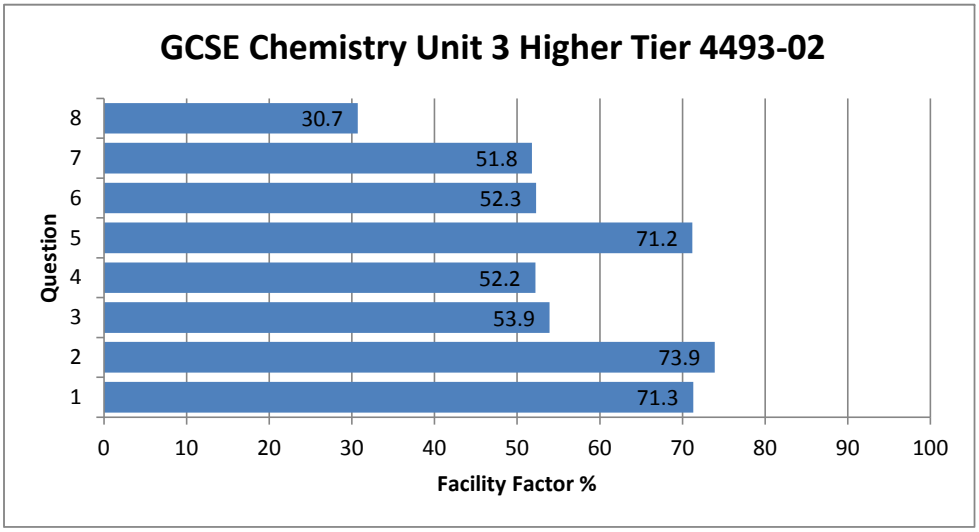
WJEC 2014 Online Exam Review

GCSE Chemistry Unit 3 Higher Tier 4493-02

All Candidates' performance across questions

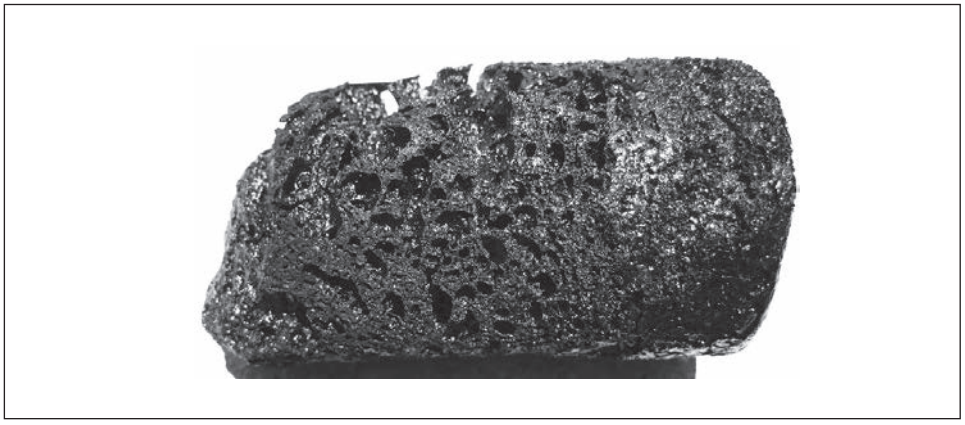
Question Title	N	Mean	S D	Max Mark	F F	Attempt %	
1	3755	7.1	2.1	10	71.3	100	
2	3756	5.9	1.4	8	73.9	100	
3	3665	3.2	1.5	6	53.9	97.6	
4	3740	3.1	1.9	6	52.2	99.6	4b
5	3754	5.7	2.1	8	71.2	100	
6	3755	5.2	2.7	10	52.3	100	
7	3690	3.1	2.2	6	51.8	98.2	7b
8	3511	1.8	1.5	6	30.7	93.5	8



Examiner only

4. Sulfuric acid is produced in industry by the contact process.

(b) When concentrated sulfuric acid is added to sugar a black solid is formed.



In terms of the elements present in sugar, describe what happens during this reaction. [2]

.....

