

- 1 Scientists are considering the use of a genetically engineered virus to kill a population of the cane toad, *Bufo marinus*, which is growing out of control in Australia.

This virus will introduce a modified form of genetic material, responsible for hormone production. The normal hormone causes the toads to mature in a similar way to hormones causing puberty in mammals. The modified genetic material will prevent toads maturing, leading to their death.

The toad was introduced into Australia because it eats scarab beetles, a pest of sugar cane plants. Sugar cane is an important crop plant.

Animals such as crocodiles and dingos are predators of the toad, but the toad can kill them by squirting a powerful toxin.

- (a) Define the term *genetic engineering*.

.....
..... [2]

- (b) State which part of the virus would carry the modified genetic material.

..... [1]

- (c) (i) Name the hormone that causes puberty in male mammals.

..... [1]

- (ii) State two characteristics that develop in a boy when this hormone is produced.

1
2 [2]

The toad population is increasing out of control. In terms of a sigmoid growth curve, it is in the exponential phase.

- (d) (i) 1. Sketch a sigmoid growth curve using the axes below.
 2. Label the axes (units are **not** needed).
 3. Label the exponential phase of the curve



[4]

- (ii) Suggest **one** limiting factor, other than viruses or predators, that could stop the toad population rising.

..... [1]

- (e) (i) Construct a **food web** for the organisms named in this question.

[2]

- (ii) Complete the table by writing each of the organisms you used in the food web in the correct column.

carnivore	herbivore	producer

[3]

[Total : 16]

2 Fig. 6.1 shows population pyramids for a developing country and a developed country.

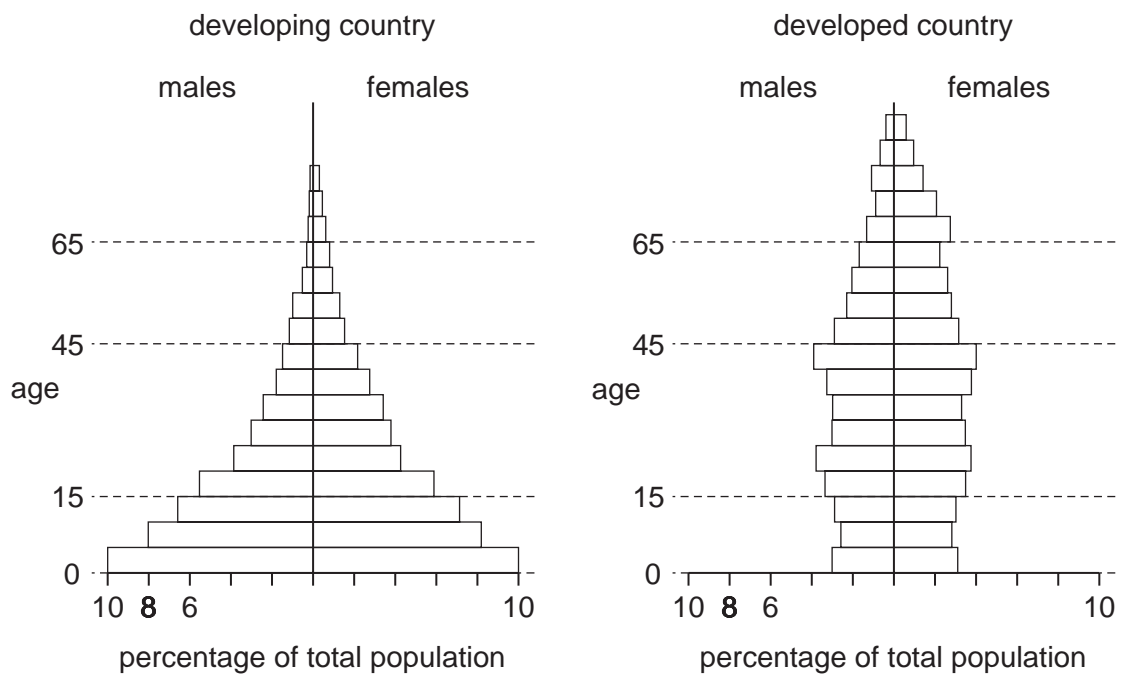


Fig. 6.1

(a) Describe how the percentage of people in the population varies with age in

(i) a developing country,

.....

(ii) a developed country.

.....
 [3]

(b) These countries have a similar population size. Compare the two pyramids. State **one** difference between the populations

(i) at under 15,

.....

(ii) over 65.

.....
 [2]

- (c) The pyramids can also be used to compare proportions of males and females in a population.

State one way in which these pyramids are similar for people who live more than 65 years.

..... [1]

- (d) With reference to **X** and **Y** chromosomes, explain the expected ratio of males to females at birth.

[4]

(e) Fig. 6.2 shows survival curves for developing and developed countries, based on samples of 10 000 people. The graph can be used to estimate the average life expectancy, defined as the age at which 50% of people in the sample are still alive.

