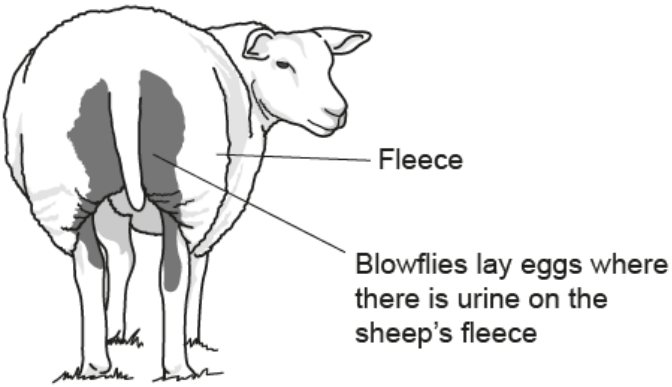
**Life on Earth – past, present and future – 2021/20 GCSE 21st GCSE Biology B**

**1.** Nov/2021/Paper_J257_03/No.6

Flystrike is a condition that affects sheep in the UK and New Zealand.

Blowflies are attracted to the smell of urine on the fleece (wool) around the sheep's backside, as shown in the diagram. They lay their eggs and when the eggs hatch, maggots are released. The maggots bury deep into the sheep's flesh and feed on it as a food source.




Sheep that are most at risk have long fleece.

**(a)** Scientists in New Zealand selectively breed sheep to prevent this problem.

**Table 6.1** gives information on different breeds of sheep and their features.

| Breed of sheep | Features of the breed |
|---|---|
| Cheviot | Bare heads and legs |
| Downs | Produce good meat |
| East Friesian | Bare backside |
| English Leicester | Long flowing heavy fleece |
| Merino | Produce good wool |

**Table 6.1**

**(i)** Select two breeds of sheep from **Table 6.1** that the scientists could use in the selective breeding programme to prevent flystrike, **and** give **one** reason for your selection.

Breeds of sheep:

1 .....

2 .....

Reason .....

.....

**[2]**

**(ii)** Describe how the scientists would use selective breeding to produce sheep that are less likely to get flystrike.

.....

.....

.....

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

**(b)** Sheep and other species produce milk. Milk contains protein, sugar and fat.

**Table 6.2** shows the percentage of sugar found in the milk from some mammals.

| Species | Percentage of sugar in milk (%) |
|---|---|
| Donkey | 6.9 |
| Rabbit | 1.8 |
| Sheep | 4.6 |

**Table 6.2**

**(i)** Describe how Benedict's reagent could be used to show that the amount of sugar in the milk of different species varies, and how the results would support the data in **Table 6.2**.

.....

.....

.....

.....

..... **[3]**

**(ii)** Name the reagent that would test for the presence of protein.

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

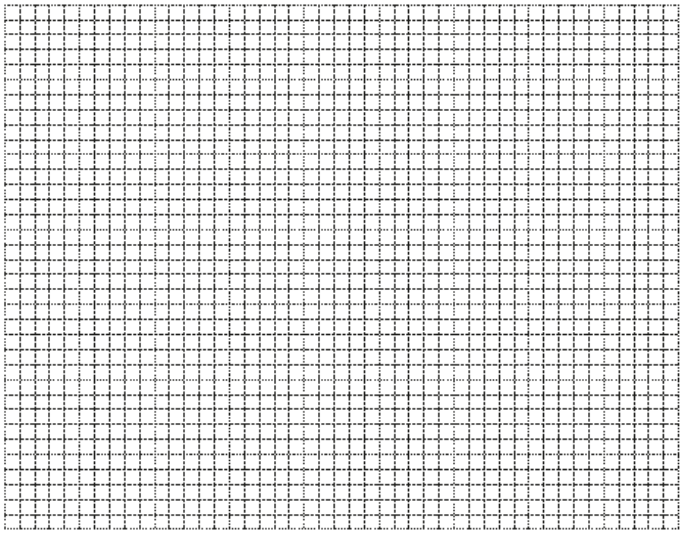
**2.** Nov/2021/Paper_J257_03/No.7

The picture shows an animal called a Tasmanian devil. These animals are only found on an island off the coast of Australia.

