

O Level Combined Chemistry Structured

Qualitative Analysis Test 3.0

Q1

A student noticed the labels on two bottles of colourless solution have dropped off. The solutions are known to be aqueous sodium chloride and aqueous ammonium carbonate.

Outline the chemical tests the student should use to distinguish between the solutions in the two bottles.

solution	test	result
aqueous sodium chloride
aqueous ammonium carbonate

[4]

Q2

Figure 5.1 describes reactions involving white solid P.

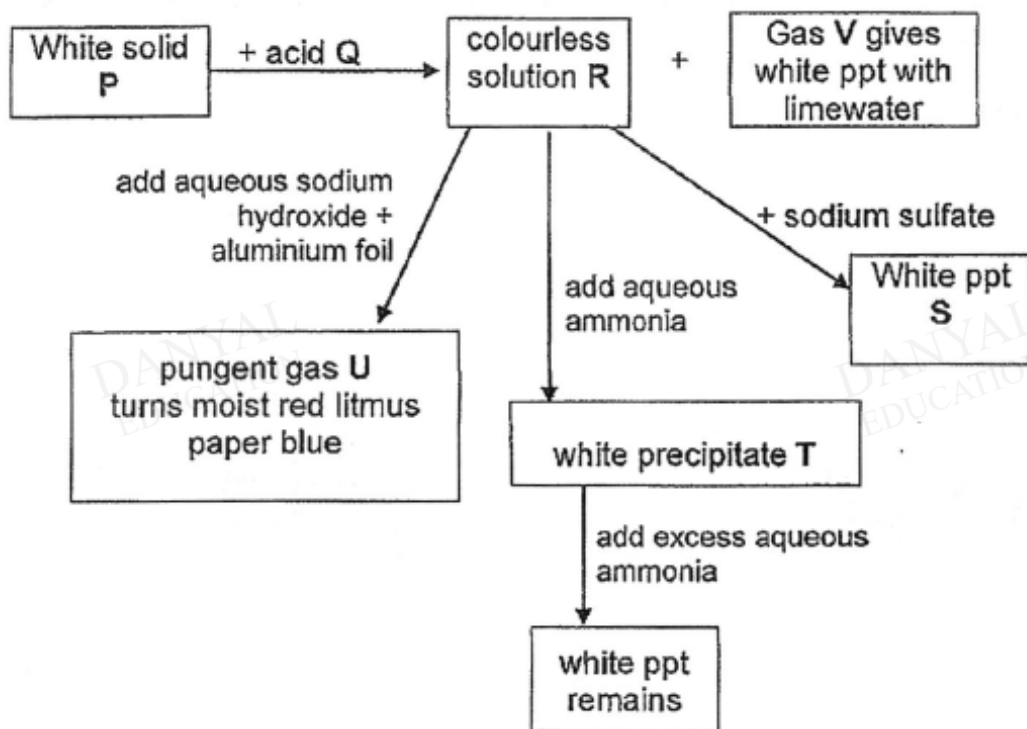


Figure 5.1

(a) Identify the following substances:

[7]

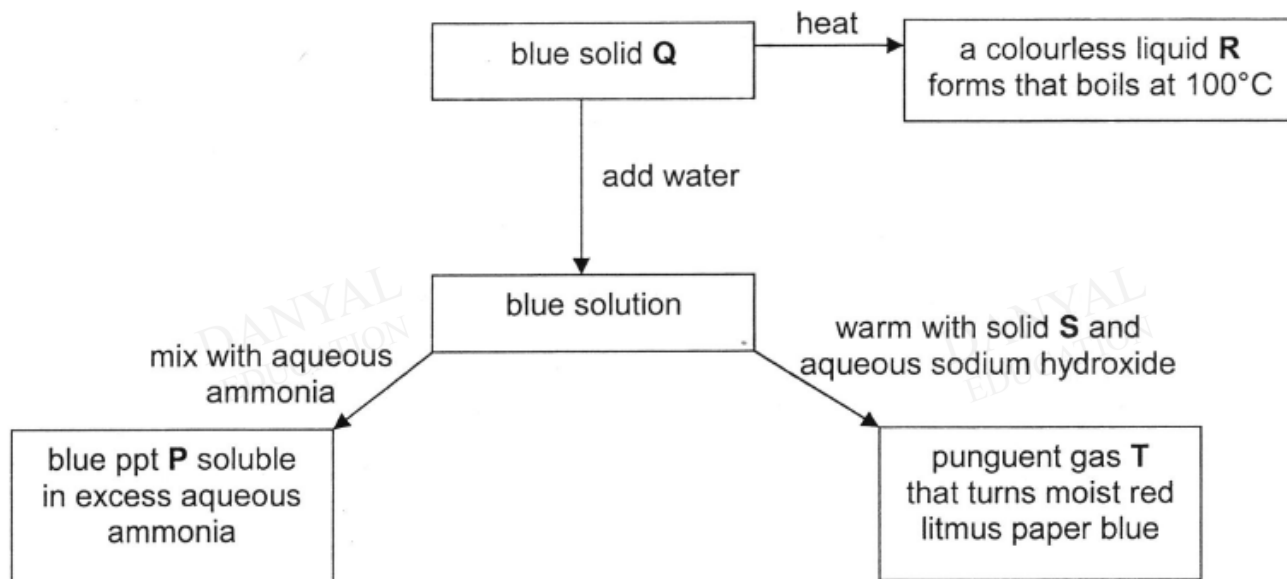
- (i) White solid P
- (ii) Acid Q
- (iii) Colourless solution R
- (iv) White precipitate S
- (v) White precipitate T
- (vi) Gas U
- (vii) Gas V

(b) Describe the observations that would be made when aqueous sodium hydroxide is added dropwise to colourless solution R till no further change. [1]

.....
.....
.....

