Questions are for both separate science and combined science students unless indicated in the question

Q1.

Carl Linnaeus invented a classification system that places organisms into groups.

(a)   What is the name of the largest classification group in Linnaeus's system?

Tick (✓) **one** box.

Family ☐

Kingdom ☐

Order ☐

(1)

(b)   Linnaeus gave each species a binomial name.

Which **two** classification groups form the binomial name?

Tick (✓) **two** boxes.

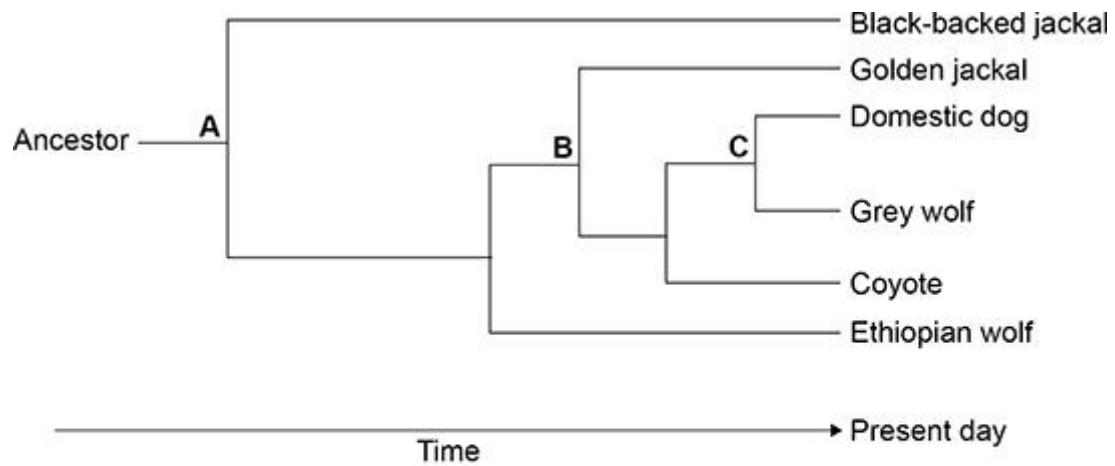Class ☐

Genus ☐

Order ☐

Phylum ☐

Species ☐

(2)

Scientists think that the animals in **Figure 2** all evolved from an ancestor that lived about 6 million years ago.

The figure below shows how the animals may have evolved.

Key

A 6 million years ago
B 3 million years ago
C 32 thousand years ago

(c)   What was the **most recent** time that the domestic dog and the golden jackal shared a common ancestor?

Tick (✓) **one** box.

32 thousand years ago   ☐

3 million years ago   ☐

6 million years ago   ☐

(1)

(d)   Which present-day animal in above figure is the **most distant** relative of the domestic dog?

_____

(1)

Scientists think the grey wolf and the domestic dog had a common ancestor.

The common ancestor:
*   lived about 32 thousand years ago
*   is now extinct.

(e)   Give **two** possible causes of extinction.

1 _____

_____

2 _____

_____

(2)

(f)   32 thousand years ago, humans hunted other animals for food.

Wolves also hunted other animals for food.

Suggest **one** reason why wolves began to follow groups of humans.

_____

_____

(1)

(g)   Some wolves are more aggressive than other wolves.

Describe how selective breeding of wolves could produce a domestic
animal that is less aggressive than the wolf.
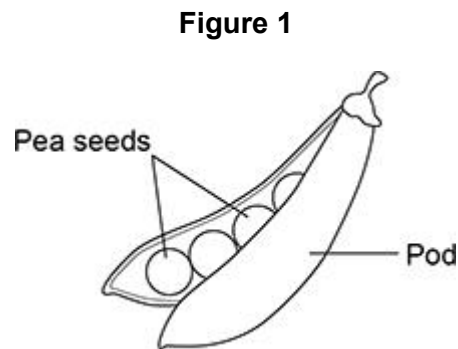
_____

_____

_____

_____

(2)
(Total 10 marks)

Q2.