The table shows data for the estimated population of Tasmanian devils from 1995 to 2008.

| Year | Estimated population of Tasmanian devils |
|---|---|
| 1995 | 140 000 |
| 2004 | 104 000 |
| 2006 | 84 000 |
| 2007 | 68 000 |
| 2008 | 52 000 |

**(a) (i)** Plot a bar chart to represent the data shown in the table.



**[3]**

**(ii)** Calculate the percentage decrease in the estimated population of Tasmanian devils between 1995 and 2008.

Give your answer to **3** significant figures.

Percentage decrease = ..... % **[3]**

**(b)** The decrease in population is because of a disease called Devil Facial Tumour disease.

Devil Facial Tumour is a form of cancer. It is spread from one Tasmanian devil to another when they bite each other.

How is the Devil Facial Tumour cancer different from cancers found in humans?

.....

.....

.....

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

**(c)** Scientists have discovered six disease-resistant Tasmanian devils in the population.

Initially scientists did not know if this resistance was hereditary.

Suggest how the scientists could investigate whether the resistance could be inherited.

.....

.....

.....

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

**3.** Nov/2021/Paper_J257_04/No.6

In the 1800s, Darwin and Wallace suggested natural selection as an explanation for evolution.

**(a)** What can happen as a result of natural selection?

Tick (✓) **two** boxes.

| | |
|---|---|
| New species can be formed. | ☐ |
| Species can become less well adapted to their environment. | ☐ |
| Species can choose how they evolve. | ☐ |
| The characteristics of individuals can change during their lifetime. | ☐ |
| The characteristics of species can change over generations. | ☐ |

**[2]**

**(b)** Darwin and Wallace observed variation in the characteristics of individuals of the same species.

**(i)** This variation in observable characteristics exists because of genetic variation.

Explain what causes genetic variation.

.....

.....

.....

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

**(ii)** Describe **one other** type of evidence observed by Darwin and Wallace that helped them to develop their explanation.

.....

.....

.....

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

**(c)** Darwin and Wallace's explanation is still useful today. It can help us to explain why some serious problems have happened, such as the spread of antibiotic-resistant bacteria.

**(i)** Explain why using antibiotics on bacteria can cause antibiotic-resistant bacteria to become more common.

Use ideas about natural selection in your answer.

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

**(ii)** Scientists have suggested that we should reduce our widespread use of antibiotics and only use them when absolutely necessary.

Give **two** ways in which this could help to slow the spread of antibiotic-resistant bacteria.

1. .....

.....

2. .....

.....

**[2]**

**4.** Nov/2021/Paper_J257_04/No.2

Plants can catch diseases.

**(a)** Complete the table to show which type of pathogen causes each plant disease.

Tick (✓) **one** box in each row.

| **Plant disease** | **Type of pathogen that causes the disease** | | | |
|---|---|---|---|---|
| | **Bacterium** | **Fungi** | **Protist** | **Virus** |
| Ash dieback | | | | |
| Crown gall | | | | |
| Tobacco mosaic | | | | |

**[3]**

**(b)** Plants have defences against pathogens.

**(i)** Which **two** are **plant** defences against pathogens?

Tick (✓) **two** boxes.

- Antibodies ☐
- Antimicrobial substances ☐
- Cell walls ☐
- Stomach acid ☐
- Red blood cells ☐

**[2]**

**(ii)** Give **one** more physical plant defence against pathogens.

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

**(c)** Humans can be vaccinated against some diseases.
Plants cannot be vaccinated against diseases. They do not have any white blood cells.

Explain why this means it is **not** possible to vaccinate plants against disease.

.....

.....

.....

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

**5.** Nov/2020/Paper_J257_03/No.2

In the past, humpback whales have been hunted for meat, oil and blubber (fat).

This hunting (known as whaling) caused their numbers to decrease and for humpback whales to be classed as an endangered species.

Whaling was banned in 1986.

The data in the table shows how the estimated number of humpback whales has changed over time.

| | **Estimated humpback whale population** |
|---|---|
| **Before whaling** | 125 000 |
| **Before the ban on whaling in 1986** | Less than 5000 |
| **2015** | 24 500 |

**(a)** Explain why scientists can only estimate how many humpback whales there are.

.....

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

**(b)** In 2015, humpback whales were removed from the endangered species list.

Do you agree with this decision?

Justify your answer using data from the table.

.....

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

**(c)** Current estimates of population size suggest that the number of humpback whales may not be increasing.

Suggest **two** possible reasons for this.

1 .....

.....

2 .....

.....

**[2]**

**(d)** In 2018, Japan announced that it will start to hunt whales again.

Use the data in the table to explain why scientists are concerned.