Q3

The diagram below describes reactions involving a blue crystalline salt, given by the letter **Q**.



(a) Identify substance

[5]

- (i) P
- (ii) Q
- (iii) R
- (iv) S
- (v) T

(b) Write an ionic equation for the formation of precipitate **P**.

.....[1]

Q4

Fig. 4.1 describes some of the reactions of a green solid, J.

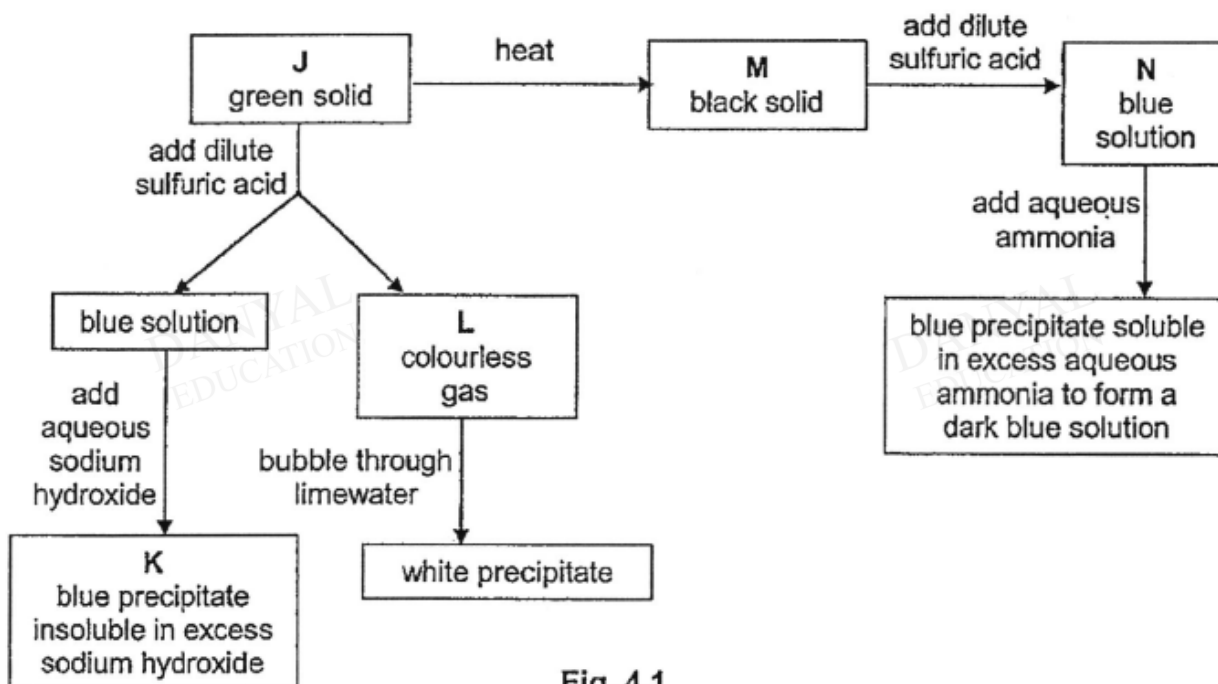


Fig. 4.1

(a) Identify J, K, L, M and N.

J

K

L

M

N

[5]