In 1866, a monk called Gregor Mendel published the results of his investigations into inheritance in pea plants.
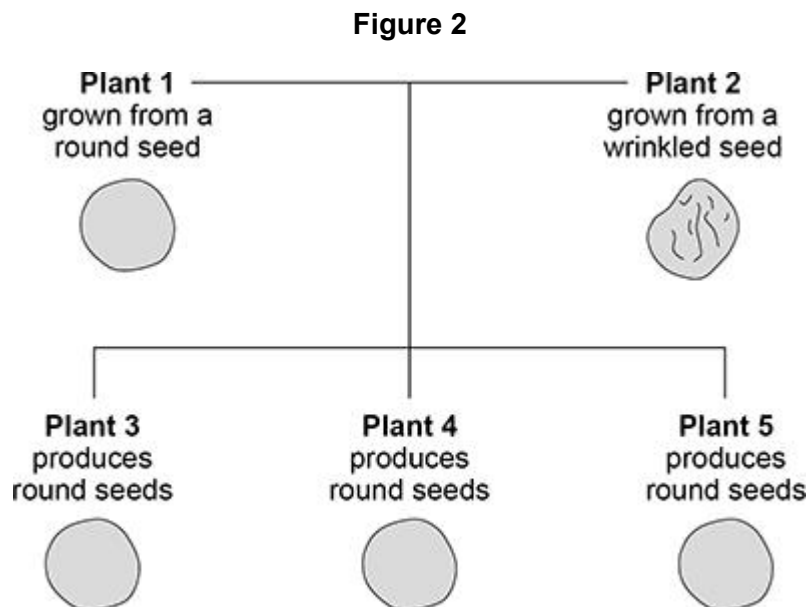
Pea plants produce seeds in a pod.

Figure 1 shows a pea pod.

Figure 1

Pea seeds can be round or wrinkled in shape.

Mendel crossed pea plants that produced round seeds with pea plants that produced wrinkled seeds.

Figure 2 shows the results.

Figure 2

In parts (a) to (c) use the following symbols to represent the alleles:

R = dominant allele for round seeds

r = recessive allele for wrinkled seeds.

(a) In **Figure 2**, the genotype of plant **1** is **RR**.

Give the genotype of plant **2**.

_____

(1)

Mendel collected the seeds from plants **3** and **4** and grew new plants from the seeds.

Mendel crossed the new plants.

(b) Complete the Punnett square diagram in **Figure 3**.

You should show:
- the male gametes
- the offspring genotypes.

Figure 3

Female

	R	r
Male		

(3)

(c) Give the ratio of round seeds to wrinkled seeds in the offspring in **Figure 3**.

Ratio of round seeds to wrinkled seeds = _____ : _____

(1)

(d) Some of the offspring in **Figure 3** are homozygous and some are heterozygous.

What does 'heterozygous' mean?

_____

_____

(1)

(e)   Mendel published his work in 1866.

Suggest **two** reasons why the importance of Mendel's work was **not** recognised until the early 1900s. **(biology only)**

1 _____

_____

2 _____

_____

(2)
(Total 8 marks)

Q3.

Some farmers keep cows indoors in large sheds.

Other farmers keep cows outdoors in fields of grass.

Figure 1 shows cows being kept indoors and outdoors.

Figure 1

The table below shows the energy inputs and energy outputs for keeping cows.

	Energy in kJ/m²/year	
	Indoors	**Outdoors**
Input as food	10 000	5 950
Input as fossil fuel	6 000	50
Output as meat and milk	40	2

(a) Calculate the total energy input for keeping cows **outdoors**.

Use data from the table above. **(biology only)**

_____

_____

Total energy input = _____ kJ/m²/year

(1)

(b)   The total energy input for keeping cows **indoors** is 16 000 kJ/m²/year.

Calculate the percentage efficiency of keeping cows **indoors**. **(biology only)**

Use the equation:

$$\text{percentage efficiency} = \frac{\text{energy output}}{\text{total energy input}} \times 100$$

_____

_____

_____

Percentage efficiency = _____ %

(2)

(c)   The percentage efficiency of keeping cows outdoors is 0.03%.

Why is it more energy efficient to keep cows indoors than to keep cows outdoors? **(biology only)**

Tick (✓) **two** boxes.