.....

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

**(e)** Whales migrate each year to breeding grounds.

On average, the distance travelled is 5000 km and they travel at an average speed of 1.6 km per hour.

Calculate how many **days** it will take the whales to reach the breeding grounds.

Use the equation: time = distance ÷ speed

Give your answer to **2** significant figures.

Time in days = ..... **[3]**

**6.** Nov/2021/Paper_J257_01/No.7

**Fig. 7.1** shows an animal called a Tasmanian devil.

**Fig. 7.1**

**(a)** Tasmanian devils are only found on an island off the coast of Australia. They look very similar to other small animals in Australia but have been classified as a **different** species.

What evidence from their cells could have been used to classify them as a different species?

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

**(b)** **Fig. 7.2** shows the estimated population of Tasmanian devils from 1995 to 2008.

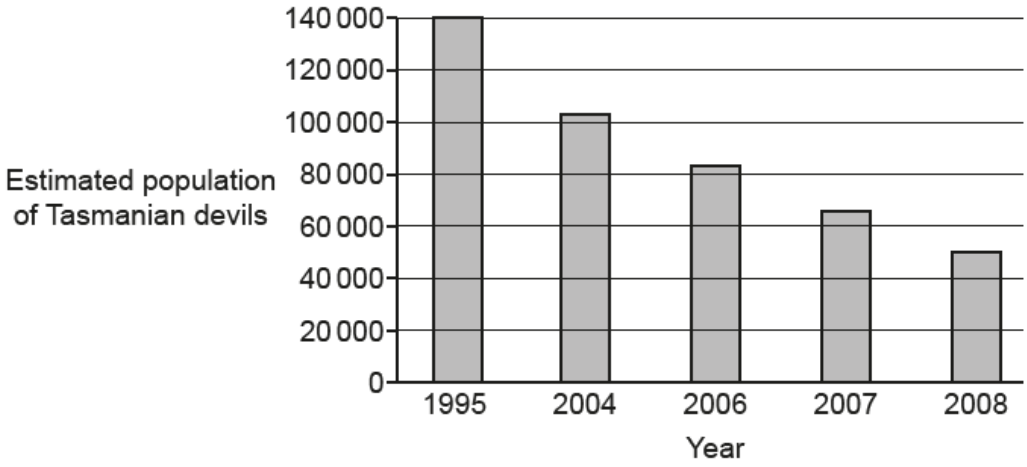



**Fig. 7.2**

**(i)** How many Tasmanian devils were there in 1995?

Number of Tasmanian devils = ..... **[1]**

**(ii)** In 2008 there were fewer Tasmanian devils.

Calculate the difference in the population from 1995 to 2008.

Difference = ..... **[2]**

**(c) (i)** The decrease in population is because of a disease called Devil Facial Tumour disease.

Explain why scientists are concerned about the population of Tasmanian devils.

Use data from **Fig. 7.2** to support your answer.

.....

.....

.....

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

**(ii)** Devil Facial Tumour is a form of cancer. It is spread from one Tasmanian devil to another when they bite each other.

How is the Devil Facial Tumour cancer different from cancers found in humans?

.....

.....

.....

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

**(iii)** Scientists have recently discovered that some Tasmanian devils have developed resistance to Devil Facial Tumour disease.

This resistance can be passed on to offspring and is becoming more common in each generation of the population.

Which process is causing the resistance to become more common?

Tick (✓) **one** box.

Immunity ☐

Infection ☐

Natural selection ☐

**[1]**

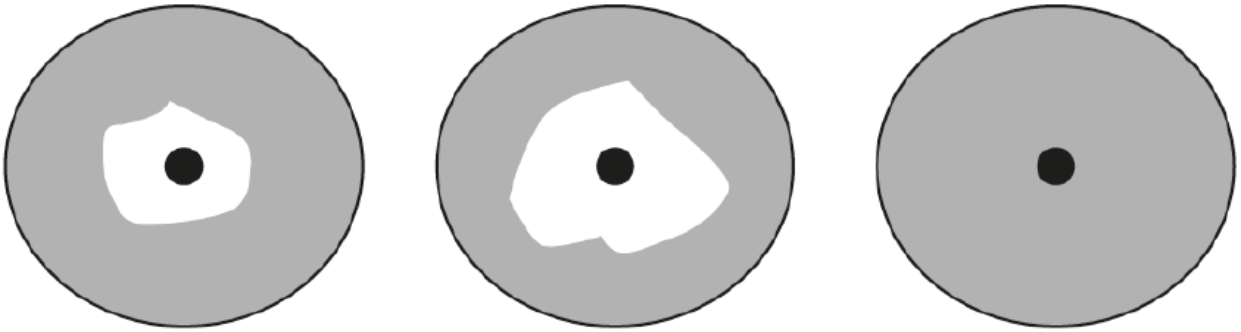
**7.** Nov/2020/Paper_J257_01/No.3

Many diseases are caused by bacteria. Antibiotics are used to kill bacteria.

