

Answers to Workbook exercises

Chapter 10

Exercise 10.1 Food poisoning in the USA

- a An organism that causes disease.
- b Look for:
- ◆ pathogen on the x -axis, and number of cases *or* percentage of cases *or both* on the y -axis; if both are plotted, then two axes will be needed, one on the left and one on the right
 - ◆ suitable scale or scales on the y -axis or y -axes, fully labelled
 - ◆ bars plotted accurately
 - ◆ if only one of number or percentage is plotted, the bars should not touch; if both are plotted, then the two bars for one organism can touch
 - ◆ if both number and percentage are plotted, there should be a key or label to make clear what each bar refers to.
- c Perhaps there were other pathogens causing food poisoning; perhaps not all cases of food poisoning were able to be identified as being caused by a particular pathogen.
- d Most people would not bother to go to a doctor when they have food poisoning, so there will be many unrecorded cases.
- e For example: keep food cool (in a fridge); wash hands and cooking implements carefully before allowing them to come into contact with food; cook food thoroughly and either eat while hot, or cool rapidly; keep raw meat and other food that may carry pathogens away from food that is to be eaten cold.

Exercise 10.2 Waste disposal in Australia

- a The amount of solid waste that was recycled increased from 15 000 000 tonnes (1.5×10^7) to 23 000 000 tonnes, an increase of 8000 000 tonnes. The amount of solid waste that was deposited as landfill also increased, from 17 000 000 tonnes to 21 000 000 tonnes, an increase of 4000 000 tonnes. The total increase in all solid waste was therefore 12 000 000 tonnes. The increase in recycled waste was twice the increase of landfill waste. This means that in 2006–7, unlike 2002–3, the amount of waste that was recycled was greater than the amount of waste deposited as landfill.
- b Answers could include some of these ideas.
- ◆ Landfill sites can cause pollution, if they are not well constructed and maintained. For example, run-off from them can carry pollutants (such as heavy metals or other named substances) into nearby waterways, where they can harm aquatic animals or humans coming into contact with the water.
 - ◆ Uncovered landfill sites can be a magnet for houseflies, rats and other pests, which can then carry pathogens to human habitations.
 - ◆ Landfill sites take up space which could be habitats for plants and animals.
 - ◆ Non-biodegradable plastics on landfill sites can harm animals that may eat them or get trapped in them.

- ◆ Recycling means that less landfill has to be used.
- ◆ Recycling reduces the need to mine resources such as metals, fossil fuels (used for making plastics) and sand (used for making glass), and so reduces the damage to habitats and the pollution that can be caused by these activities.

- c i 2002–3: $15\,000\,000 + 17\,000\,000 = 32\,000\,000$ tonnes
 2006–7: $23\,000\,000 + 21\,000\,000 = 44\,000\,000$ tonnes
- ii $44\,000\,000 - 32\,000\,000 = 12\,000\,000$ tonnes
- iii $(12\,000\,000 \div 32\,000\,000) \times 100 = 37\%$

S Exercise 10.3 Eradicating polio

- a For example: children are more likely to put their hands to their mouths without washing them first; they are more likely to play in contaminated water.
- b Look for some of these ideas. (*For some of the points, accept other years to be quoted.*)
- ◆ The number of polio cases has fallen from about 53 000 in 1980 to just over 3000 in 2005.
 - ◆ The highest number of cases was in 1981, when 66 000 cases were recorded.
 - ◆ The steepest fall was from 1981 to 1983 or 1984.
 - ◆ Numbers of cases fluctuated between 1982 and 1988, remaining roughly constant at just below 40 000 cases per year.
 - ◆ Numbers fell fairly steadily from 1987 to 1995 or 1996.
 - ◆ Numbers remained very low, fluctuating only slightly, between 2001 and 2005.

- c Immunisation coverage increased sharply from 1980 to 1991, from about 22% to 76%. This coincided with a sharp decrease in the number of polio cases. Immunisation coverage remained high from 1991 onwards, increasing slightly to 78%. This coincided with a steady fall, and then constant low level, in the number of polio cases. This could be explained if immunisation does reduce the number of cases. However, it is not impossible that some other factor is causing the fall in cases, as a correlation does not prove cause.
- d The antigens in the vaccine would be digested by enzymes, or broken down by stomach acid, in the alimentary canal, before they could be absorbed into the blood.
- e The antigens on the polio viruses would be recognised as foreign by lymphocytes. These lymphocytes would multiply to form a clone, which would then make antibodies against the viruses. Some of them would remain in the blood as memory cells. If the polio virus is encountered again, these memory cells will rapidly make antibodies to destroy them.
- f The sequence of the bases in the virus's DNA codes for the sequence of amino acids in proteins that are made. If the bases are different, the amino acid sequence in the proteins will also be different, so the protein will not work in the same way as usual. If this protein is needed to help the virus to reproduce, then it will not be able to do so.