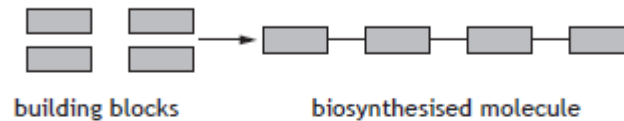# CfE Higher Biology

Unit 2 Metabolism and Survival

Key Area 1 Metabolic Pathways

1. The diagram below shows how a molecule might be biosynthesised from building blocks in a metabolic pathway.

building blocks   biosynthesised molecule

Which line in the table below describes the metabolic process shown in the diagram and the energy relationship involved in the reaction?

|	Metabolic process	Energy relationship
A	anabolic	energy used
B	anabolic	energy released
C	catabolic	energy used
D	catabolic	energy released

2. The cell membrane contains pumps that actively transport substances.

Which of the following forms the major component of membrane pumps?

A   Protein

B   Phospholipid

C   Nucleic acid

D   Carbohydrate

3. Mitochondria are small membrane-bound compartments present in eukaryotic cells.

One advantage to a mammalian muscle cell of having many small mitochondria is that they provide a

A   small surface area to volume ratio to increase the uptake of oxygen

B   large surface area to volume ratio to increase the uptake of oxygen

C   large surface area to volume ratio to decrease the uptake of carbon dioxide

D   small surface area to volume ratio to decrease the uptake of carbon dioxide.

4. ATP is recycled to transfer energy within cells. The diagram shows two reactions involving ATP.

Reaction 1

ATP   ADP + Pi
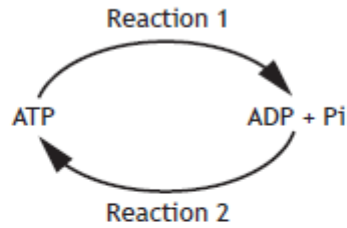
Reaction 2

Which row in the table describes Reaction 1 and Reaction 2?

	Reaction 1	Reaction 2
A	catabolic and energy released	anabolic and energy required
B	anabolic and energy released	catabolic and energy required
C	catabolic and energy required	anabolic and energy released
D	anabolic and energy required	catabolic and energy released

5. The graph below shows changes in the α-amylase concentration and the starch content of a barley grain during early growth and development.

Time (days)
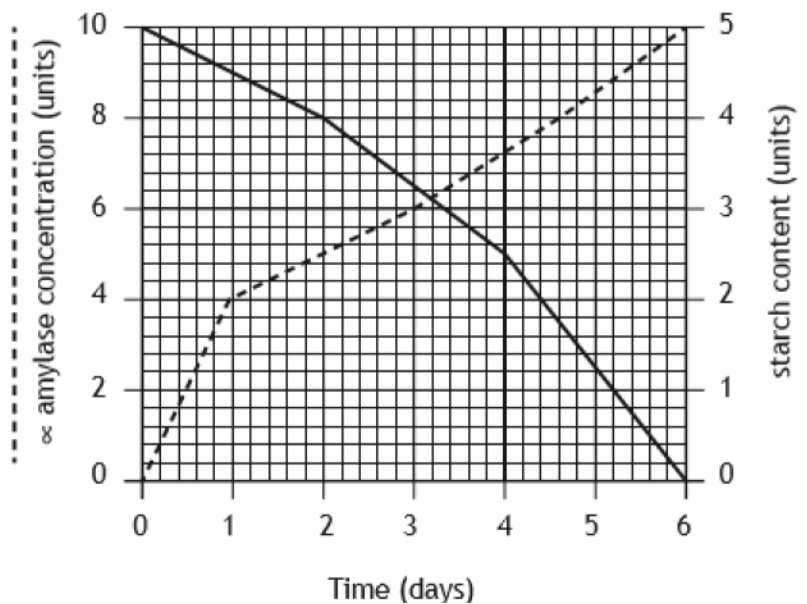
Identify the time by which the starch content of the barley grains had decreased by 50%.

