9 Qualitative Analysis

For each question, choose the most suitable option and write the letter (**A**, **B**, **C** or **D**) in the brackets provided.

Level 1

1. When a dilute acid and a dilute alkali are mixed, a white precipitate is formed.

   What could the identity of the acid and alkali be?

	Acid	Alkali
A	Hydrochloric acid	Silver hydroxide
B	Nitric acid	Sodium hydroxide
C	Sulfuric acid	Barium hydroxide
D	Sulfuric acid	Calcium chloride

( )

2. Which of the following can be used to distinguish between chlorine gas and hydrogen chloride gas?

   A Burning splint

   B Damp blue litmus paper

   C Glowing splint

   D Limewater ( )

3. Aluminium hydroxide and zinc hydroxide dissolve in excess aqueous sodium hydroxide. Why is this so?

   A They are acidic.

   B They are amphoteric.

   C They are always soluble in excess alkali.

   D They decompose when excess alkali is added. ( )

4. A student wants to test for nitrate ions in solution **D**. He added aqueous sodium hydroxide and aluminium powder into solution **D** and heated the mixture.

   What should he use to test for the gas produced?

   A A burning splint

   B Damp blue litmus paper

   C Damp red litmus paper

   D Limewater ( )

Q 5. Aqueous ammonia was added into the following solutions.

Ammonium iodide Calcium nitrate Iron(II) sulfate Zinc chloride

How many of the solutions would **not** show an observation?

A 1 **B** 2

C 3 **D** 4 ( )

Level 2

6. Gas **A** produces a white precipitate when bubbled into limewater.

Which of the following are **true** of gas **A**?

1 It can react with aqueous sodium hydroxide.

2 It can react with calcium oxide.

3 It can turn damp blue litmus paper red.

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D All of the above ( )

Q 7. Study Figure 9.1.

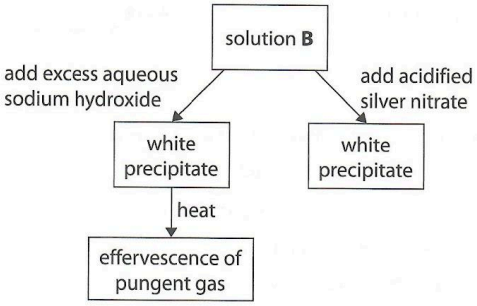

Figure 9.1

What are the possible cation(s) and anion(s) present in solution **B**?

	Cation(s) Present in B	Anion(s) Present in B
A	Ca^{2+}	Cl^-
B	Ca^{2+}, NH_4^+	Cl^-
C	Zn^{2+}	Cl^-, SO_4^{2-}
D	Zn^{2+}, NH_4^+	SO_4^{2-}

( )

8. Which of the following solids will **not** form a clear solution when added into aqueous ammonia?

A Aluminium nitrate

B Copper(II) sulfate

C Sodium chloride

D Zinc hydroxide

( )

9. Study Figure 9.2.

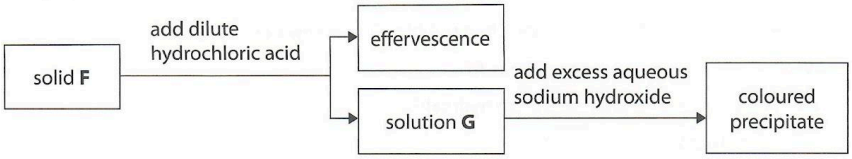

Figure 9.2

What could be the identity of **F** and the colour of **G**?

	Identity of F	Colour of G
A	Ammonium carbonate	Colourless
B	Copper(II) nitrate	Blue
C	Iron(II) carbonate	Green
D	Iron(III) nitrate	Yellow

( )

Level 3

10. Hydrogen peroxide decomposes according to the following equation.

$$2H_2O_2 \longrightarrow J + 2H_2O$$

Which of the following statements are most likely **true** about **J**?

1 It can be identified using a glowing splint.

2 It can dissolve in water to form an acidic solution.

3 It turns damp red litmus paper blue.

4 It can combine with carbon to form a gas that produces a white precipitate when bubbled into limewater.

A 1 and 2 only

B 1 and 4 only

C 2 and 3 only

D 3 and 4 only

( )

11. The following statements describe some properties of three gases, **X**, **Y** and **Z**.

- Gas **X** burns in oxygen to form a colourless liquid that boils at 100 °C.
- Gas **Y** is a compound made up of an element from Group 14 and an element from Group 16 of the periodic table.
- Gas **Z** is an element that can also form gas **Y**.

Some tests are conducted on gases **X**, **Y** and **Z** to identify them.

Which of the following are observed?

	Gas X	Gas Y	Gas Z
A	The burning splint is extinguished with a "pop" sound.	A white precipitate is formed in limewater.	The glowing splint is rekindled.
B	The burning splint is extinguished with a "pop" sound.	A white precipitate is formed in limewater.	The burning splint is rekindled.
C	The glowing splint is extinguished with a "pop" sound.	A white precipitate is formed in limewater.	The burning splint is extinguished with a "pop" sound.
D	A white precipitate is formed in limewater.	The glowing splint is extinguished with a "pop" sound.	The glowing splint is rekindled.

