyramid of energy.
- 6 Food webs must constantly recycle minerals – this job is done by decomposers which break down non-living organic material thus unlocking simpler compounds to be useful for other organisms.
- 7 Carbon is an essential chemical element in the biosphere and it is recycled between the air, soil and living organisms in a process called the carbon cycle.
- 8 The carbon cycle is being pushed off balance by human activity such as the burning of fossil fuels – this has intensified the planet’s natural greenhouse effect. The greenhouse effect is a natural phenomenon which keeps Earth’s surface warm by letting in light energy, converting the light energy to heat energy and retaining the heat the same way the glass of a greenhouse does. The problem is, the intensification of this effect is causing large sheets of polar ice in the Arctic to melt, adversely affecting the organisms which live there.
- 9 The precautionary principle is an ethical theory which says that action should be taken to prevent harm even if there is not sufficient data to prove that the unchecked activity will have severe negative consequences; the debate today is whether or not the precautionary principle should be invoked when making decisions about things such as carbon emissions.



# Biology

HIGHER LEVEL

- 10** Over time, populations tend to follow a sigmoid curve that can be divided into three phases:
- the exponential phase – a population grows rapidly from a small number of individuals
  - the transitional phase – population growth slows
  - the plateau stage – numbers stagnate as the population reaches its carrying capacity.
- 11** Evolution is the process of cumulative change in the heritable characteristics of a population – the evidence for evolution can be seen in:
- the fossil record which shows continual changes in organisms over time
  - the selective breeding of domesticated animals to produce varieties which did not exist before
  - homologous structures such as the pentadactyl limbs of whales, humans and bats.
- 12** Evolution by natural selection as proposed by Darwin and Wallace follows these steps:
- a) there is an overproduction of offspring generating a competition for resources
  - b) there is variation within populations allowing some offspring to have a slight advantage over others
  - c) individuals which possess characteristics that are poorly adapted for their environment tend to be less successful at surviving and therefore at finding a mate
  - d) individuals which possess characteristics that are well adapted for their environment tend to be more successful at surviving, finding a mate and passing on their genetic characteristics to the next generation
  - e) after many generations, slight changes can accumulate to a point where the current generation is very different from its ancestors.
- 13** Examples of natural selection in modern times include antibiotic resistance in bacteria and pesticide resistance in rats.
- 14** Every identified organism on Earth has a scientific name based on the binomial nomenclature system – the first name is the genus and the second is the species. Various plant and animal phyla have been set up based on:
- morphological characteristics (e.g. annelids are worms that have segmented bodies)
  - reproductive characteristics (e.g. bryophytes reproduce by spores rather than flowers or seeds).
- 15** Dichotomous keys can be used to help identify the kingdom, phylum, class, order, family, genus and species that an organism belongs to.