

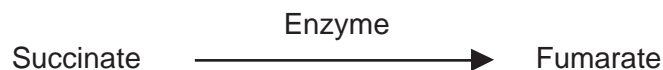
- 1 (a)** The table contains statements about three stages of respiration.

Complete the table with a tick if the statement in the first column is true for each stage of respiration in an animal.

	Glycolysis	Link reaction	Krebs cycle
Occurs in mitochondria			
Carbon dioxide produced			
NAD is reduced			

(3 marks)

- (b)** The following reaction occurs in the Krebs cycle.



A scientist investigated the effect of the enzyme inhibitor malonate on this reaction. The structure of malonate is very similar to the structure of succinate. The scientist added malonate and the respiratory substrate, pyruvate, to a suspension of isolated mitochondria. She also bubbled oxygen through the suspension.

- (b) (i)** Explain why the scientist did not use glucose as the respiratory substrate for these isolated mitochondria.

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(2 marks)

(b) (ii) Explain how malonate inhibits the formation of fumarate from succinate.

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(2 marks)

(b) (iii) The scientist measured the uptake of oxygen by the mitochondria during the investigation. The uptake of oxygen decreased when malonate was added. Explain why.

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(2 marks)

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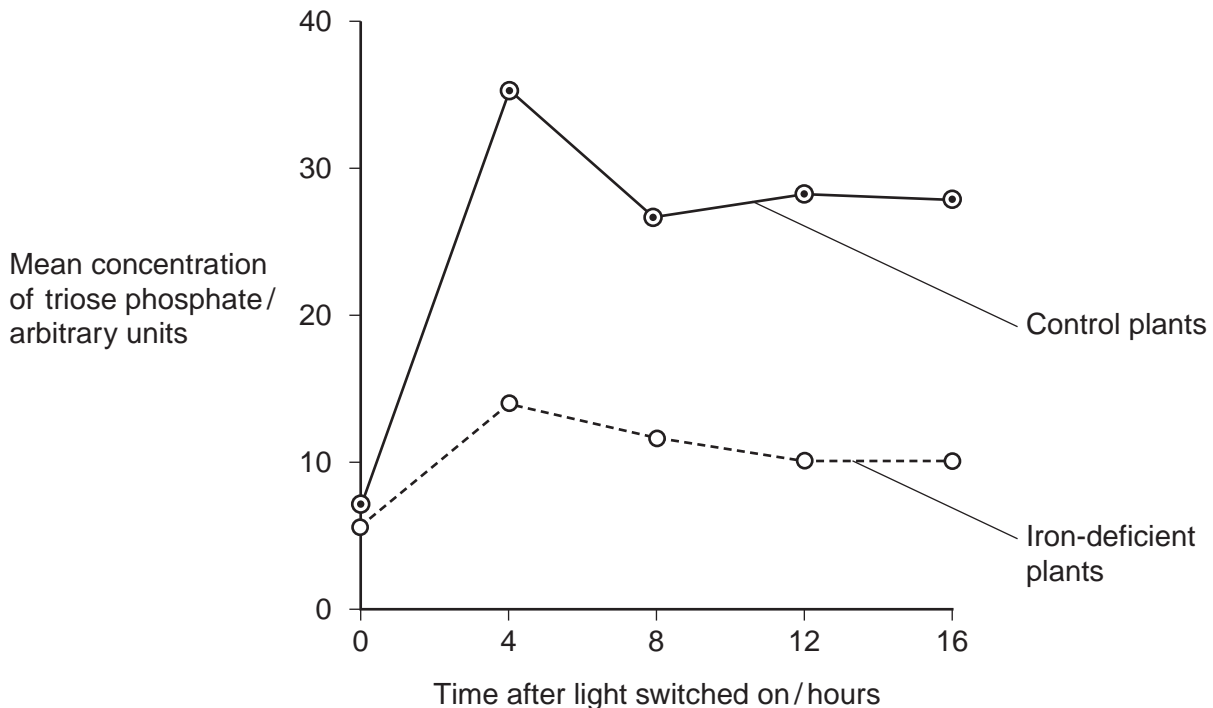
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Scientists investigated the effect of iron deficiency on the production of triose phosphate in sugar beet plants. They grew the plants under the same conditions with their roots in a liquid growth medium containing all the necessary nutrients. Ten days before the experiments, they transferred half the plants to a liquid growth medium containing no iron. The scientists measured the concentration of triose phosphate produced in these plants and in the control plants:

- at the end of 6 hours in the dark
- then for 16 hours in the light.