A 2·0 days

B 3·2 days

C 4·0 days

D 6·0 days

6. In metabolic pathways, the rates of reaction can be affected by the presence of enzyme inhibitors.

Which row in the table below is correct?

	Type of inhibition	Inhibitor binds to active site	Effect of increasing substrate concentration on inhibition
A	competitive	yes	reversed
B	non competitive	yes	unaffected
C	competitive	no	unaffected
D	non competitive	no	reversed

7. The diagram shows an enzyme, its substrate and a substance which inhibits it.
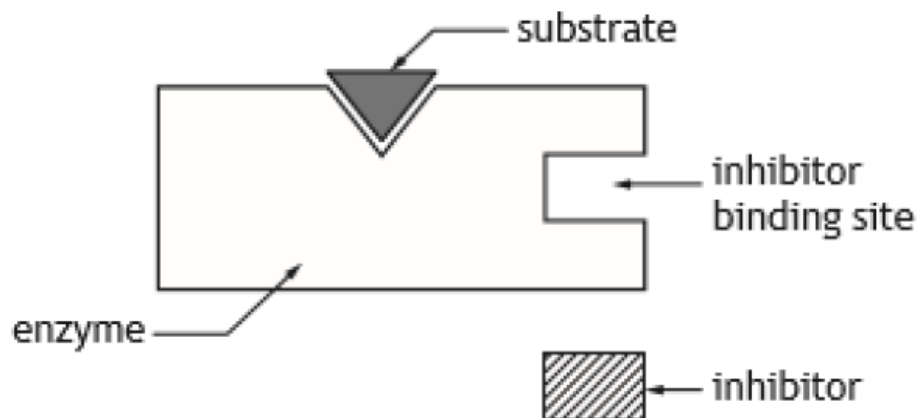
The following statements describe some features of enzyme inhibition.

1 The inhibitor binds to the active site.

2 The effect of the inhibitor is reduced by increasing the substrate concentration.

3 The inhibitor is non-competitive.

Which of these statements apply to the inhibitor shown in the diagram?

    A 1 only

    B 3 only

    C 1 and 2 only

    D 2 and 3 only

8. An investigation was carried out to determine the effect of lead ion concentration on the activity of the enzyme amylase.

The results are shown in the table.

| Lead ion concentration (mol l⁻¹)	Amylase activity (% of control)
0·0 (control)	100
0·1	84
0·2	23
0·3	11
0·4	2
0·5	0

A conclusion that can be drawn from these results is that inhibition was

A   highest at high lead ion concentrations

B   highest at low lead ion concentrations

C   lowest at lead ion concentration 0·5 mol l−1

D   highest at lead ion concentration 0·1 mol l−1.

9. Catalase is an enzyme which breaks down hydrogen peroxide into oxygen and water. Paper discs soaked in catalase sink when placed into hydrogen peroxide solution. The discs rise to the surface when oxygen is produced. The time taken for the discs to rise can be used to measure catalase activity.

An experiment was set up to investigate the effect of copper sulfate concentration on catalase activity.

Six tubes were set up, each containing 10 cm3 of hydrogen peroxide and 5 cm3 of a different concentration of copper sulfate. One paper disc was then placed into each test tube as shown in the diagram. The time taken for each paper disc to rise to the surface was recorded

hydrogen peroxide (10 cm^3)
+ copper sulfate (5 cm^3) —————
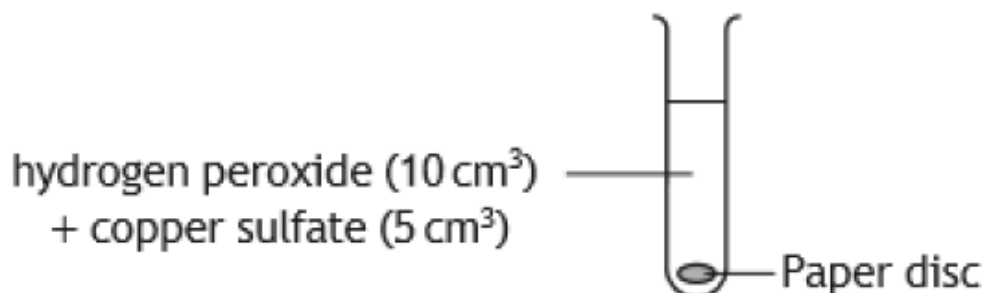
——Paper disc

The results are shown in the table.

