1 **(a)** In his book 'On the Origin of Species', Charles Darwin made the following four observations:

W Offspring generally appear similar to their parents.
X No two individuals are identical.
Y Organisms have the ability to produce large numbers of offspring.
Z Populations in nature tend to remain relatively stable.

From these observations he made a number of deductions, which are listed below in Table 6.1.

The deductions are supported by one **or more** of the observations (**W**, **X**, **Y** or **Z**).

In Table 6.1, indicate which of the above observations supported each deduction.

You may use each letter (**W**, **X**, **Y**, or **Z**) once, more than once or not at all.

Table 6.1

deduction	supporting observation(s)
characteristics are passed on to the next generation	
there is a struggle for existence	
individuals with beneficial characteristics are among the few who survive	

[3]

(b) Resistance to antibiotics has evolved in some pathogenic bacteria, such as MRSA.

Suggest why the resistance of MRSA to existing antibiotics is of major concern to humans.

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

(c) The evolution of antibiotic resistance in bacteria is evidence to support the theory of evolution.

How does **fossil** evidence support the idea that evolution has taken place?

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

[Total: 8]

2 **(a)** Fig. 6.1 shows two species of trilobites, a group of arthropods that became extinct about 240 million years ago. Species **A** is 20 million years older than species **B**.

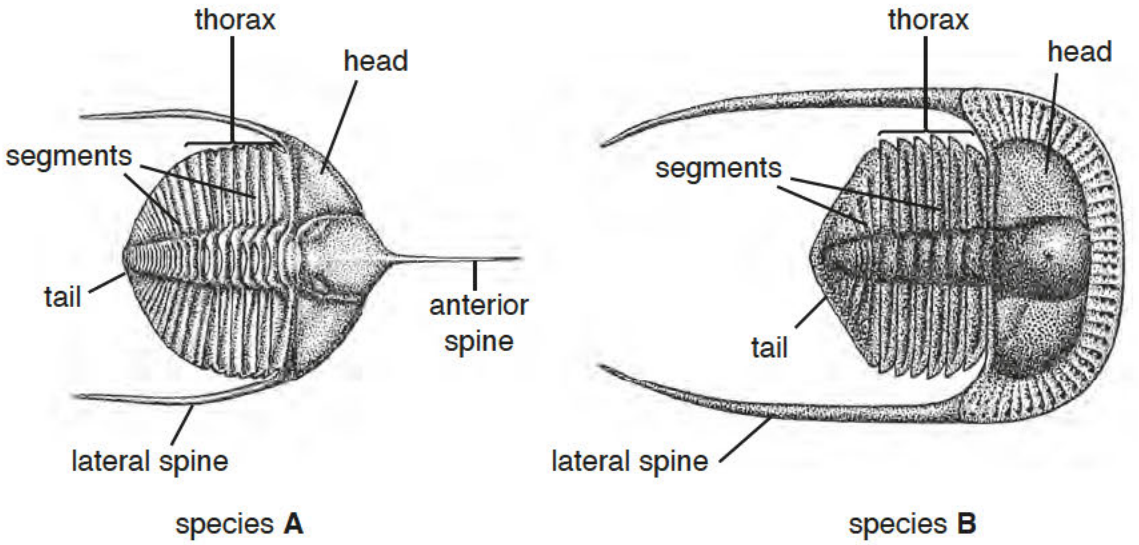


Fig. 6.1

(i) List **three** observable features from Fig. 6.1 that suggest the two species are related.

1 .....

2 .....

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

(ii) List **two** observable features from Fig. 6.1, **other than size**, that could suggest they are **different** species.

1 .....

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

(b) Explain how fossils provide evidence for the theory of evolution.

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

[Total: 7]

3 An important aspect of food production is maximising productivity. Maximum productivity can be achieved in a number of different ways.

(a) In selective breeding, humans look for variation between members of the same species and use this variation to improve productivity.

(i) State the **two** different causes of variation.

1 .....

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

Fig. 6.1 is a scattergraph that shows the growth rate and egg productivity in a flock of chickens.

