

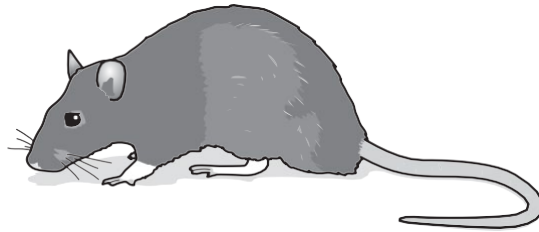
**GCSE Biology A (Gateway)**

**J247/04 Biology A B4-B6 and B7 (Higher Tier)**

**Question Set: 23**

1

Rats are a major pest in many areas of the world. They can reduce food security and spread diseases.



- (a) Warfarin is a chemical that is used as a rat poison. It stops the correct functioning of platelets in the blood.

Explain why warfarin can be used as a rat poison.

It stops blood clotting in rats so rats may die when bleeding occurs, as they would continuously lose blood [2]

- (b) In 1958, some rats were found that were resistant to warfarin. They did not die, even when fed with large amounts of the poison. Scientists found that the resistance was due to dominant allele **R**.

Two resistant rats can mate and produce non-resistant rats.

Draw a genetic diagram below to show how these non-resistant rats can be produced.

	R	r	
R	RR	Rr	R
r	Rr	rr	r

[3]

- (c) When scientists studied the resistant rats they found that there were two different types.

Homozygous rats are resistant to warfarin but need to eat 20 times more vitamin K.

Heterozygous rats are resistant to warfarin but only need slightly increased amounts of vitamin K.

The scientists found that the non-resistant rats never died out completely.

Explain why.

May have different genetic variants or mutations which affect body's reaction to Warfarin to allow them to survive in another form [2]

OR

They may have bred before dying so would inherit non-resistant allele to next offspring which might inherit another non-resistant allele from resistant rat

(d) Scientists now think that they might be able to reduce rat populations by using genetic engineering. They want to insert a gene into male rats that destroys all sperm that contain an X chromosome.

(i) Name the enzyme used to join two sections of DNA together in genetic engineering.

Ligase

[1]

(ii) Explain how this method of genetic engineering would rapidly reduce the rat population.

You may use a diagram in your answer.

All sperm cells with X chromosomes are killed so there will be no female offspring after reproduction so no female rat present to interbreed to maintain rat population by

[3]

Total Marks for Question Set 23: 11 preventing further reproduction, future generations

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