Concentration of copper sulfate solution (mol l^{-1})	Time taken for paper disc to rise (seconds)
0·2	8
0·3	12
0·4	15
0·6	18
0·8	19
1·0	20

(a) (i) Name the independent variable in this experiment.

_____ **1**

(ii) Describe a suitable control for this experiment.
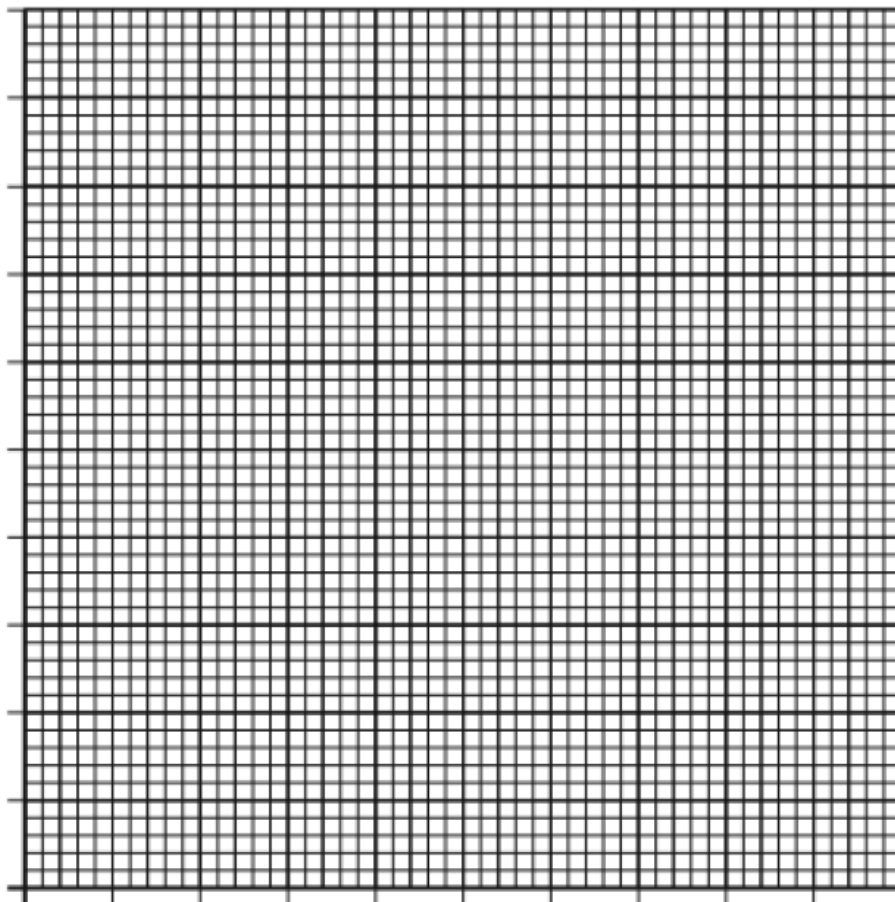
_____

_____ **1**

(iii) Suggest how the temperature of the tubes could be kept constant.

_____

_____ **1**

(iv) Give a feature of the experiment which may make the results unreliable.

_____

_____ **1**

(b) (i) Draw a line graph using the results in the table.

2

9b continued

(ii) Calculate the percentage increase in the time taken for the paper disc to rise when the copper sulfate concentration increased from 0·2 mol l−1 to 1·0 mol l−1.

Space for calculation

_____ % **1**

(c) Draw a conclusion from the results of this experiment.

_____

_____ **1**

10.

Describe competitive and non-competitive inhibition of enzyme action.   4