Cows are more stressed indoors.   ☐

Cows move less indoors.   ☐

It is noisier indoors.   ☐

It is warmer indoors.   ☐

There is less light indoors.   ☐

(2)

Diseases in cows can cause problems for farmers.

(d)　Suggest why diseases spread more quickly when the cows are kept indoors.

(biology only)

_____

_____

(1)

One species of bacterium causes a disease in cows.

Scientists investigated the effect of eight different antibiotics on the growth of this species of bacterium.

The scientists put discs containing the different antibiotics onto a Petri dish containing the bacteria.

Antibiotics **A** to **H** were used in the investigation.

Figure 2 shows what the Petri dish looked like after 2 days.

Figure 2
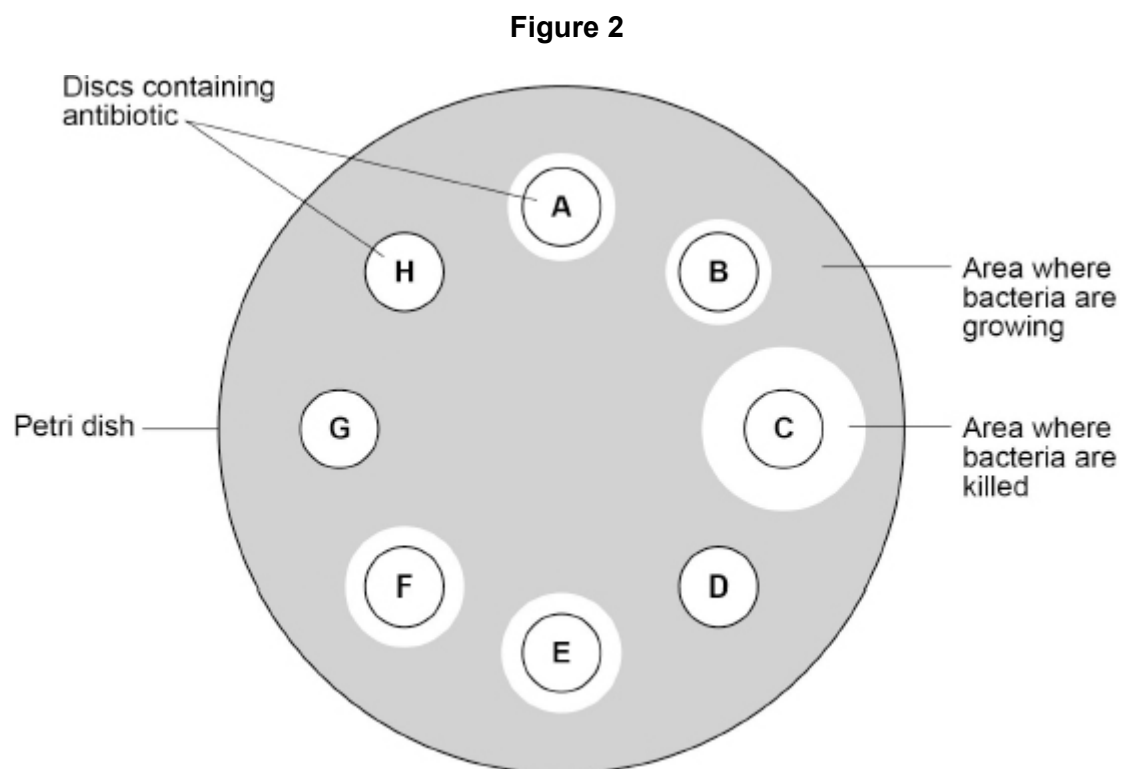
(e)　This species of bacterium is resistant to some of the antibiotics.

Give the letter of **one** antibiotic the bacterium is resistant to.

_____

(1)

(f)   Complete the sentence.

Choose the answer from the box.

carbohydrate	DNA	lipid

Antibiotic resistance in a single bacterium is caused by a change in the

bacterium's _____.

(1)

(g)   Complete the sentence.

Choose the answer from the box.

excretion	feeding	reproduction

A change in one bacterium can cause millions of bacteria to become resistant to the antibiotic.