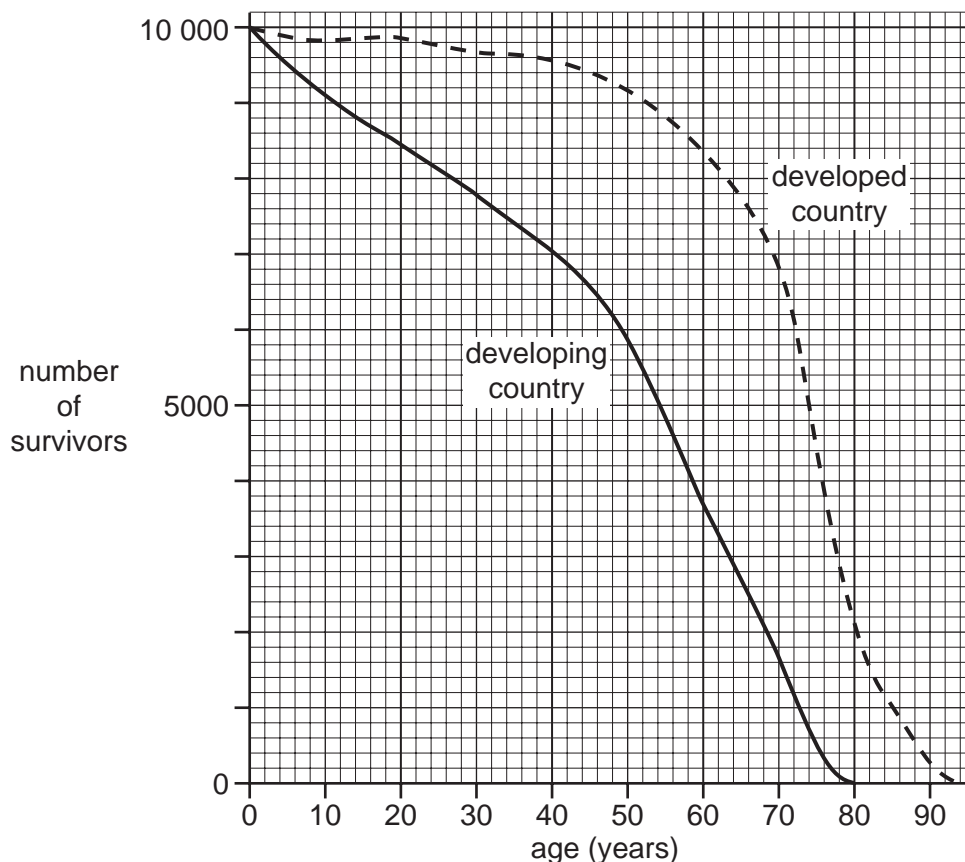


Fig. 6.2

(i) Using Fig. 6.2, estimate the average life expectancy for people in a developing country and a developed country. Write your answers in the table.

	average life expectancy
developing country	
developed country	

[1]

(ii) Suggest two reasons for the difference in life expectancy.

1.
2.

[2]

[Total:13]

- (b) Soya beans and beef produced on the land are both good sources of protein. Table 3.2 shows the nutritional content of products made from soya and beef.

Table 3.2

product	nutritional content per 100 g of product			
	energy / kJ	protein / g	saturated fat / g	fibre / g
corned beef	905	26.9	12.1	0.0
soya sausages	1128	19.0	2.1	2.0

- (i) Using data from Table 3.2, state and explain two reasons why soya sausages may be healthier than corned beef as a major item in the diet.

1

.....

.....

.....

2

.....

..... [4]

- (ii) Soya beans are harvested from plants. Corned beef is produced from cattle that have fed on grass.

Explain why it is more energy efficient for humans to eat soya products as a source of protein than corned beef. Use the food chains involved to support your answer.

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 17]

4 Toads are amphibians. Only two species are native to Britain, the Common toad (*Bufo bufo*) and the Natterjack toad (*Bufo calamita*).
 Natterjack toads like warm sandy soil in open and sunny habitats, with shallow pools for breeding. Examples of these habitats are heathland and sand dunes.
 Common toads like cooler, more shady habitats, such as woodland.
 Many areas of sand dunes are being developed for camp sites. Heathland can easily change to woodland as trees grow on it. In the summer, woodland is colder than heathland due to the shade the trees create.
 These conditions suit the Common toad, but not the Natterjack. As a result of the changing habitats the Natterjack toad is becoming an endangered species.

(a) (i) Name **one** external feature that identifies an animal as an amphibian.

..... [1]

(ii) Amphibians are a class of vertebrate.

Name two other vertebrate classes.

1.

2. [2]

(b) State **one** piece of information from the passage to show that the Common toad and Natterjack toad are closely related species.

.....
 [1]

(c) From the information provided, state two reasons why Natterjack toads are becoming endangered.

1.

.....

2.

..... [2]

(d) Suggest measures that could be taken to protect the Natterjack toad from extinction.

.....

.....

..... [2]

Fig. 1.1 shows a food web for British toads.

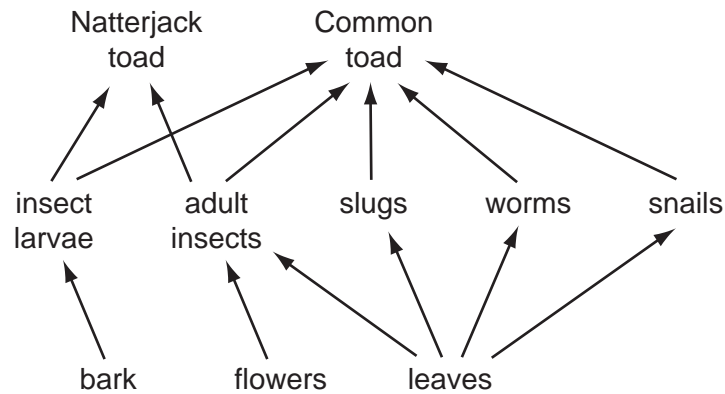


Fig. 1.1

(e) (i) State the trophic level of toads.

..... [1]

(ii) State which foods the two species of toad both eat.

..... [1]

(iii) With reference **only** to food, suggest why the Common toad is more likely to survive when the two species are in competition.

.....
..... [1]

[Total: 11]