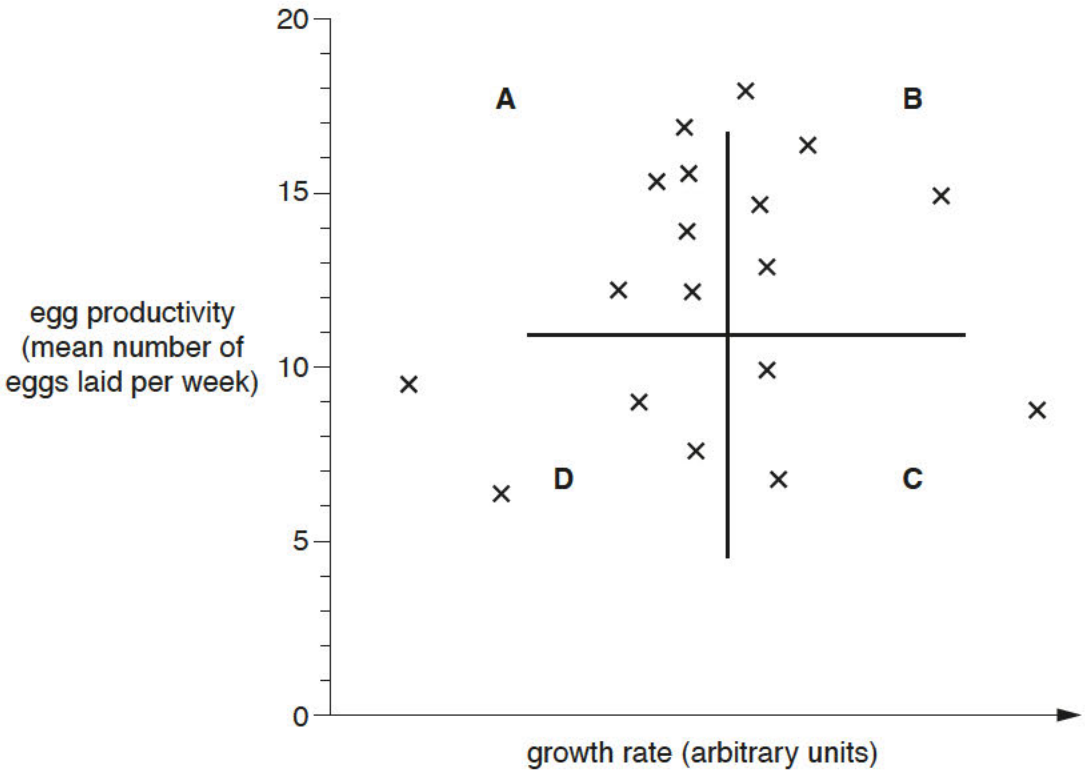


Fig. 6.1

(ii) The growth rate of the chickens in Fig. 6.1 shows **continuous** variation.

Describe **three** characteristics of this type of variation.

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

(iii) A chicken breeder divides the flock into four groups, **A**, **B**, **C** and **D**, as shown in Fig. 6.1.

State which group of chickens, **A**, **B**, **C** or **D**, he should use to breed from in order to improve the growth and productivity of the flock.

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

(iv) Suggest **two undesirable** consequences of selective breeding in chickens.

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

(v) The wild ancestor of the domestic chicken is the red jungle fowl found in the rainforests of South East Asia.

Explain why it is important to preserve the population of the red jungle fowl.

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

(b) In the past, domestic chickens were given antibiotics as a growth promoter.

(i) When antibiotic growth promoters were used, it was claimed that the meat was of better quality, with less fat and increased protein content.

Suggest **two further** benefits of using antibiotics.

1 .....

.....

2 .....

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

(ii) The use of antibiotics as growth promoters in animal production was banned in the European Union in 2006.

Suggest a concern that led to this ban.

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

[Total: 13]

4 When a new species is discovered, it needs to be classified.

(a) Define the term *classification.*

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

(b) **(i)** Suggest what criteria a taxonomist may take into account when classifying a new species.

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

(ii) Table 2.1 shows the main taxonomic groups. The groups are **not** in the correct order.

Table 2.1

	Q	**R**	**S**	**T**	**U**	**V**	**W**
taxonomic group	species	order	class	phylum	genus	kingdom	family

Place the **letters** representing the taxonomic groups into the correct order.

The first one has been done for you.

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

(c) The classification of organisms into domains is relatively new.

Describe the differences between a classification system based on domains and one based on kingdoms.

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

[Total: 12]

5 **(a)** Fig. 5.1 shows a section of a leaf from a pear tree that is infected by the mildew fungus.