.....

.....

6

Turn over.

4

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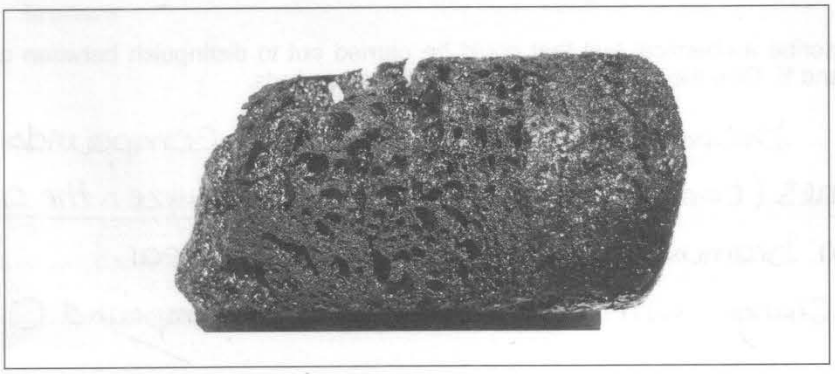

In terms of the elements present in sugar, describe what happens during this reaction.

[2]

The Sulphuric acid takes away the elements in water; hydrogen and oxygen from the glucose and leaves carbon behind (the black solid)

4

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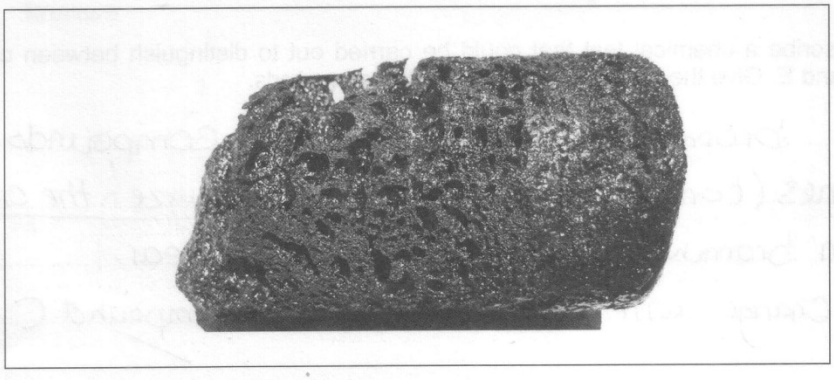

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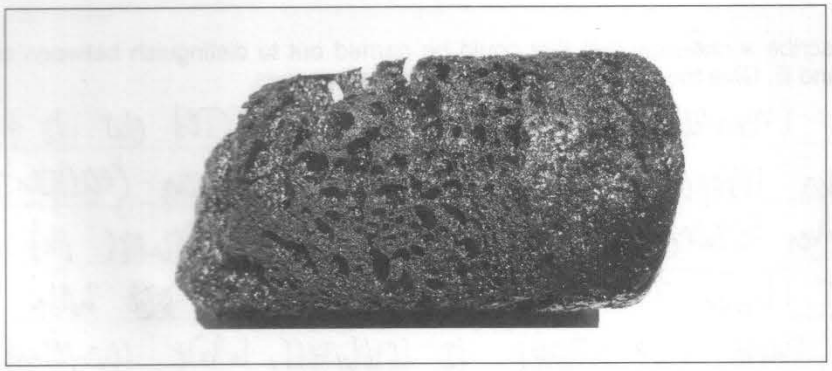

In terms of the elements present in sugar, describe what happens during this reaction.

