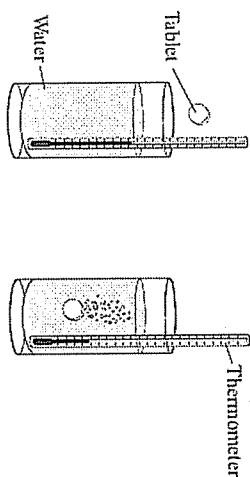


Energy transfer in chemical reactions

1. 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 CO₂

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)

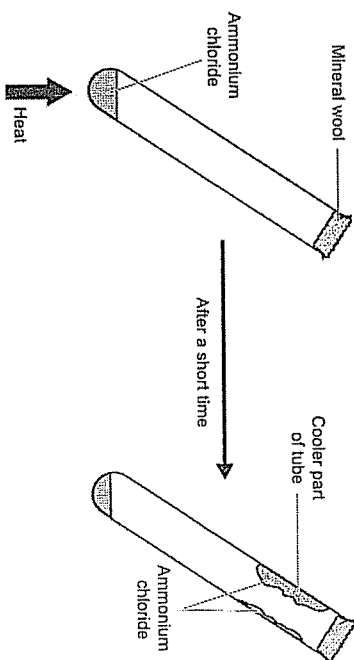
- (ii) Tick (✓) the statement which describes what happens to the energy during the reaction.

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.	

(Total 3 marks) (1)

2. A student did two experiments using ammonium chloride.

- (a) In the first experiment the student heated a small amount of ammonium chloride in a test tube.



Two reactions take place in the test tube.

Reaction 1	ammonium chloride → ammonia + hydrogen chloride (colourless gases)
Reaction 2	ammonia + hydrogen chloride → ammonium chloride

- (i) Complete the sentences by crossing out the incorrect word in each box.

Reaction 1 takes place at a

high
low

 temperature.

Reaction 2 takes place at a

high
low

 temperature.

(1)

- (ii) Draw a ring around the word which best describes reactions 1 and 2.
 combustion displacement oxidation reduction reversible

(1)

(iii) Suggest a reason for the mineral wool at the top of the test tube.

 (1)

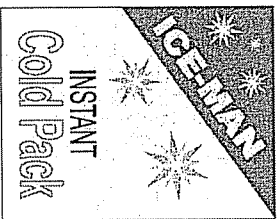
- (b) In the second experiment the student mixed a small amount of ammonium chloride with some water in a beaker.
The temperature of the water was measured before and after adding the ammonium chloride.

Temperature before adding the ammonium chloride	20°C
Temperature after adding the ammonium chloride	16°C

Draw a ring around the word which best describes the process which takes place.

- combustion displacement endothermic exothermic freezing
- (Total 4 marks) (1)

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.	

- (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.

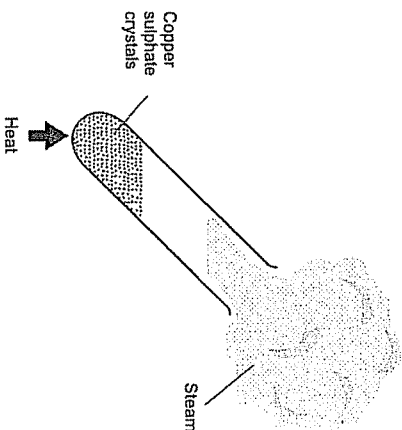
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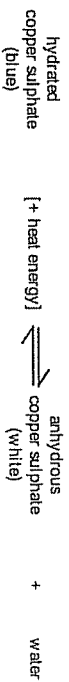
(Total 4 marks) (2)

4. A student heated some blue copper sulphate crystals. The crystals turned into white copper sulphate.



- (a) The blue copper sulphate had to be heated to change it into white copper sulphate.
State whether the reaction was exothermic or endothermic.
Explain your answer.
.....

- (b) The word equation for this reaction is shown below.



- (i) What does the symbol ⇌ tell you about this reaction?
.....
- (1)
- (ii) How could the student turn the white powder back to blue?
.....

