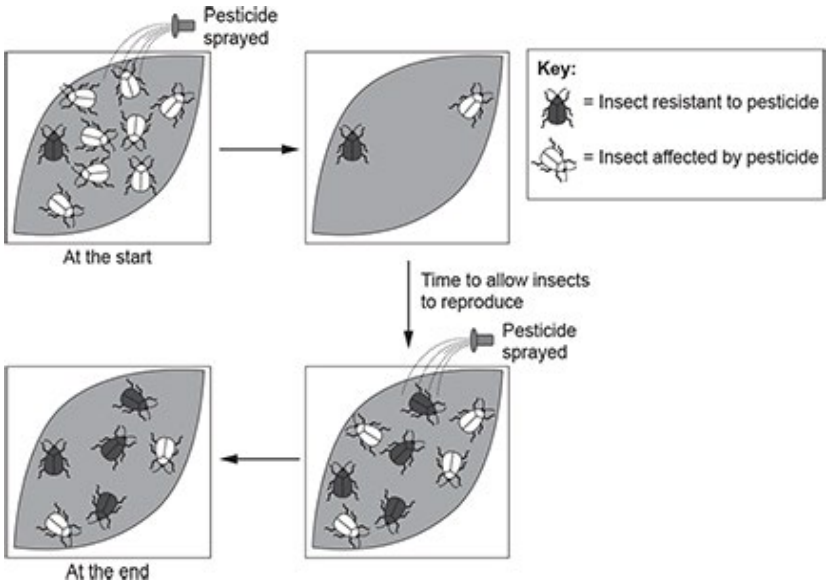
1(a). A scientist investigates the effects of pesticide on a population of insects.

At the start, the population contained:

- one insect resistant to the pesticide,
- eight insects affected by the pesticide.

They sprayed the insecticide twice, with a time gap between the sprayings.

The diagram shows their results.



Complete the table using the information in the diagram.

	Number of insects resistant to pesticide	**Number of insects affected by pesticide**	**Ratio of insects resistant to pesticide : insects affected by pesticide**
At the start	1	8	1: 8
At the end			

[2]

(b). Which process does the scientist's investigation demonstrate?

Tick (✓) **one** box

Genetic engineering ☐

Natural selection ☐

Selective breeding ☐

[1]

(c). Explain why the results of this investigation are important for farmers.

[2]

2. Scientists use molecular phylogenetics to classify a newly discovered animal.

What features do the scientists use in their classification?

A The number of bones in the limbs
B The sequence of the DNA
C The type of circulatory system
D Where in the cell respiration occurs