Their results are shown in the graph.



(a) (i) The experiments were carried out at a high carbon dioxide concentration. Explain why.

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(1 mark)

(a) (ii) Explain why it was important to grow the plants under the same conditions up to ten days before the experiment.

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(1 mark)

- 3** Urea from animal waste can be used as a fertiliser. Some bacteria in the soil secrete the enzyme urease which hydrolyses urea into ammonia. Some of this ammonia is released into the atmosphere. NBPT is an inhibitor of urease and can be added to urea fertiliser to reduce the loss of ammonia to the atmosphere.

- 3 (a)** A molecule of NBPT has a similar structure to a molecule of urea. Use this information to suggest how NBPT inhibits the enzyme urease.

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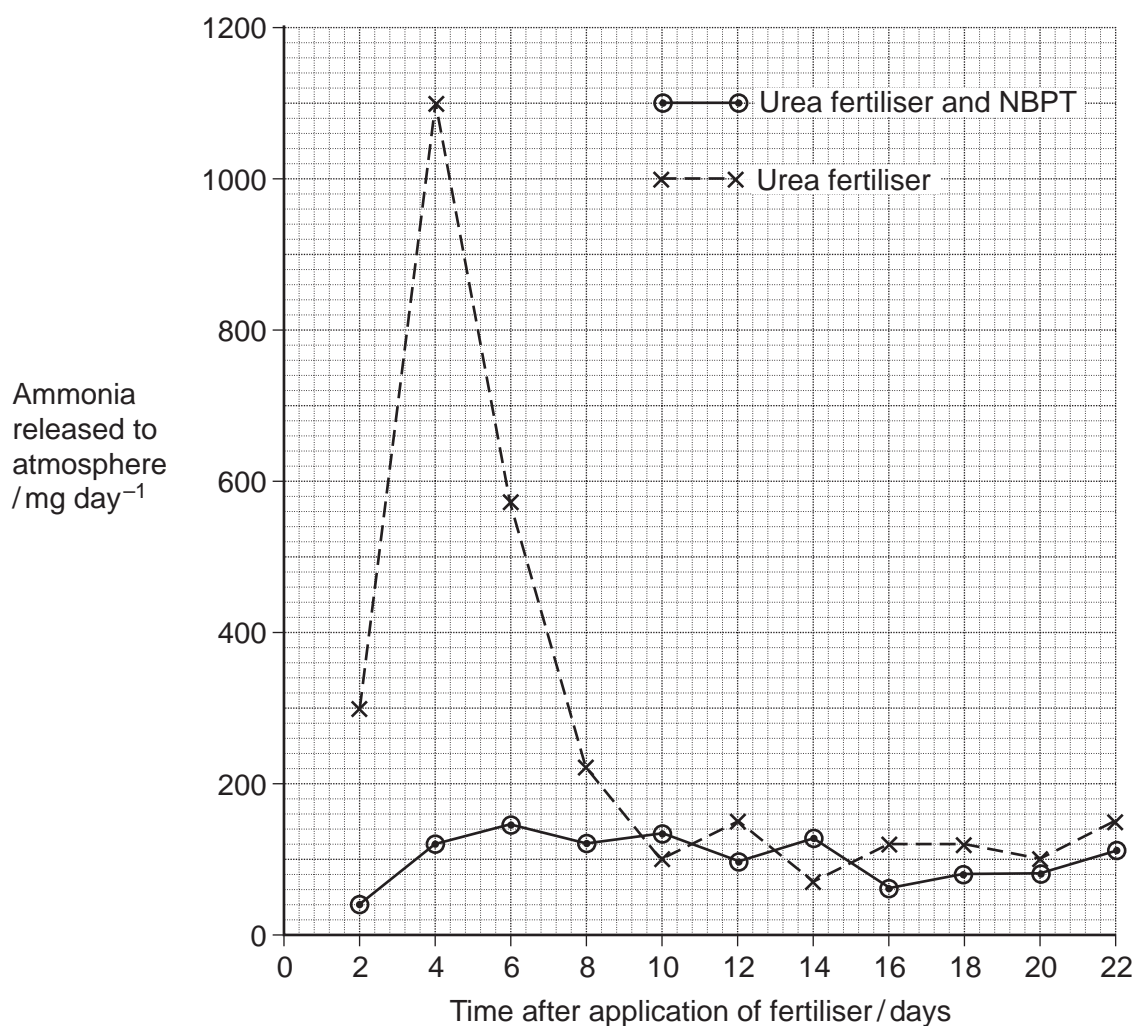
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(2 marks)

Scientists investigated the effect of NBPT on the release of ammonia from urea fertiliser added to the soil. A control experiment was carried out. This involved adding urea fertiliser only. The graph shows their results.