[2]

Sugar is made up of carbon, hydrogen and oxygen. Because sulfuric acid is a dehydrating agent, it takes water from the sugar, leaving the black solid carbon

4

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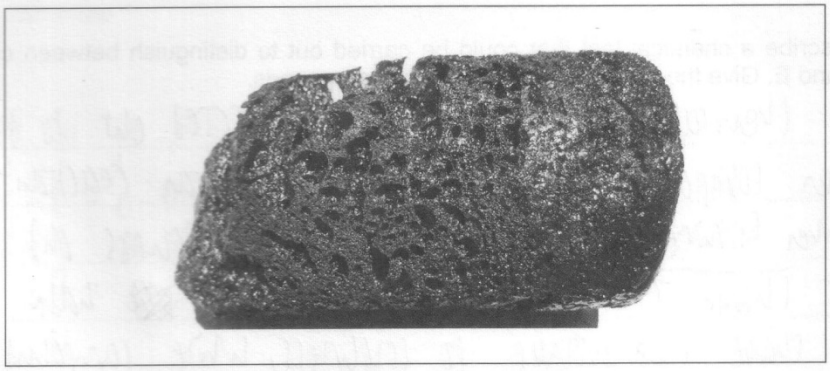

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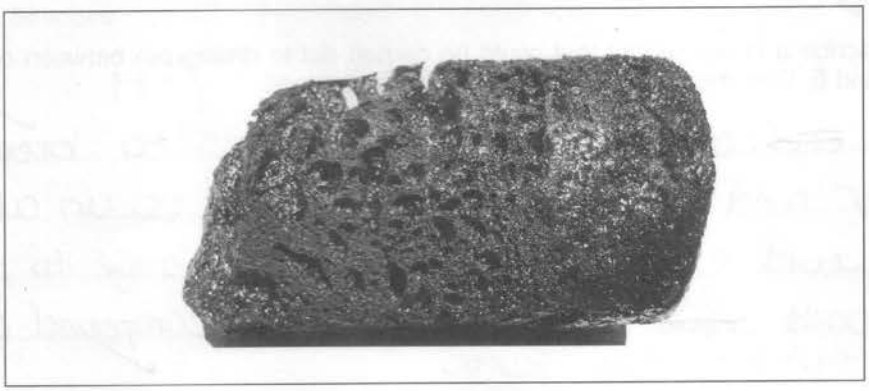

In terms of the elements present in sugar, describe what happens during this reaction.

[2]

The hydrogen and oxygen molecules are removed from sugar because they are water molecules and sulfuric acid is a dehydrating agent, which means it removes water from a substance

4

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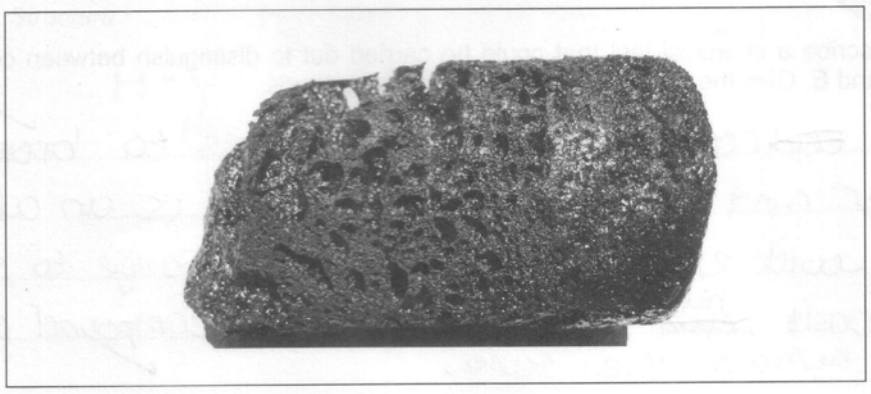

