

Name:

Date:

C5 - Test 2
ENERGY CHANGES
Beginner

GCSE

CHEMISTRY

AQA - Combined Science

Mark

Grade

Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

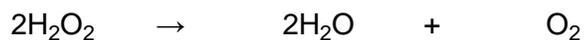
Information

- The marks for the questions are shown in brackets

1.

Hydrogen peroxide decomposes slowly to give water and oxygen.

The reaction is *exothermic*.



(a) In an *exothermic* reaction, energy is given out.

Draw a ring around the correct answer to complete the sentence.

In an *exothermic* reaction, the temperature

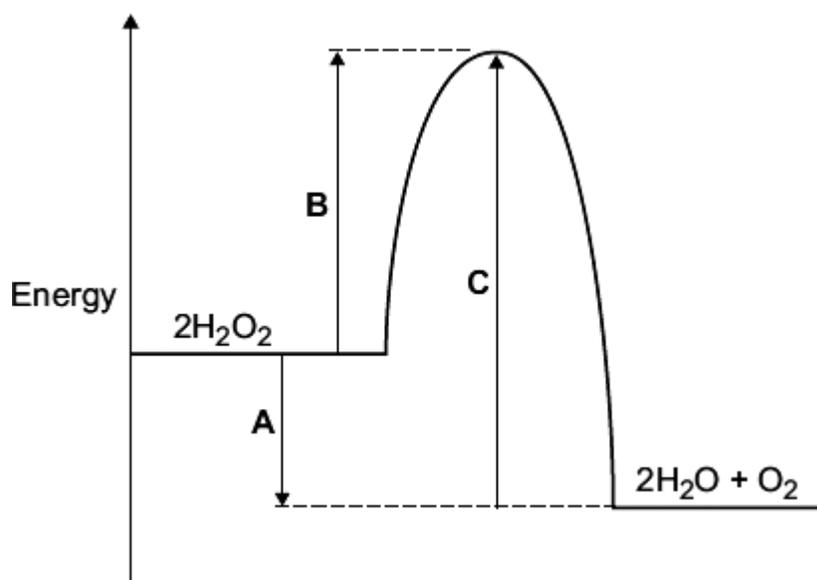
goes down.

goes up.

stays the same.

(1)

(b) The energy level diagram for this reaction is shown below.



The energy changes, **A**, **B** and **C**, are shown on the diagram.

Use the diagram to help you answer these questions.

(i) Which energy change, **A**, **B** or **C**, is the activation energy?

(1)

(ii) Which energy change, **A**, **B** or **C**, shows that this reaction is exothermic?

(1)

- (iii) Hydrogen peroxide decomposes quickly when a small amount of manganese(IV) oxide is added.

Draw a ring around the correct answer to complete each sentence.

Hydrogen peroxide decomposes quickly because

manganese(IV) oxide is

- a catalyst.
- an element.
- a solid.

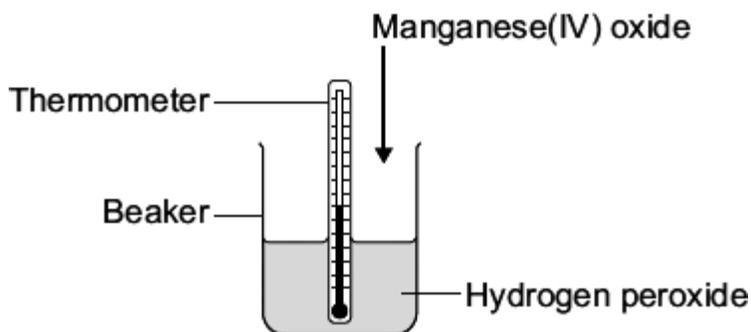
The manganese(IV) oxide has lowered the

- activation energy.
- boiling point.
- temperature.

(2)

- (c) A student did an experiment to find the amount of energy produced when hydrogen peroxide solution is decomposed using manganese(IV) oxide.

The apparatus the student used is shown in the diagram.



The student first measured the temperature of the hydrogen peroxide. Then the student added the manganese(IV) oxide, stirred the mixture and recorded the highest temperature.

- (i) Suggest why the student stirred the mixture before recording the highest temperature.

(1)

(ii) The biggest error in this experiment is heat loss.

Suggest how the student could change the apparatus so that less heat is lost.