3 (b) (i) Describe how NBPT affected the loss of ammonia from urea fertiliser.

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(1 mark)

3 (b) (ii) Suggest an explanation for the increase in mass of ammonia released over the first four days in the control experiment.

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(2 marks)

3 (c) Suggest how the addition of NBPT to urea fertiliser could result in increased growth of crop plants.

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(3 marks)

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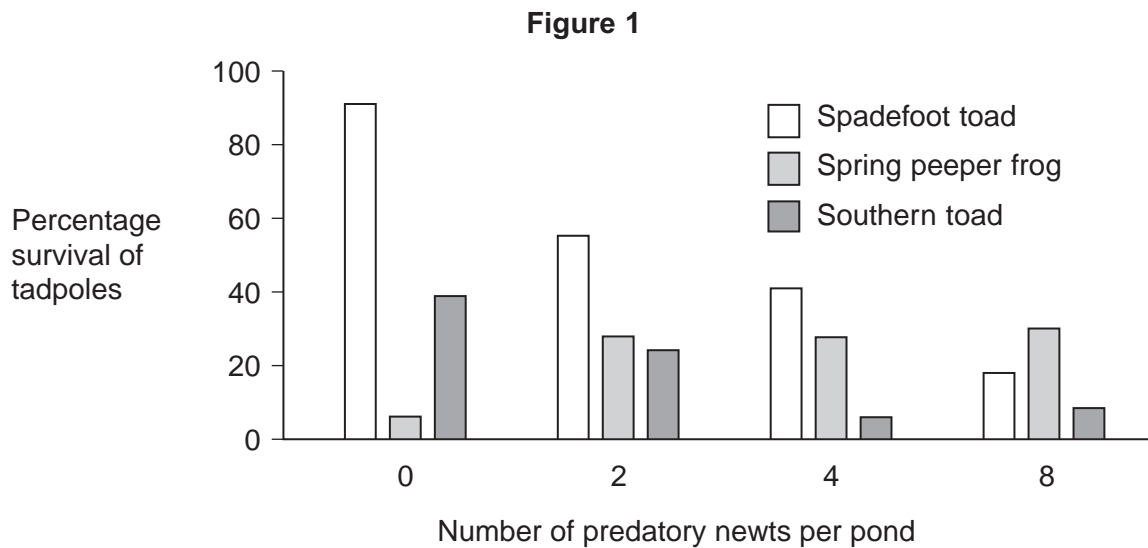
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- 4 The young of frogs and toads are called tadpoles. Ecologists investigated the effect of predation on three species of tadpole. They set up four artificial pond communities. Each community contained

- 200 spadefoot toad tadpoles
- 300 spring peeper frog tadpoles
- 300 southern toad tadpoles.

The ecologists then added a different number of newts to each pond. Newts are predators. **Figure 1** shows the effect of increasing the number of newts on the percentage survival of the tadpoles of each species.



- 4 (a) (i) Describe the effect of an increase in the number of newts on the percentage survival of the tadpoles of each of the **toad** species.

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(2 marks)

- 4 (a) (ii) Suggest an explanation for the effect of an increase in the number of newts on the percentage survival of the tadpoles of spring peeper frogs.

