

GCSE Combined Science: Trilogy

Worksheet: Energy changes and reversible reactions

TIME 20 min	TOTAL 19 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Energy changes and reversible reactions

NAME _____

CLASS _____

DATE _____

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

In a reversible reaction, the forward reaction is exothermic.

0 1 . 1

What type of reaction must the reverse reaction be?

Tick (✓) **one** box.

Exothermic

☐

Endothermic

☐

Neither exothermic nor endothermic

☐

It depends on the temperature

☐

[1 mark]

0 1 . 2

Explain why the amount of energy released by the forward reaction must equal the amount of energy absorbed by the reverse reaction.

.....

.....

[1 mark]

0 2

When blue hydrated copper sulfate is heated, it forms white anhydrous copper sulfate and water.



The forward reaction is endothermic.

0 2 . 1

What type of reaction is the reverse reaction?

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.....

[1 mark]

0 2 . 2

Give **two** observations when water is added to white anhydrous copper sulfate.

.....

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.....

.....

[2 marks]

0 2 . 3

When 1 mole of hydrated copper sulfate is heated, 78 kJ of energy is taken in. How much energy is released when 1 mole of anhydrous copper sulfate reacts with water?

.....

.....

.....

Energy released = kJ

[1 mark]

0 3

A teacher heated some white solid ammonium chloride at the bottom of a long test tube, loosely plugged with mineral wool.



The forward reaction is endothermic.

After a few minutes the solid at the bottom of the tube had disappeared, and a white solid had formed on the cooler glass near the top of the tube.

0 3 . 1

Explain why the ammonium chloride had to be heated for it to decompose.

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[2 marks]

0 3 . 2

Explain why a white solid formed near the top of the tube.

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.....

[2 marks]

0 3 . 3

Compare the energy transferred when a sample of ammonium chloride decomposes with the energy transferred when the same mass of ammonium chloride re-forms.

.....

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.....

.....

[2 marks]

0 4

White anhydrous copper sulfate reacts with water to form blue hydrated copper sulfate:



A student wants to show that the forward reaction is exothermic. The student has anhydrous copper sulfate, water, a polystyrene cup, a thermometer, a measuring cylinder, a balance and a stirring rod.

0 4 . 1

Describe a method the student could use.

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[4 marks]

0 4 . 2

The temperature of the water rose by 18 °C.

What does this result show about the reverse reaction?

Explain your answer.

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.....

.....

[2 marks]

0 4 . 3

Explain why hydrated copper sulfate must be heated continuously to turn it back into anhydrous copper sulfate.

.....

.....

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Energy changes and reversible reactions · 19 marks

Question 1 (2 marks)

01.1 [1 mark]

Correct: Endothermic

01.2 [1 mark]

Answer: Energy is conserved: the reverse reaction simply undoes the forward reaction, so it must take in exactly the energy that was released.

- energy is conserved, so reversing the reaction must absorb exactly as much energy as the forward reaction released (1)
-

Question 2 (4 marks)

02.1 [1 mark]

Answer: Exothermic

- exothermic (1)
-

02.2 [2 marks]

Answer: The solid turns blue; it gets hot.

- the solid turns blue (1)
 - it gets hot / the temperature increases (1)
-

02.3 [1 mark]

Answer: 78 kJ

- 78 (kJ) (1)
-

Question 3 (6 marks)

03.1 [2 marks]

Answer: The forward reaction is endothermic, so it takes in energy; the energy has to be supplied by heating.

- the forward (decomposition) reaction is endothermic / takes in energy (1)
 - so energy must be supplied (continuously) by heating for it to happen (1)
-

03.2 [2 marks]

Answer: The ammonia and hydrogen chloride gases cooled near the top of the tube, where the exothermic reverse reaction happened, re-forming solid ammonium chloride.

- the ammonia and hydrogen chloride gases rise and cool near the top of the tube (1)
 - at the lower temperature the reverse reaction happens (it is exothermic), re-forming (white solid) ammonium chloride (1)
-

03.3 [2 marks]

Answer: The same amount of energy is transferred: it is taken in when the ammonium chloride decomposes and released when it re-forms.

- the same amount of energy is transferred in each direction (1)
 - energy is taken in by the decomposition but released when the ammonium chloride re-forms (1)
-

Question 4 (7 marks)

04.1 [4 marks]

Answer: Measure a known volume of water (e.g. 20 cm³) into the polystyrene cup with the measuring cylinder and record its temperature. Weigh out a known mass of anhydrous copper sulfate (e.g. 5 g), add it to the water and stir. Record the highest temperature reached and calculate the temperature rise.

- measure a known volume of water into the polystyrene cup using the measuring cylinder (1)
- record the starting temperature of the water (1)
- add a weighed mass of anhydrous copper sulfate and stir (1)
- record the highest temperature reached (and calculate the temperature change) (1)

04.2 [2 marks]

Answer: The reverse reaction (hydrated copper sulfate → anhydrous copper sulfate + water) is endothermic: it takes in the same amount of energy as the forward reaction releases.

- the reverse reaction is endothermic (1)
- because the forward reaction is exothermic (it released energy), and the same amount of energy is taken in by the reverse reaction (1)

04.3 [1 mark]

Answer: The reaction is endothermic, so energy has to be supplied all the time it is happening.

- the reaction is endothermic, so energy must keep being supplied (by heating) for it to continue (1)
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