Types of Chemical reactions – 2021/20 GCSE Gateway Chemistry A

1. Nov/2021/Paper_J248/01/No.3

A student measures the pH of a solution and finds that the pH is 5.

Which of these statements is correct?

A The solution is a strong acid.

B The solution is a weak acid.

C The solution is alkaline.

D The solution is neutral.

Your answer ☐ **[1]**

2. Nov/2021/Paper_J248/01/No.4

Which statement describes a **chemical** change?

A Acid being neutralised

B Ice melting

C Salt dissolving in water

D Water boiling

Your answer ☐ **[1]**

3. Nov/2021/Paper_J248/01/No.19

Sodium hydroxide, NaOH, reacts with sulfuric acid, H_2SO_4, in a neutralisation reaction.

(a) **Table 19.1** shows the cations and anions in solutions of sodium hydroxide and sulfuric acid.

Solution	Cation	Anion
NaOH	Na^+	.....
H_2SO_4	.....	SO_4^-

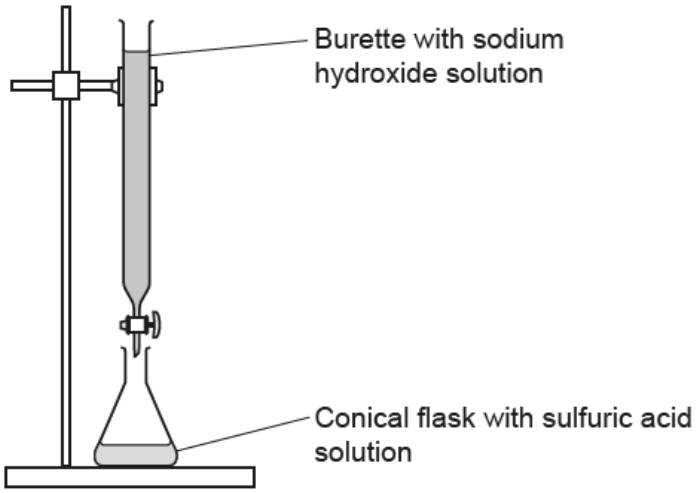
Table 19.1

Complete **Table 19.1** to show the **ions** in solutions of sodium hydroxide and sulfuric acid.

[2]

(b) A student investigates the neutralisation reaction.

The diagram shows the apparatus the student uses.



(i) The student repeats the experiment and stops the reaction at a neutral pH.

The student thinks the solution in the conical flask contains **more** hydrogen ions than hydroxide ions.

Is the student correct?

Explain your answer.

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..... **[2]**

(ii) The student repeats the reaction and stops the reaction at a neutral pH.

Write down what you would see when taking the pH of a **neutral** solution, using a pH probe and universal indicator.

pH probe reading .....

Universal indicator ..... **[2]**

(c) When sodium hydroxide, NaOH, reacts with sulfuric acid, H_2SO_4, sodium sulfate, Na_2SO_4, and water are made.

Complete the **balanced symbol** equation for the reaction.

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

[2]

(d) The student repeats the experiment using solutions of three different acids. **Table 19.2** shows their results.

The concentration of sodium hydroxide solution used is the same each time.

Solutions of acid	Volume of acid (cm^3)	Volume of sodium hydroxide solution added to get to neutral pH (cm^3)
X	25.0	12.2
Y	25.0	16.5
Z	25.0	24.2

Table 19.2

Which of the acid solutions, **X**, **Y** or **Z**, has the **lowest** pH at the start of the experiment?

..... **[1]**

4. Nov/2020/Paper_J248/01/No.5

Sodium hydroxide reacts with hydrochloric acid. Sodium chloride and water are made.

What is the name of this type of reaction?

A Neutralisation

B Oxidation

C Reduction

D Thermal decomposition

Your answer ☐ **[1]**

5. Nov/2020/Paper_J248/01/No.6

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]**

6. Nov/2020/Paper_J248/01/No.17

Acids are substances that turn universal indicator paper red.

(a) **(i)** What makes a substance acidic?

..... **[1]**

(ii) Sodium hydroxide, NaOH, is an alkali.

Sodium hydroxide neutralises sulfuric acid, H_2SO_4. The reaction makes a salt called sodium sulfate, Na_2SO_4. Water is also made.

Complete the **balanced symbol equation** for this reaction.

..... NaOH + H_2SO_4 → Na_2SO_4 + ... H_2O

[2]

(b) 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 **(b)(i)**.