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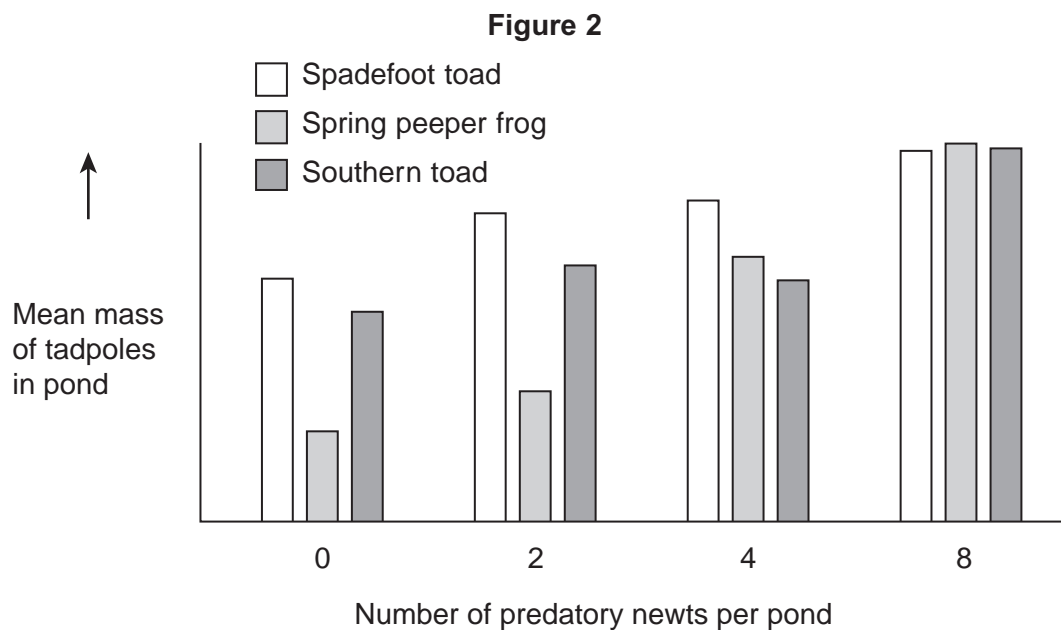
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(2 marks)

Figure 2 shows how the masses of the tadpoles were affected in each pond during the investigation.



- 4 (b) Using the information provided in **Figure 1** explain the results obtained in **Figure 2**.

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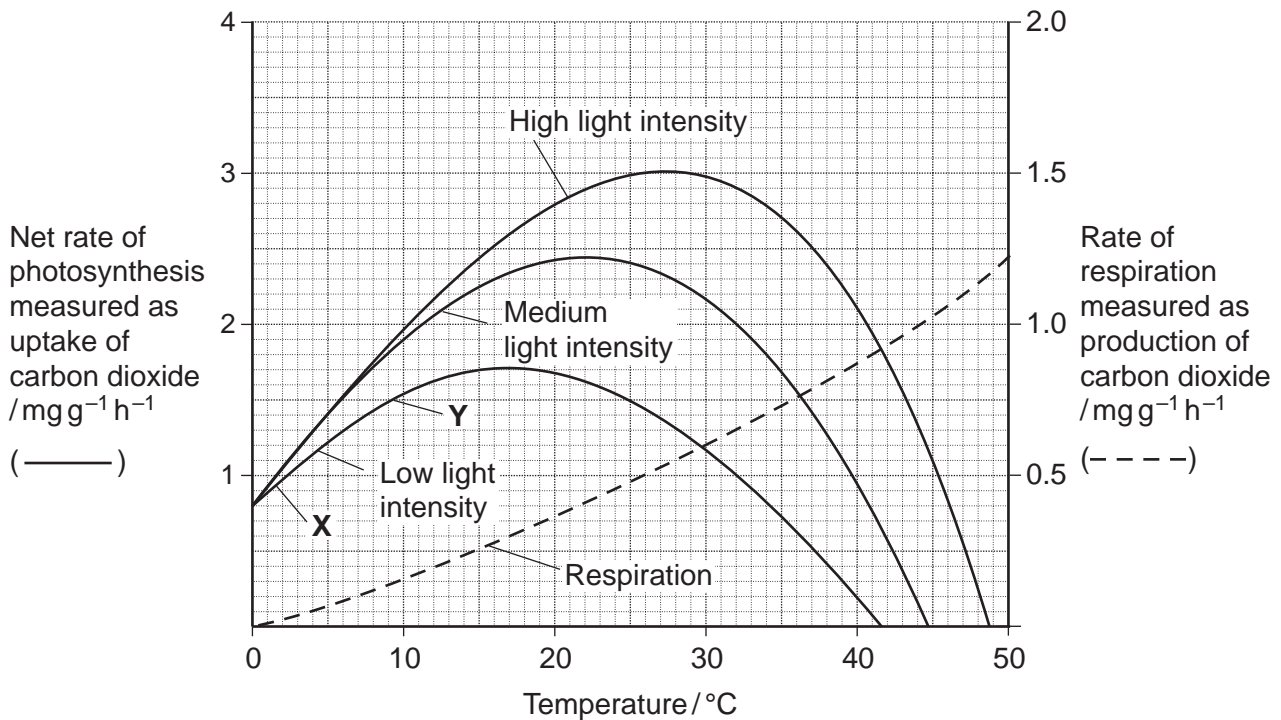
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(2 marks)

- 5** Scientists investigated the effects of temperature and light intensity on the rate of photosynthesis in creeping azalea. They investigated the effect of temperature on the net rate of photosynthesis at three different light intensities. They also investigated the effect of temperature on the rate of respiration. The graph shows the results.