(Total 3 marks) (1)

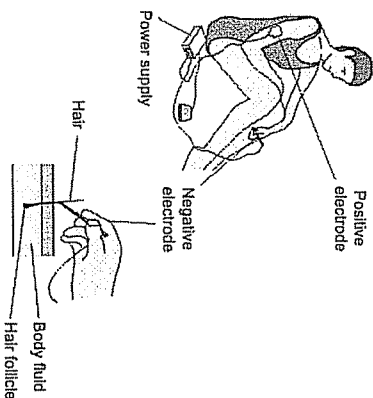
Electrolysis

1. Electrolysis can be used to remove unwanted hair from the skin.

The positive electrode is connected by a patch to the skin.

The negative electrode is connected to the hair.

The body fluid is a solution that contains sodium chloride. The electricity causes the electrolysis of a small amount of this solution.



- (a) In this solution hydrogen ions move to the negative electrode.
Complete the sentence using one word from the box.

negative	neutral	positive
----------	---------	----------

Hydrogen ions move to the negative electrode because they have a charge.

- (b) Draw a ring around the name of the gas produced at the positive electrode during the electrolysis of sodium chloride solution.

chlorine hydrogen nitrogen

(1)

- (c) The electrolysis of the sodium chloride solution forms a strong alkali around the hair follicle.

- (i) Complete the name of this strong alkali using one of the words from the box.

chlorine hydrogen nitrogen

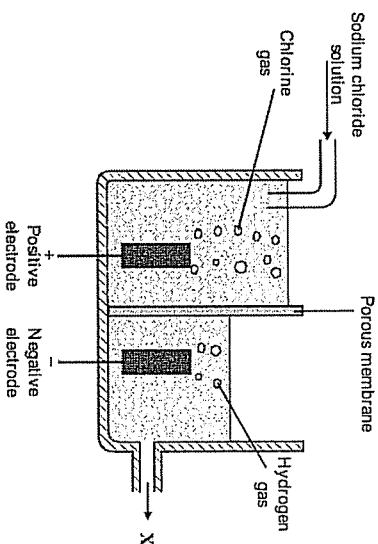
The name of this strong alkali is sodium

(1)

- (ii) Suggest how this strong alkali helps to remove the hair.

.....
.....
.....
(Total 4 marks)

2. Sodium chloride solution is a useful raw material for the manufacture of other substances.



- (i) What is the name of the process shown?

.....
(1)

- (ii) Chloride ions lose electrons at the positive electrode. What is the name of this type of reaction?

.....
(1)

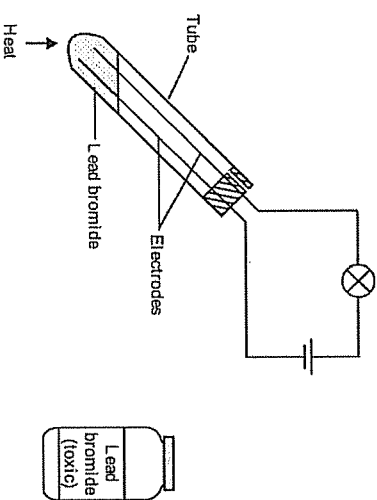
- (iii) The solution formed at X is alkaline. What causes this solution to be alkaline?

.....
.....
(2)

- (iv) Give a balanced ionic equation for the formation of hydrogen gas at the negative electrode.

.....
.....
(Total 7 marks)

3. A student investigated the electrolysis of lead bromide.



Lead bromide was placed in the tube and the circuit was switched on. The light bulb did not light up.

The tube was heated and soon the bulb lit up. The observations are shown in the table.

Positive electrode	Negative electrode
red-brown gas	silver liquid

- (a) What is meant by *electrolysis*?
.....
(2)
- (b) Why did the lead bromide conduct electricity when the tube was heated?
.....
(1)
- (c) Name the substances formed at the:
positive electrode,
negative electrode,
(2)
- (d) Suggest one safety precaution that should be taken during this investigation.
.....
(1)
- (Total 6 marks)