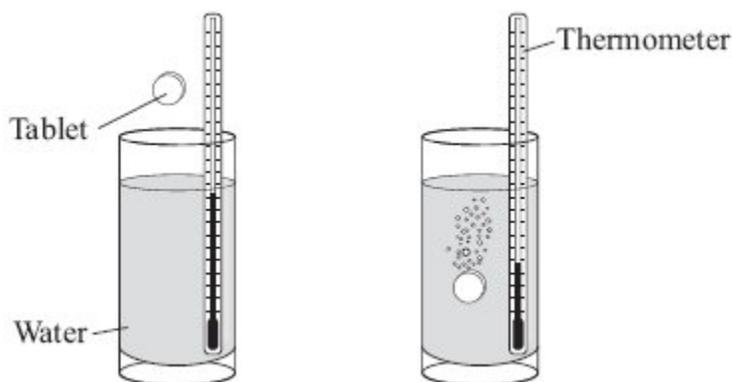
(1)

(Total 7 marks)

2.

An indigestion tablet contains sodium hydrogencarbonate and citric acid.

When the tablet is added to cold water a chemical reaction takes place and there is a lot of fizzing.



(a) The formula of the gas that causes the fizzing is CO_2

Name this gas _____ .

(1)

(b) This chemical reaction is endothermic.

(i) Tick (✓) the statement which describes what happens to the temperature of the solution.

Statement	Tick (✓)
The temperature of the solution will increase.	
The temperature of the solution will decrease.	
The temperature of the solution will stay the same.	

(1)

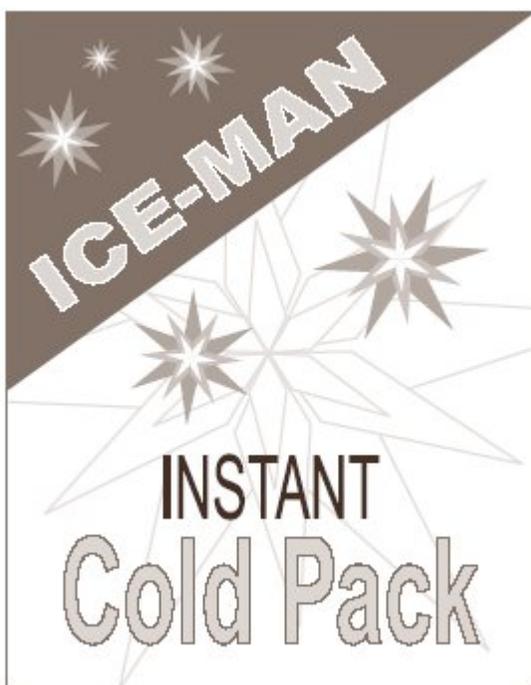
- (ii) Tick (✓) the statement which describes what happens to the energy during the reaction.

Statement	Tick (✓)
Energy is given out to the surroundings.	
Energy is taken in from the surroundings.	
No energy is given out to or taken from the surroundings.	

(1)
(Total 3 marks)

3.

Instant cold packs are used to treat sports injuries.



One type of cold pack has a plastic bag containing water. Inside this bag is a smaller bag containing ammonium nitrate.

The outer bag is squeezed so that the inner bag bursts. The pack is shaken and quickly gets very cold as the ammonium nitrate dissolves in the water.

(a) **One** of the statements in the table is correct.

Put a tick (✓) next to the correct statement.

Statement	(✓)
The bag gets cold because heat energy is given out to the surroundings.	
The bag gets cold because heat energy is taken in from the surroundings.	
The bag gets cold because plastic is a good insulator.	

(1)

(b) Draw a ring around the word that best describes the change when ammonium nitrate dissolves in water.

electrolysis endothermic exothermic

(1)

(c) Suggest and explain why the pack is shaken after the inner bag has burst.

(2)

(Total 4 marks)

4.



An airship caught fire when it was coming in to land in 1937. The airship was filled with hydrogen. A spark or flame ignited the hydrogen. The hydrogen reacted with oxygen in the air to produce water.

(a) Write a word equation for the reaction of hydrogen with oxygen.

(1)

(b) Draw a ring around the correct answer in each box to complete this sentence.

When reactions take place, energy is

released
supplied

 to break the existing bonds

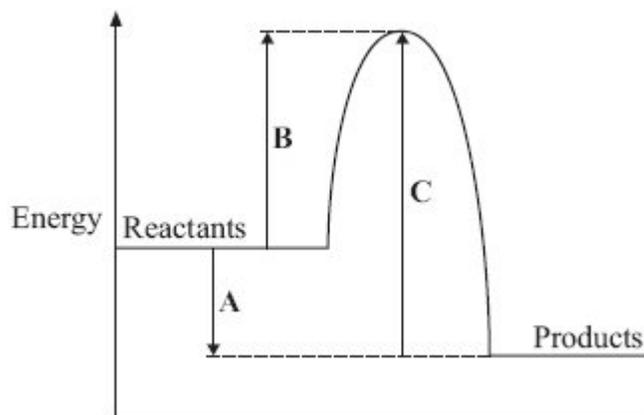
and energy is

released
supplied

 when new bonds form.