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..... **[2]**

(c)* Potassium chloride is a mineral found in many foods.

A student wants to make a salt called potassium chloride, KC*l*, by neutralisation of an acid by an alkali.

Describe how to make a pure, dry sample of potassium chloride in a laboratory by neutralisation.

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..... **[6]**

7. Nov/2020/Paper_J248/02/No.13

Zinc, Zn, reacts with copper sulfate solution, $CuSO_4$.

$Zn(s) + CuSO_4(aq) \longrightarrow ZnSO_4(aq) + Cu(s)$

What type of reaction is this?

A Combustion

B Displacement

C Neutralisation

D Thermal decomposition

Your answer ☐ **[1]**

8. Nov/2021/Paper_J248/03/No.6

Copper oxide reacts with carbon. Oxidation takes place in this reaction.

$2CuO + C \longrightarrow 2Cu + CO_2$

Which substance is **oxidised**?

A C

B CO_2

C Cu

D CuO

Your answer ☐ **[1]**

9. Nov/2021/Paper_J248/03/No.7

Sulfuric acid, H_2SO_4, reacts with sodium hydroxide, NaOH, in a neutralisation reaction.

What are the products of this reaction?

A Sodium sulfate and hydrogen

B Sodium sulfate and water

C Sodium sulfate, hydrogen and oxygen

D Sodium sulfate, hydrogen and water

Your answer ☐ **[1]**

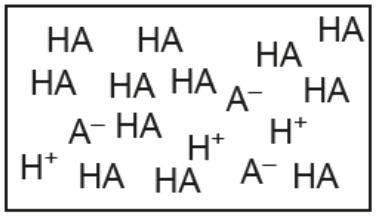
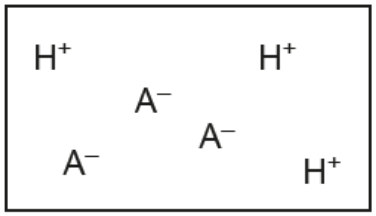
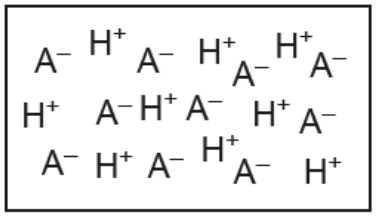
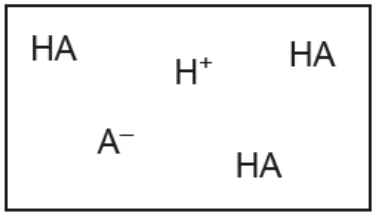
10. Nov/2021/Paper_J248/03/No.21(c)

(c) The painkiller is an acid.

(i) The diagrams show **four** different types of acid solutions.

The acid molecule is represented as HA. The ions formed in solution are represented as H^+ and A^-.

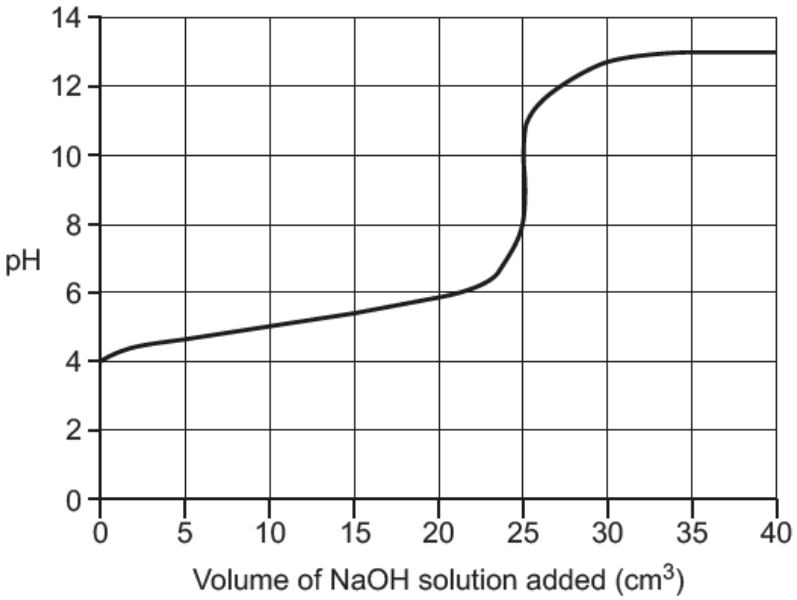
Draw lines to match each description with the correct acid solution diagram.