( )

12. Five compounds, **M**, **N**, **O**, **P** and **Q** were mixed in separate test tubes according to Table 9.1.

Table 9.1

Compounds Mixed		Observation
M	O	Effervescence
N	Q	White precipitate
O	P	No change observed
P	Q	Blue precipitate

Based on the observations, what could be the identities of the five compounds?

	M	N	O	P	Q
A	K_2CO_3	$BaCl_2$	HNO_3	NaOH	$CuSO_4$
B	NaCl	$AgNO_3$	$ZnCl_2$	$CuSO_4$	$MgCl_2$
C	Na_2CO_3	$CaCl_2$	HCl	$CuCl_2$	$Fe(OH)_3$
D	$MgSO_4$	$Ba(NO_3)_2$	$Ca(NO_3)_2$	KOH	$CuSO_4$

( )

O 13. Figure 9.3 shows two graphs that were obtained when two experiments, **I** and **II**, were carried out.

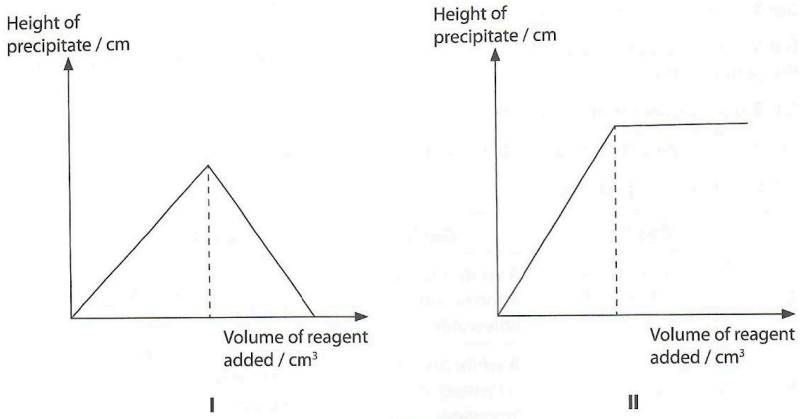

Figure 9.3

Which of the following could be a step that was carried out in experiments **I** and **II** respectively?

	Experiment I	Experiment II
A	Add aqueous ammonia to copper(II) sulfate solution until it is in excess.	Add aqueous barium nitrate, followed by dilute nitric acid, to magnesium chloride solution.
B	Add aqueous barium nitrate, followed by dilute nitric acid, to magnesium chloride solution.	Add aqueous ammonia to copper(II) sulfate solution until it is in excess.
C	Add aqueous sodium hydroxide to zinc chloride solution until it is in excess.	Add aqueous sodium hydroxide to copper(II) sulfate solution until it is in excess.
D	Add aqueous sodium hydroxide, followed by dilute hydrochloric acid to aqueous ammonium nitrate.	Add aqueous ammonia to copper(II) sulfate solution until it is in excess.

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Q 14. Study the flowchart in Figure 9.4.

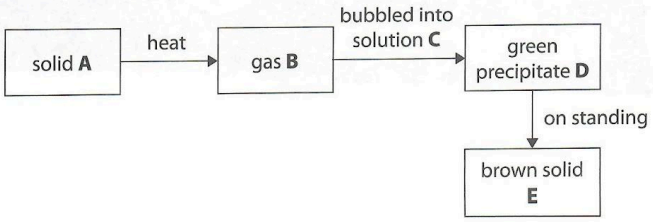

Figure 9.4

Which of the following are **true** of substances **A** to **E**?

	Cation in A	Identity of B	Cation in C	Identity of D	Cation in E
A	Ca^{2+}	CO_2	Fe^{2+}	$FeCO_3$	Fe^{3+}
B	Mg^{2+}	NH_3	Fe^{3+}	$Fe(OH)_3$	Fe^{2+}
C	NH_4^+	NH_3	Fe^{2+}	$Fe(OH)_2$	Fe^{3+}
D	Zn^{2+}	CO_2	Cu^{2+}	$CuCO_3$	Cu^+

( )

Q 15. Figure 9.5 shows the graph obtained when aqueous sodium hydroxide is added dropwise into solution **X** until it is in excess. When the resultant solution was warmed gently, effervescence of a pungent gas is observed.

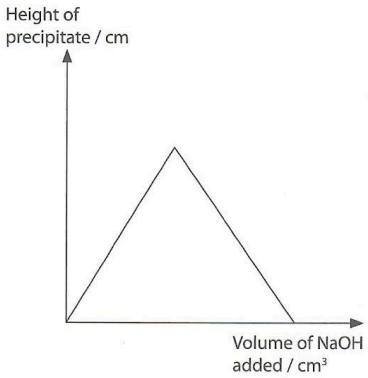

Figure 9.5

Which of the following statements is/are **true** about the reaction above?

1 The precipitate formed could be zinc hydroxide.

2 The pungent gas is ammonia.

3 There are at least two cations present in solution **X**.

A 1 and 2 only **B** 2 and 3 only

C 3 only **D** All of the above ( )