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0

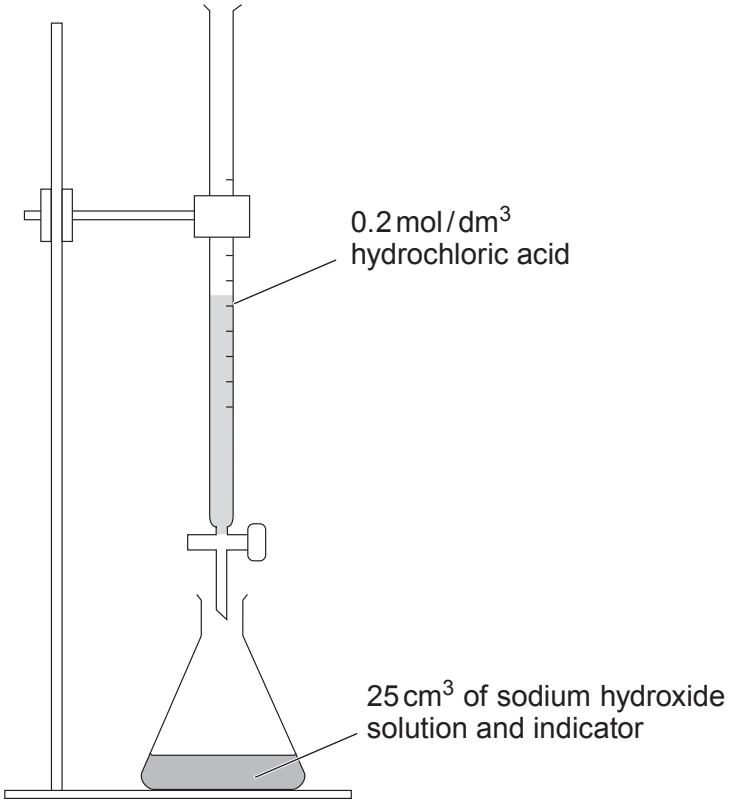
Examiner only

7. A laboratory technician prepared a solution of sodium hydroxide, NaOH, in the following way.

- He weighed out accurately 2.0 g of sodium hydroxide.
- He dissolved the sodium hydroxide in 250 cm^3 of water.

The relative formula mass (M_r) of sodium hydroxide is 40.

(b) A student was asked to carry out a titration to check the concentration of the sodium hydroxide solution. She carried out the titration using the apparatus shown below.



Examiner only

The equation for the reaction taking place is as follows.

$$NaOH + HCl \longrightarrow NaCl + H_2O$$

The titration was carried out three times and the results obtained are shown below.

	Titration		
	1	2	3
Volume of hydrochloric acid added (cm^3)	22.2	22.7	22.6

Calculate the number of moles of hydrochloric acid that reacted and hence the concentration of the sodium hydroxide solution. [4]

Concentration of sodium hydroxide solution = ... mol / dm^3

6

Turn over.

7b

only

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Calculate the number of moles of hydrochloric acid that reacted and hence the concentration of the sodium hydroxide solution. [4]

22.2+22.7 +22.6 = 67.5 / 3 = 22.5

$m = \frac{m}{m}$

$m = \frac{22.5}{.0.2}$

$m = 112.5$

$C = \frac{M}{V}$

$C = \frac{112.5}{25 cm^3}$

Concentration of sodium hydroxide solution = 4.5 mol/dm^3

7b

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1

7b

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Mean = 22.5

Calculate the number of moles of hydrochloric acid that reacted and hence the concentration of the sodium hydroxide solution. [4]

0.2 × 0.225 = 0.045 mol

1 : 1 ratio = 0.045

$= \frac{0.045}{0.025}$ ecf $= 1.8$

Concentration of sodium hydroxide solution = 1.8 mol/dm^3

7b

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Calculate the number of moles of hydrochloric acid that reacted and hence the concentration of the sodium hydroxide solution. [4]

Average volume of HCl = (22.2 + 22.7 + 22.6) ÷ 3

= 22.5 cm^3

Moles = volume × concentration

= $\frac{22.5}{1000}$ × 0.2

= 0.0045 moles HCl

Ratio 1:1, so 0.0045 moles NaOH

concentration = $\frac{\text{Moles}}{\text{volume}}$

= $\frac{0.0045}{25/1000}$ = 0.18 mol/dm^3

Concentration of sodium hydroxide solution = ... 0.18 ..... mol/dm^3

7b

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Ratio 1:1, so 0.0045 moles NaOH

concentration = $\frac{\text{Moles}}{\text{volume}}$

= $\frac{0.0045}{25/1000}$ = 0.18 mol/dm^3

4

Concentration of sodium hydroxide solution = 0.18 mol/dm^3

Examiner only

8. Describe the similarities in the reactions of ethanoic acid and sulfuric acid with metals, carbonates and bases. Describe and explain any differences observed. You should include relevant equations in your answer. [6 QWC]