A dilute, strong acid	
A concentrated, weak acid	
A dilute, weak acid	
	

[3]

(ii) The scientist titrates a solution of the painkiller against a solution of sodium hydroxide, NaOH.

The titration curve is shown.



The scientist concludes that the painkiller is a **strong** acid.

Is the scientist correct?

Explain your answer.

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..... **[2]**

11. Nov/2021/Paper_J248/04/No.9

What is the **balanced half equation** for the formation of bromine from bromide ions?

A $Br^- - e^- \rightarrow Br$

B $Br^- \rightarrow Br - e^-$

C $2Br^- - 2e^- \rightarrow Br_2$

D $2Br^- \rightarrow Br_2 - 2e^-$

Your answer ☐ **[1]**

12. Nov/2020/Paper_J248/03/No.11

Magnesium powder reacts with copper(II) oxide. Magnesium oxide and copper are made.

$Mg + CuO \rightarrow MgO + Cu$

Which substance is the **reducing agent**?

A Magnesium

B Copper oxide

C Magnesium oxide

D Copper

Your answer ☐ **[1]**

13. Nov/2020/Paper_J248/03/No.13

Which equation shows the formation of a Group 2 metal ion?

M represents a Group 2 metal and e^- represents an electron.

A $M + e^- \rightarrow M^+$

B $M + 2e^- \rightarrow M^{2+}$

C $M \rightarrow M^+ + e^-$

D $M \rightarrow M^{2+} + 2e^-$

Your answer ☐ **[1]**

14. Nov/2020/Paper_J248/03/No.15

Phosphoric acid contains phosphate ions, PO_4^{3-}.

Phosphoric acid is completely neutralised by sodium hydroxide.

What is the formula of the salt that is made?

A Na_2PO_4

B Na_3PO_4

C $Na(PO_4)_3$

D $Na_2(PO_4)_3$

Your answer ☐ **[1]**

15. Nov/2020/Paper_J248/03/No.19

A farmer wants to test the pH of soil samples. He researches information about different pH test kits.

Look at the information he finds.

pH test kit	Price	pH of soil sample				
		pH 2	pH 4	pH 7	pH 9	pH 14
A	£4.95	Red	Yellow	Green	Blue	Purple
B	£10.99	Yellow	Yellow	Pink	Pink	Pink
C	£11.50	Pink	Orange	Yellow	Blue	Blue
D	£2.99	Colourless	Colourless	Colourless	Pink	Pink
E	£12.75	Red	Orange	Yellow	Yellow	Yellow

(a)* Evaluate the advantages and disadvantages of the pH test kits and suggest which pH test kit the farmer should use.

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..... **[6]**

(b) After testing the soil samples, the farmer finds that the soil in one of his fields is acidic.

Acidic soil can be neutralised by spreading magnesium carbonate, $MgCO_3$, onto the soil.

The farmer uses 25.0 kg of magnesium carbonate.

Calculate the number of moles of magnesium carbonate the farmer uses.
(A_r: C = 12.0; Mg = 24.3; O = 16.0)

Give your answer to **3** significant figures.

Number of moles of magnesium carbonate = ... **[3]**

16. Nov/2020/Paper_J248/03/No.21(b)

(b) (i) Sodium oxide reacts with water.

An aqueous solution of sodium hydroxide is made.

Write the **balanced symbol equation** for this reaction, including **state symbols**.

..... **[3]**

(ii) Sodium hydroxide neutralises acids. It is an alkali.

Which ion do solutions of alkalis contain?

..... **[1]**

(iii) A salt is made when sodium hydroxide neutralises sulfuric acid.

Name this salt.

..... **[1]**

(iv) A sample of hydrochloric acid has a pH of 1.04.

A student adds water to the hydrochloric acid until the pH is 3.04.

The concentration of hydrogen ions decreases.

Calculate the factor by which the hydrogen ion concentration has decreased.

Decrease in hydrogen ion concentration = ... **[2]**

17. Nov/2020/Paper_J248/04/No.18(b)

(b) Sodium ions, Na^+, are formed when sodium reacts with water.

Look at the equation. It shows how a sodium ion is formed from a sodium atom.

$Na - e^- \longrightarrow Na^+$

The symbol e^- means an electron.

The formation of a sodium ion from a sodium atom is an example of **oxidation**.

Explain why.

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..... **[1]**