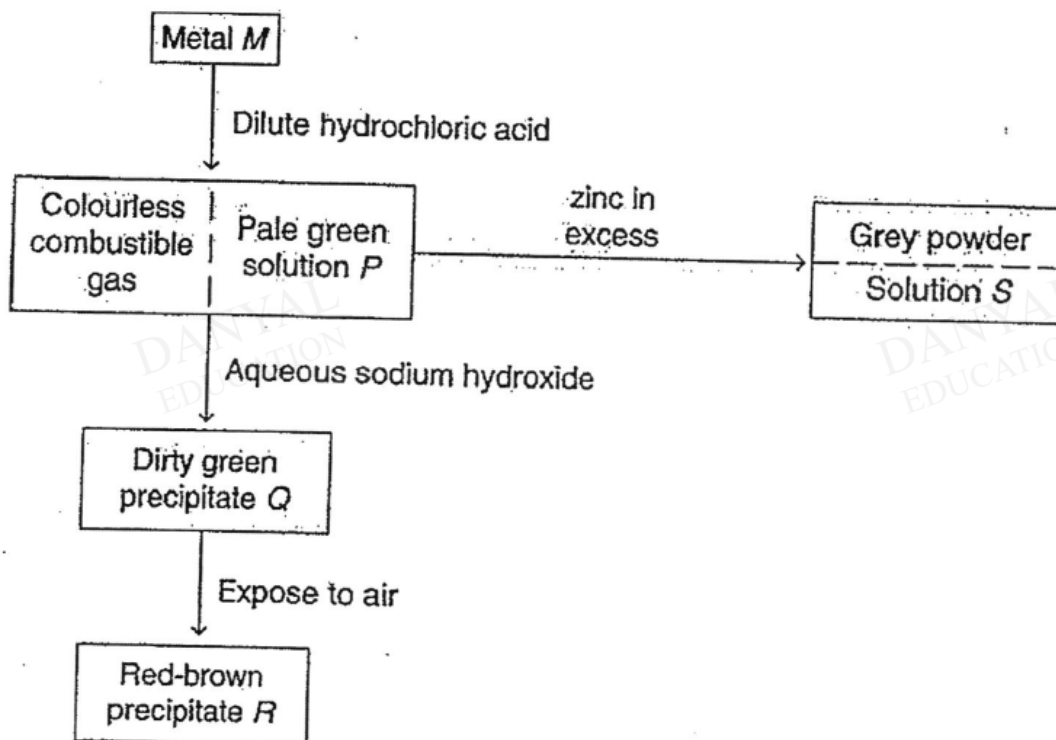
(b) Write a balanced chemical equation, with state symbols, for any one of the changes described in Fig. 4.1.

.....

[2]

Q5

The figure below shows some of the reactions of several substances.



(a) Identify M, P, Q and R.

M : P :

Q : R : [4]

(b) Write the balanced equation, including state symbols, for the reaction between metal M and dilute hydrochloric acid.

..... [2]

(c) (i) Explain the observation when zinc is added to solution P.

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

(ii) State the colour change you would expect to observe for the reaction in (c)(i).

..... [1]

Answers

Qualitative Analysis Test 3.0

Q1

solution	test	observation and result	
aqueous sodium chloride	Add aqueous sodium hydroxide separately to each solution / Add sulfuric acid separately to each solution [1]	No visible change when sodium hydroxide / sulfuric acid is added. [1]	[2]
aqueous ammonium carbonate	Add aqueous sodium hydroxide and warm [1] Or Add dilute hydrochloric acid [1]	Damp red litmus turns blue [1/2]. Ammonia gas is produced [1/2] Or Bubbles are seen. [1/2] Carbon dioxide gas is produced [1/2]	[2]

Q2

(a) Identify the following substances: [6]

- (i) White solid P *Lead (II) oxide*
- (ii) Acid Q *Nitric acid*
- (iii) Colourless solution R *Lead (II) nitrate*
- (iv) White precipitate S *Lead (II) sulfate*
- (v) White precipitate T *Lead (II) hydroxide*
- (vi) Gas U *Ammonia gas*

(b) Describe the observations that would be made when aqueous sodium hydroxide is added dropwise to colourless solution R till no further change. [2]

A white ppt is formed [1]

Soluble in excess sodium hydroxide to form a colourless solution [1]

Q3

a	P – copper (II) hydroxide/ $\text{Cu}(\text{OH})_2$ Q – copper (II) nitrate/ $\text{Cu}(\text{NO}_3)_2$ R – water/ H_2O S – aluminium/ Al T – ammonia/ NH_3
b	$\text{Cu}^{2+}(\text{aq}) + 2\text{OH}^-(\text{aq}) \rightarrow \text{Cu}(\text{OH})_2(\text{s})$

Q4

a	J: copper(II) carbonate / CuCO_3 K: copper(II) hydroxide / $\text{Cu}(\text{OH})_2$ L: carbon dioxide / CO_2 M: copper(II) oxide / CuO N: copper(II) sulfate / CuSO_4
b	$\text{CuCO}_3(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{CuSO}_4(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$ $\text{CuO}(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{CuSO}_4(\text{aq}) + \text{H}_2\text{O}(\text{l})$ $\text{CuSO}_4(\text{aq}) + 2\text{NaOH}(\text{aq}) \rightarrow \text{Cu}(\text{OH})_2(\text{s}) + \text{Na}_2\text{SO}_4(\text{aq})$ $\text{CO}_2(\text{g}) + \text{Ca}(\text{OH})_2(\text{aq}) \rightarrow \text{CaCO}_3(\text{s}) + \text{H}_2\text{O}(\text{l})$ Or any other reactions

Q5

(a)	M: iron, Fe P: iron (II) chloride, FeCl_2 Q: iron (II) hydroxide, $\text{Fe}(\text{OH})_2$ R: iron (III) hydroxide, $\text{Fe}(\text{OH})_3$
(b)	$\text{Fe}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{FeCl}_2(\text{aq}) + \text{H}_2(\text{g})$
(ci)	Zinc being more reactive than iron will displace iron.
(cii)	Pale green solution turns colourless