- 5 (a) (i)** Name the factors that limited the rate of photosynthesis between X and Y.

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(1 mark)

- 5 (a) (ii)** Use information from the graph to explain your answer.

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(2 marks)

- 5 (b)** Use information from the graph to find the gross rate of photosynthesis at 20°C and medium light intensity.

Answer

(1 mark)

- 5 (c)** Creeping azalea is a plant which grows on mountains. Scientists predict that in the area where this plant grows the mean summer temperature is likely to rise from 20°C to 23°C. It is also likely to become much cloudier. Describe and explain how these changes are likely to affect the growth of creeping azalea.

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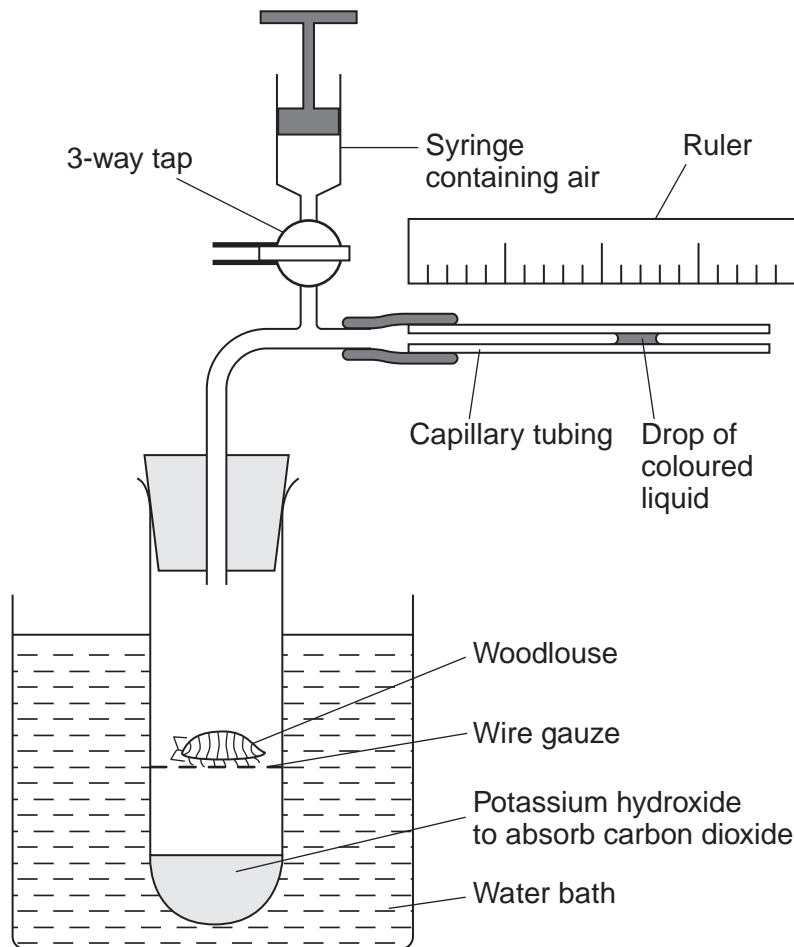
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- 6 (a)** A student measured the rate of aerobic respiration of a woodlouse using the apparatus shown in the diagram.



- 6 (a) (i)** The student closed the tap. After thirty minutes the drop of coloured liquid had moved to the left. Explain why the drop of coloured liquid moved to the left.

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(3 marks)

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- 6 (a) (ii)** What measurements should the student have taken to calculate the rate of aerobic respiration in mm^3 of oxygen $\text{g}^{-1} \text{h}^{-1}$?

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(3 marks)

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- 6 (b)** DNP inhibits respiration by preventing a proton gradient being maintained across membranes. When DNP was added to isolated mitochondria the following changes were observed

- less ATP was produced
- more heat was produced
- the uptake of oxygen remained constant.

Explain how DNP caused these changes.

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- (c) Explain how the intensive rearing of domestic livestock increases net productivity.

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END OF QUESTIONS

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