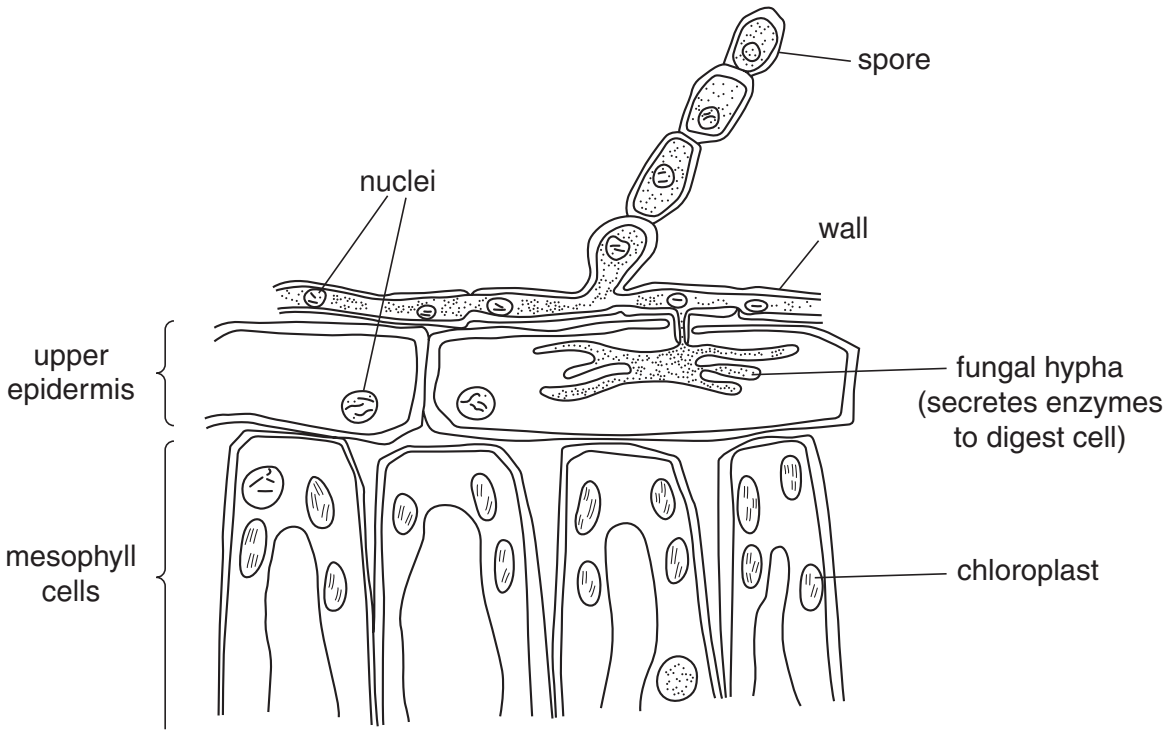


Fig. 5.1

(i) State **one** feature, **shown in Fig. 5.1**, that excludes **both** the pear tree and mildew from the kingdom Prokaryotae.

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

(ii) State **two** reasons why mildew should be placed in the kingdom Fungi.

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

(iii) State **two** reasons why the pear tree should be placed in the kingdom Plantae.

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

(iv) Name **two** kingdoms other than Prokaryotae, Fungi and Plantae.

1 .....

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

(b) The mildew fungus also infects wheat plants, causing disease.

- Most wheat plants in the UK show little resistance to this disease.
- Some Iranian wheat plants are resistant.
- The yield from these resistant wheat plants is very low.

(i) An investigation into the resistance of the Iranian wheat plants to mildew produced the results shown in Fig. 5.2.

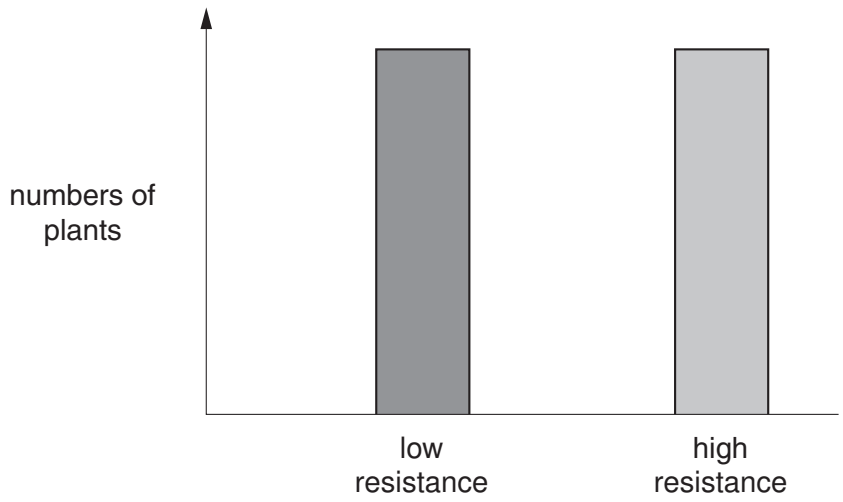


Fig. 5.2

State the type of variation that is shown in Fig. 5.2 **and** describe its characteristics.

type of variation .....

characteristic of this type of variation

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

(ii) Outline how a breeding programme could be carried out to produce wheat plants which have both high yield **and** resistance to mildew.

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

(c) Over a period of time, mildew can overcome the resistance bred into the wheat.

Use the theory of natural selection to explain how the mildew fungus adapts to overcome this resistance.

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

[Total: 17]