Your answer ☐ **[1]**

3. The table shows the mean mass of four types of rodent and the mean number of years they live.

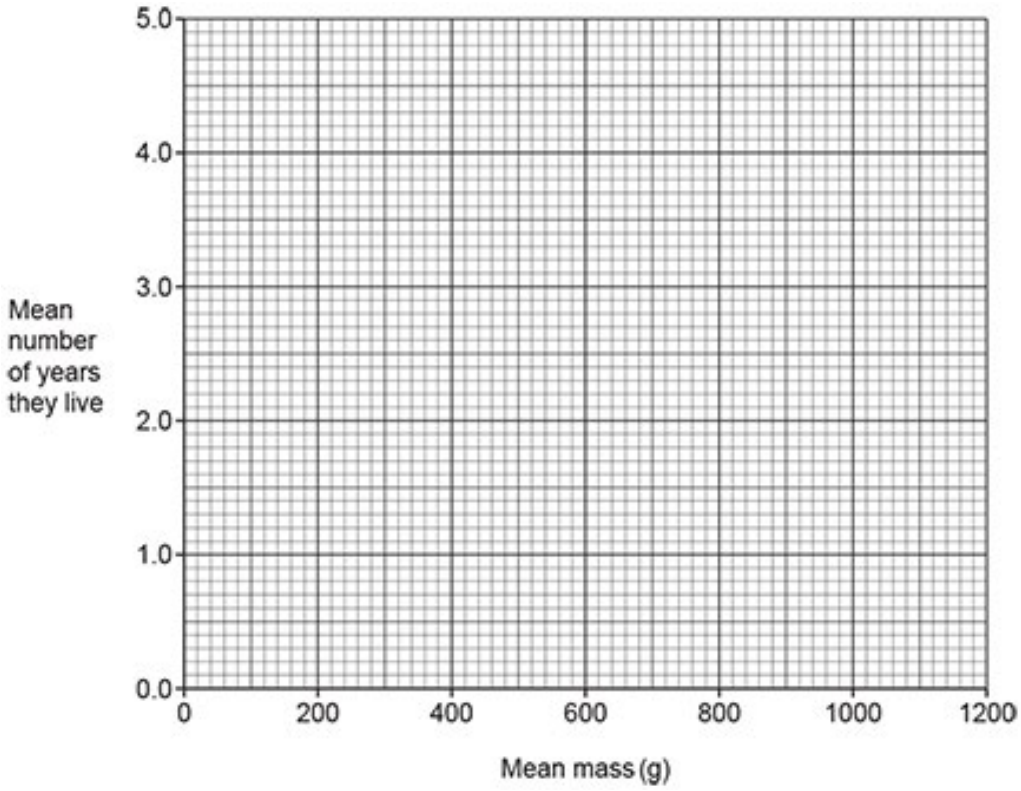
Type of rodent	Mean mass (g)	Mean number of years they live
Gerbil	40	1.5
Guinea pig	1000	4.0
Rat	200	2.0
Squirrel	600	3.0

i. Plot the data from the table on the graph.

[2]

ii. Draw a line of best fit through the points.

[1]



iii. Mole rats are rodents that have a mean mass of 60 g.

Use your graph to predict the mean number of years that mole rats live.

Mean number = ... years **[1]**

iv. Mole rats actually live much longer than predicted by the graph.

Scientists think that one reason for this is that their cells do **not** divide in an uncontrolled way.

Explain why this would help the mole rats to live longer.

[2]

4. Charles Darwin and Gregor Mendel did important work in the development of science.

Which row gives the areas of their work?

	Charles Darwin	Gregor Mendel
A	evolution	medicine
B	medicine	genetics
C	evolution	genetics
D	genetics	evolution

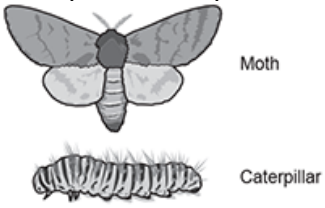
Your answer ☐ **[1]**

5. Which statement describes why seeds from seedbanks are an important tool in conservation?

A If there is a food shortage then the seeds can be used for food.
B The seeds can be used if certain species of plants become extinct.
C The seeds can be used to feed endangered animals.
D The seeds grow fast as the temperature is warm inside the seedbank.

Your answer ☐ **[1]**

6. Pine processionary moths lay eggs that develop into caterpillars, as shown in the diagram.



The caterpillars have hairs on their bodies that cause irritation to predators.

Cuckoos have a special sticky membrane lining their guts that traps these hairs.

This allows the cuckoos to eat the caterpillars.

i. Cuckoos evolved this sticky membrane by the process of natural selection.

The statements **A–E** show steps in this process.
They are **not** in the correct order.

A The gene for sticky membranes increases in the population.
B Cuckoos with sticky membranes reproduce and pass on the gene.
C Cuckoos with sticky membranes are more likely to survive.
D A change in a gene in the cuckoo produces a sticky membrane.
E Over many generations the cuckoos all have sticky membranes.

Write a letter in each box to show the correct order.
One has been done for you.

				E

[3]

ii. Name the scientist who first published a book describing the theory of natural selection.

_____ **[1]**

END OF QUESTION PAPER