A scientist grows bacteria on three agar plates. He then tests the effectiveness of three different antibiotics, **A**, **B** and **C**.

The results are shown in **Fig. 3.1**.

- The black circle in the centre of each plate is the antibiotic.
- The grey areas are where bacteria have grown.
- The white areas are the zones of inhibition, where the bacteria have been killed.



**Antibiotic A** **Antibiotic B** **Antibiotic C**

**Fig. 3.1**

**(a)** The scientist concludes that **Antibiotic B** is the most effective.

Explain how the scientist reached this conclusion.

.....

.....

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

**(b)** The bacteria are resistant to one antibiotic.

Which antibiotic are the bacteria resistant to?

Tick (✓) **one** box.

**Antibiotic A** ☐

**Antibiotic B** ☐

**Antibiotic C** ☐

Explain your answer.

.....

.....

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

**(c)** The statements **A**, **B**, **C** and **D** explain how bacteria become resistant to antibiotics but they are in the wrong order.

**A** The bacterium reproduces.

**B** The bacterium survives.

**C** The bacteria passes on its resistance.

**D** There is a mutation in the DNA of the bacteria.

Put the statements in the correct order by writing a letter in each box.

| | | | |
|---|---|---|---|
| | | | |

**[3]**

**(d)** The theory of evolution by natural selection was developed by which two scientists?

Tick (✓) **one** box.

Darwin and Wallace ☐

Mendel and Darwin ☐

Wallace and Mendel ☐

**[1]**

**(e)** **Fig. 3.2** shows the evolution of humans using fossils.

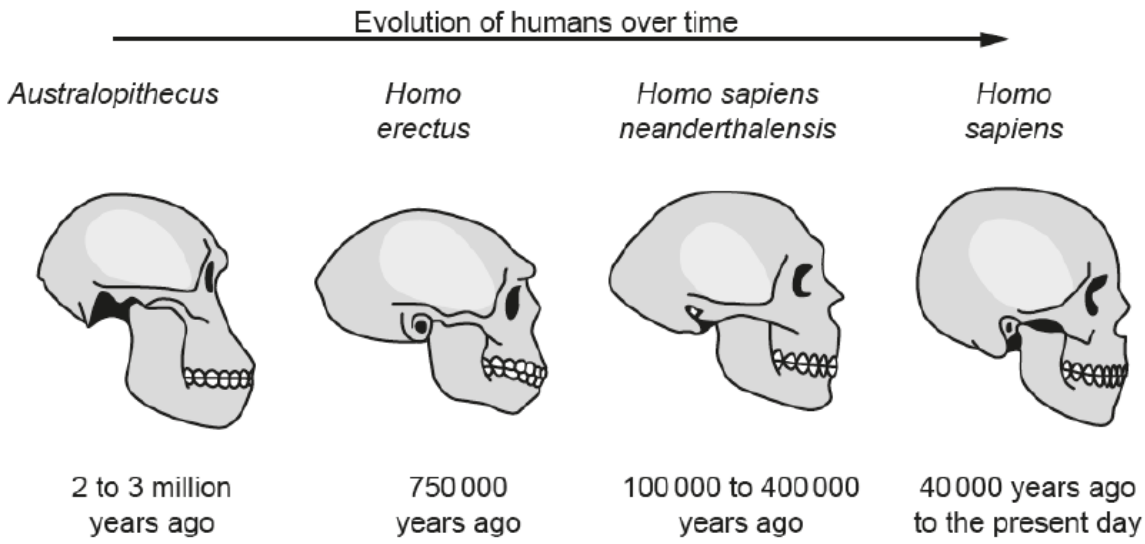



**Fig. 3.2**

Describe how the fossils in **Fig. 3.2** provide evidence for evolution.

.....

.....

.....

.....

.....

..... **[3]**