## **Types of Chemical Reactions**

1. Neutralisation occurs when acids react with alkalis.	
What is the ionic equation for neutralisation?	
A $H^+ + OH^- \rightarrow H_2O$ B $H^- + OH^+ \rightarrow H_2O$ C $H^+ + OH^+ \rightarrow H_2O$ D $H^- + OH^- \rightarrow H_2O$	
Your answer	[1]
<ul><li>2. Sodium hydroxide reacts with hydrochloric acid. Sodium What is the name of this type of reaction?</li><li>A Neutralisation</li></ul>	m chloride and water are made.
B Oxidation	
<ul><li>C Reduction</li><li>D Thermal decomposition</li></ul>	
Your answer	[1]
3. Lemon juice can be described as a weak acid.	
What is the pH value for a weak acid?  • pH 1	
В pH 4	
<b>C</b> pH 7	
D pH 14	
Your answer	[1]

4. A student neutralises an alkali with an acid in a titration experiment.	
Complete the word equation for the reaction of an acid with an alkali.	
acid + alkali → +	[2]
5. Sulfur dioxide is a pollutant found in many large cities.	
Sulfur dioxide is an <b>acidic</b> gas.	
i. Suggest a value for the pH of sulfur dioxide.	
	[1]
ii. Describe <b>one</b> problem caused by sulfur dioxide.	
ii. Describe one problem caused by suitar dioxide.	
	[1]
<b>6 (a).</b> * Potassium chloride is a mineral found in many foods.	
A student wants to make a salt called potassium chloride, KCI, by neutralisation of an acid by an alkali.	
Describe how to make a pure, dry sample of potassium chloride in a laboratory by neutralisation.	
	[C]
	[6]

(b). Acids are substances that turn universal indicator paper red.	
i. What makes a substance acidic?	
	<u>[1]</u>
ii. Sodium hydroxide, NaOH, is an alkali.	
Sodium hydroxide neutralises sulfuric acid, $H_2SO_4$ . The reaction r sulfate, $Na_2SO_4$ . Water is also made.	nakes a salt called sodium
Complete the <b>balanced symbol equation</b> for this reaction.	

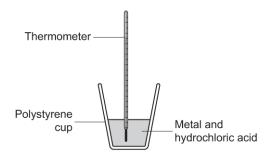
...... NaOH + 
$$H_2SO_4 \rightarrow Na_2SO_4 + ...... H_2O$$

[2]

- **(c).** A student investigates the reaction of an aqueous solution of sodium hydroxide and sulfuric acid. During the experiment, the student tests the pH of the solution with universal indicator.
  - i. Suggest a piece of equipment that the student could use instead of universal indicator paper to test the pH of the solution.

	[1]
ii. Describe how to use the equipment suggested in (i).	
	[2]

7 (a). A student investigates the reaction of different metals with hydrochloric acid.



The student repeats the experiment with different metals.

She repeats the experiment three times for each metal.

She measures the temperature change in each experiment.

Look at her results.

	Temperature change (°C)				
Metal	letal Test 1 Test 2 Test 3				
Magnesium	10.3	10.5	10.2		
Zinc	8.6	8.7	7.6		
Iron	5.2	4.9	5.1		

i.	One of the student's results is anomalous.	
Р	out a ring around the anomalous result in the table.	[1]
ii.	Suggest a reason why the result could be anomalous.	
		-
		_
iii.	Calculate the <b>mean</b> temperature change for <b>magnesium</b> .	
	Give your answer to 1 decimal place.	
	Mean temperature change =	°C <b>[2]</b>
(b).		
i.	The student wants to improve her experiment to get more <b>accurate</b> results.	
٠.	Suggest an improvement to her experiment, which will give more accurate results.	
	Give a reason for the improvement.	
Ir	mprovement	
R	Reason	
		[2]
ii.	The student concludes that the more reactive the metal is, the higher the temperature rise.	
	Describe further tests the student can do to confirm her conclusion.	
		-
		-

[2]

8. This question is about the extraction of metals.	
When iron oxide is heated with carbon, iron is made.	
i. Complete the word equation for this reaction.	
iron oxide + carbon → +	[1]
ii. Iron oxide is <b>reduced</b> during this reaction.	
Explain how you can tell that iron oxide is reduced.	
	[1]
Phil investigates some exothermic and endothermic reactions.	
He measures the temperature changes during some chemical reactions.	
Look at the table. It shows his results.	

Reaction	Temperature at start (°C)	Temperature at end (°C)	Temperature change (°C)
Α	15	25	+10
В	15	15	0
С	18	15	-3
D	15	20	+5

10 (a). Look at the data about some hydrocarbons.