(1)

(c) An energy level diagram for the reaction of hydrogen and oxygen is shown below.



Use the energy level diagram above to help you to answer these questions.

(i) Which energy change, **A**, **B** or **C**, represents the activation energy?

(1)

(ii) Which energy change, **A**, **B** or **C**, shows that the reaction is exothermic?

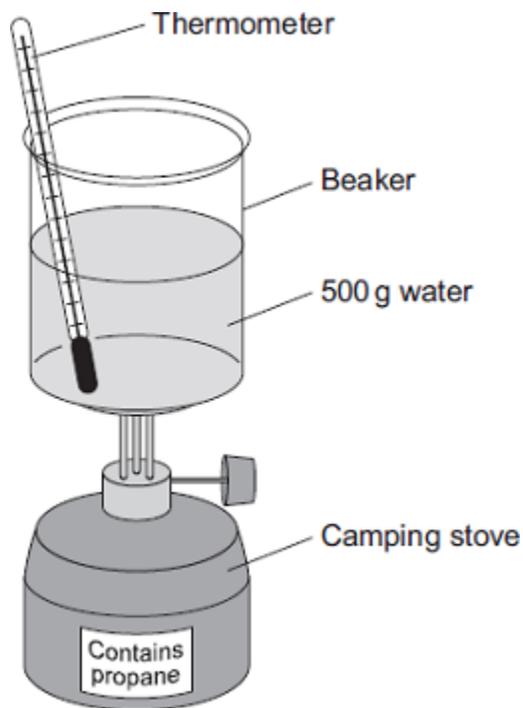
(1)

(iii) Explain why the hydrogen and oxygen needed a spark or flame to start the reaction.

(1)

(Total 5 marks)

5. A camping stove uses propane gas.



(a) A student did an experiment to find the energy released when propane is burned.

The student:

- put 500 g water into a beaker
- measured the temperature of the water
- heated the water by burning propane for 1 minute
- measured the temperature of the water again.

The student found the temperature change was 20 °C.

The student can calculate the energy released, in joules (J), using the equation:

$$\text{energy released (J)} = \text{mass of water (g)} \times 4.2 \times \text{temperature change (}^\circ\text{C)}$$

(i) Use the student's result to calculate the energy released in joules (J).

Energy released = _____ J

(2)

(ii) State **two** safety precautions that the student should take during the experiment.

1. _____

2. _____

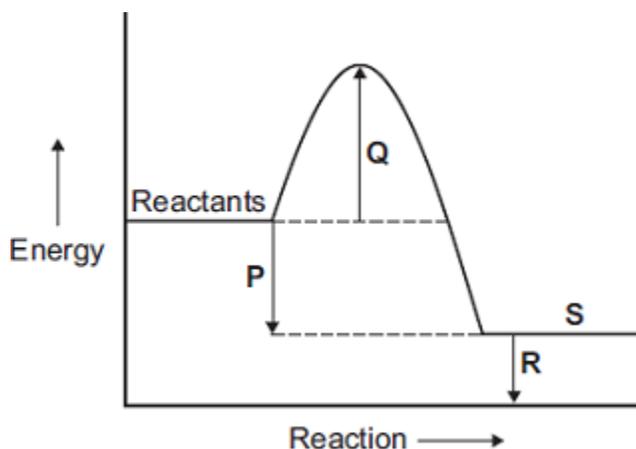
(2)

(iii) Tick (✓) **two** boxes which describe how the student could make his result more accurate.

	Tick (✓)
Stir the water before measuring the temperature.	
Heat the water until it boils.	
Place a lid on the beaker.	
Use a larger beaker for the water.	

(2)

(b) The change in energy when propane is burned can be shown in an energy level diagram.



Draw **one** line from each description to the correct letter.

Description	Letter
<input type="text" value="products"/>	<input type="text" value="P"/>
<input type="text" value="activation energy"/>	<input type="text" value="Q"/>
<input type="text" value="energy released by the reaction"/>	<input type="text" value="R"/>
	<input type="text" value="S"/>

(3)

(c) Propane and hydrogen are both used as fuels.

Some information about propane and hydrogen is given in the table.

Fuel	Resource	Products formed when fuel burned
propane	crude oil	carbon dioxide and water
hydrogen	water	water

Use the information in the table to suggest **two** disadvantages that propane has as a fuel compared to hydrogen.

1. _____

2. _____

(2)
(Total 11 marks)