6

END OF PAPER

Examiner only

8. Describe the similarities in the reactions of ethanoic acid and sulfuric acid with metals, carbonates and bases. Describe and explain any differences observed. You should include relevant equations in your answer. [6 QWC]

When ethanoic acid and sulfuric acid both react with metals, they both produce a salt and hydrogen.

Metal + Acid → Salt + Hydrogen

The similarities between the two when they react with a metal carbonate is they both produce a salt, water and carbon dioxide

Metal carbonate + Acid → Salt + water + Carbon dioxide.

Finally, the similarities between the two when they react with a base is that they produce a salt and water.

Base + Acid → Salt + water

The differences when they react with metals, carbonates and bases is that they produce different salts. This is because they aren't the same element. Also, another difference is that the reactions with sulfuric acid were more vigorous and exothermic because sulfuric acid is a stronger acid compared to ethanoic acid.

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8. Describe the similarities in the reactions of ethanoic acid and sulfuric acid with metals, carbonates and bases. Describe and explain any differences observed. You should include relevant equations in your answer. [6 QWC]

If ethanoic acid or sulfuric acid reacts with a metal a salt and hydrogen are formed
Metal + acid → Salt + hydrogen
If ethanoic acid or ~~sulp~~ sulfuric acid reacts with a base a salt and water are produced.
Base + acid → Salt + water
If ethanoic acid or sulfuric acid reacts with a ~~Carbonate~~ a salt and water are produced.
Carbonate + acid → Salt + water
The difference in a metal reacting ~~to~~ with an acid to a base or carbonate is that hydrogen is produced instead of water.

only

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Base + acid → Salt + water

If ethanoic acid or sulfuric acid reacts with a ~~carbonate~~ a salt and water are produced.

Carbonate + acid → Salt + water

The difference in a metal reacting ~~to~~ with an acid to a base or carbonate is that hydrogen is produced instead of water.

2

8. Describe the similarities in the reactions of ethanoic acid and sulfuric acid with metals, carbonates and bases. Describe and explain any differences observed. You should include relevant equations in your answer. [6 QWC]

Ethanoic Acid and Sulphuric Acid both react with Metals to produce a Salt and hydrogen

$H_2SO_4 + Mg \rightarrow MgSO_4 + H_2$

$2CH_3COOH + Mg \rightarrow Mg(CH_3COO)_2 + H_2$

They both react with a Carbonate to produce a Salt carbon dioxide and water

$H_2SO_4 + MgCO_3 \rightarrow MgSO_4 + CO_2 + H_2O$

$2CH_3COOH + MgCO_3 \rightarrow Mg(CH_3COO)_2 + CO_2 + H_2O$

They both react with bases to mak Salt and water

$Mg(OH)_2 + H_2SO_4 \rightarrow MgSO_4 + 2H_2O$

$Mg(OH)_2 + CH_3COOH \rightarrow MgCH_3COO + H_2O$

The differences are ethanoic acid produces ethanoate Salts and Sulphuric acid produces Sulfates.

Also, Sulfuric acid is a strong acid so dissociates completely and gives very vigorous reactions but ethanoic acid dissociates partially and is a weak acid so gives much weaker reactions. So, all of the reactions for ethanoic acid would be giving out less heat and less bubbles of gas.

6

END OF PAPER

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$2CH_3COOH + MgCO_3 \rightarrow Mg(CH_3COO)_2 + CO_2 + H_2O$

They both react with bases to make Salt and water

$Mg(OH)_2 + H_2SO_4 \rightarrow MgSO_4 + 2H_2O$

$Mg(OH)_2 + CH_3COOH \rightarrow MgCH_3COO + H_2O$

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6

END OF PAPER