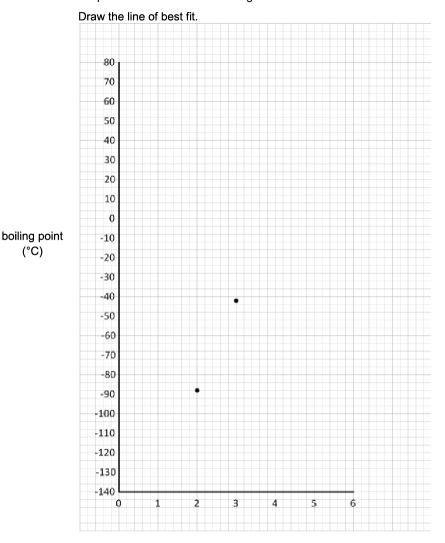
Name	Number of carbon atoms in molecule	Molecular formula	Boiling point (°C)
ethane	2	C <sub>2</sub> H <sub>6</sub>	-88
propane	3	C <sub>3</sub> H <sub>8</sub>	-42
pentane	5	C <sub>5</sub> H <sub>12</sub>	36
hexane	6	C <sub>6</sub> H <sub>14</sub>	69

Butane contains 4 carbon atoms.

Use the table to suggest the molecular formula of butane.

[1]

- (b). The data for ethane and propane have been plotted on the grid.
  - i. Plot the data for pentane and hexane on the grid.



number of carbon atoms

ii.

		answer:°C	[1]
	iii.	Describe the relationship between the number of carbon atoms in the molecule and its boiling point.	
		Use ideas about forces between molecules to explain your answer.	
_			
-			[2]
_			
11.	Magne	esium oxide reacts with water to make an alkaline solution.	
Des	scribe h	now you would measure the pH of the magnesium hydroxide solution.	
Αp	H mete	er is <b>not</b> available.	
			[3]
12.			
	i. Zinc	nitrate, Zn(NO <sub>3</sub> ) <sub>2</sub> , can be made by reacting zinc oxide, ZnO, with nitric acid, HNO <sub>3</sub> .	
	٧	Vater, H₂O, is also made.	
	٧	Vrite a <b>balanced symbol</b> equation for this reaction.	
			[2]
i	<b>i.</b> Paul	suggests this method for preparing zinc nitrate.	

Measure 50 cm<sup>3</sup> of dilute nitric acid into a beaker. Add 1 spatulaful of zinc oxide.

Heat the mixture until crystals of zinc nitrate are made.

1. 2. 3.

Use your graph to estimate the boiling point of butane.

Paul's method will not make a pure dry sample of zinc nitrate.

What improvements should Paul make to the method to make sure that:

- 4. the reaction is complete
- 5. the zinc nitrate can be separated from the nitric acid and the zinc oxide?

Explain your answer.	
	[4]
<b>13.</b> Ammonium sulphate is a salt.	
It is manufactured using the reaction between the alkali ammonia and sulphuric acid. $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$	
What type of reaction is this?	
	[1]

**14 (a).** Sarah does three titrations with dilute hydrochloric acid and potassium hydroxide solution.

burette

dilute hydrochloric acid

25.0 cm³ of potassium hydroxide solution with three drops of litmus

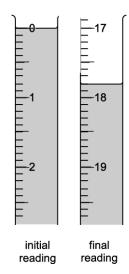
In her first titration Sarah measures the initial volume of hydrochloric acid in the burette.

She slowly adds the acid until the potassium hydroxide is just neutralised.

She then measures the volume of the hydrochloric acid again.

Describe how Sarah can tell when the potassium hydroxide solution is just neutralised.	
	<b>F</b> 01

**(b).** Look at the diagrams. They show parts of the burette during the first titration. **first titration** 



Here is Sarah's results table.

Titration number	1	2	3
final reading in cm <sup>3</sup>		37.5	32.1
initial reading in cm <sup>3</sup>		20.4	15.0
titre (volume of acid added) in cm <sup>3</sup>		17.1	17.1

i. Complete the table by reading the burette readings from the diagrams.

[2]

ii. Sarah thinks the mean titre is 17.1 cm<sup>3</sup>.

Is she correct?

Explain your answer.

**15.** Fahmida does three chemical tests on an unknown solution.

Look at her results.

Chemical test	Result
pH probe	pH value is 3
dilute hydrochloric acid followed by barium chloride solution	white precipitate
dilute nitric acid followed by silver nitrate solution	white precipitate

Which ions are present in the solution?

Choose from:

	calcium	hydrogen	iron(II)	chloride	sulfate
Explain your a	nswer.				
					[4]

**END OF QUESTION PAPER**