This is because bacteria have a high rate of _____.

(1)

(h)   Suggest why the production of millions of antibiotic-resistant bacteria is a problem for farmers.

_____

_____

_____

_____

(2)
(Total 11 marks)

Q4.

Living organisms can be classified into groups.

Trilobites are animals that lived in the sea 400 to 500 million years ago.

The table below gives the classification of two species of trilobite.

Classification group	Trilobite A	Trilobite B
	Animalia	*Animalia*
Phylum	*Arthropoda*	*Arthropoda*
Class	*Trilobita*	*Trilobita*
Order	*Ptychopariida*	*Ptychopariida*
Family	*Alokistocaridae*	*Marjumiidae*
	Elrathia	*Modocia*
Species	*kingii*	*typicalis*

(a)   Complete the table above.

Choose answers from the box.

Community	Genus	Kingdom	Mammal	Population

(2)

(b)   Which scientist invented the classification system given in the table above?

Tick (✓) **one** box.

Darwin   ☐

Lamarck   ☐

Linnaeus   ☐

Mendel   ☐

(1)

(c)   What is the binomial name of trilobite **A**?

Use information from above table.

Tick (✓) **one** box.

Arthropoda kingii   ☐

Elrathia kingii   ☐

Trilobita kingii   ☐

(1)

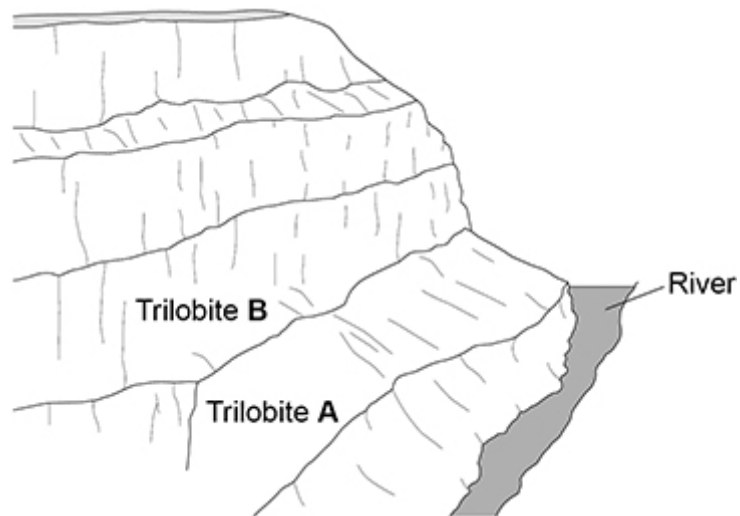**Figure 1** shows fossils of the two species of trilobite.

Figure 1

Trilobite A   Trilobite B

Figure 2 shows:
*   layers of rock in a cliff
*   where the trilobite fossils were found.

Figure 2

A scientist made the hypothesis:

'Trilobite **B** may have evolved from trilobite **A**.'

(d)   What **two** pieces of evidence from **Figure 1** and **Figure 2** support the scientist's hypothesis?

Tick (✓) **two** boxes.

Trilobite **A** and trilobite **B** were in the same type of rock.   ☐

Trilobite **A** was found in older rocks than trilobite **B**.   ☐

Trilobite **B** has a smaller mass than trilobite **A**.   ☐

Trilobite **B** is a different colour from trilobite **A**.   ☐

Trilobite **B** is more complex than trilobite **A**.   ☐

(2)

(e)   Trilobites are animals that lived in the sea.

Complete the sentences about how the fossils of trilobites **A** and **B** were formed.

Choose answers from the box.

acids	bones	hard parts	minerals
	rocks	sediments	soft parts

The animal dies and falls to the sea bed.

The animal is buried in _____.

The _____ of the animal decay.

The remains which do **not** decay are replaced by _____.

(3)

(f)   Trilobites **A** and **B** are now extinct.

Give **three** possible causes of extinction.

1   _____

_____

2   _____

_____

3   _____

_____

(3)

(g)   Suggest **one** reason why scientists **cannot** be sure what caused the trilobites to become extinct.

_____

_____

(1)
(Total 13 marks)