

GCSE Biology B (Twenty First Century Science)
J257/02 Depth in Biology (Foundation)

Question Set 4

1 Warfarin is a medicine that helps to prevent the formation of blood clots.
 It is given to people who are at risk from a blood clot blocking one of their veins.
 Warfarin interferes with an enzyme involved in the blood clotting process.

(a) (i) Which statement about enzymes is true?

Tick (✓) **one** box.

An enzyme blocks a chemical reaction.

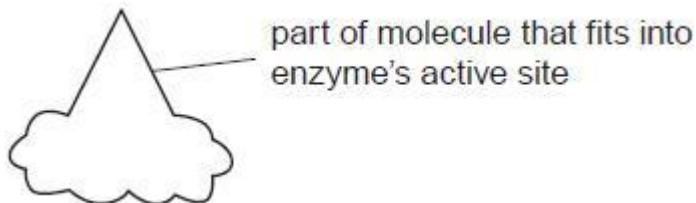
An enzyme recognizes many different substrates.

An enzyme speeds up a chemical reaction.

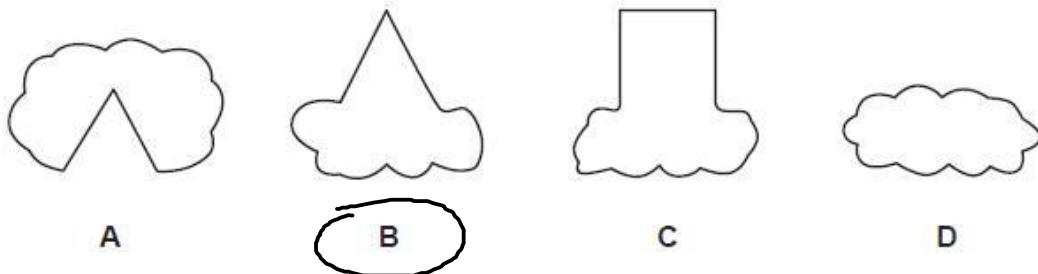
An enzyme is used up during a chemical reaction.

[1]

(ii) Warfarin blocks the active site of the blood clotting enzyme. The diagram represents a molecule of warfarin.



Which **one** of the following diagrams, **A**, **B**, **C** or **D**, could represent the enzyme's normal substrate?



[1]

(b) Warfarin helps to prevent the formation of blood clots when it is given to a patient in the correct amount.

The amount of medicine given to a patient is called the dose.

However, there is not one correct dose of warfarin that works for everybody. Different patients need a different dose.

- (i) Doctors usually start by giving a low dose of warfarin to a patient. They then increase the dose if necessary.

Explain why it is better to start with a low dose of warfarin **and** suggest what could happen if the dose is too high.

Low dose is less risky. High dose has side effects like it can be toxic and would prevent patient from being able to seal wounds by clotting.

[3]

- (ii) Doctors think that different people need a different dose of warfarin because of differences in their genomes.

Explain how differences in the genome could cause a person to need a different dose of warfarin.

Different people have different genetic alleles. Some alleles will affect how the body reacts to warfarin and how well warfarin fits into blood clotting enzyme active site.

[2]

- (iii) Explain how gene technology could be used to help a doctor to give the correct dose of warfarin to a patient.

Genetic testing for alleles that affect how the body reacts to warfarin. It will help develop personalised medicine for the patient.

[2]

- (c) Warfarin has also been used as rat poison since 1948.

However, many populations of rats are now resistant to warfarin.

Explain how a population of rats could have become resistant to warfarin.

[6]

There was genetic variation within a population of rats. A mutation created a genetic allele that gives resistance to warfarin. The mutated allele was passed on to offspring when the rats who had the allele reproduced. Over many generations the rats who had this allele were more likely to survive and reproduce. This finally created a population of rats where this allele had now become common and most rats were resistant to warfarin.

Total Marks for Question Set 4: 15

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