

**1. June/2022/Paper\_11/No.20**

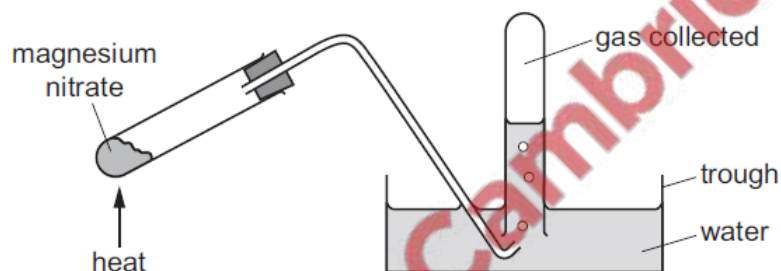
A mixture contains magnesium carbonate and barium carbonate only. A sample of the mixture is dissolved in nitric acid to produce a solution.

How could this solution be processed into a magnesium compound and a separate barium compound?

- A Add  $\text{HCl}(\text{aq})$ , filter off the solid barium chloride.
- B Add  $\text{HCl}(\text{aq})$ , filter off the solid magnesium chloride.
- C Add  $\text{H}_2\text{SO}_4(\text{aq})$ , filter off the solid barium sulfate.
- D Add  $\text{H}_2\text{SO}_4(\text{aq})$ , filter off the solid magnesium sulfate.

**2. June/2022/Paper\_11/No.21**

A sample of magnesium nitrate is heated in the apparatus shown.



The pH of the solution in the trough is measured.

The gas collected is tested with a glowing splint.

What are the results?

	pH of solution in trough	splint test
A	8	relights
B	2	relights
C	8	extinguished
D	2	extinguished

3. June/2022/Paper\_12/No.20

The table gives information about calcium carbonate and calcium hydroxide.

Which row is correct?

	calcium carbonate is more soluble in water than calcium hydroxide	calcium hydroxide can be manufactured using calcium carbonate as a starting material
A	no	no
B	no	yes
C	yes	no
D	yes	yes

4. June/2022/Paper\_12/No.21

Q is a Group 2 metal.

An excess of  $\text{QCO}_3(\text{s})$  is added to  $\text{H}_2\text{SO}_4(\text{aq})$  followed by filtration. A sample of  $\text{QSO}_4$  is then obtained by evaporation of the filtrate.

What could be the identity of Q?

- A barium, calcium or magnesium
- B barium or calcium only
- C calcium only
- D calcium or magnesium only

5. June/2022/Paper\_13/No.20

$\text{NaOH}(\text{aq})$  is added to separate samples of magnesium chloride and barium chloride solutions.

$\text{H}_2\text{SO}_4(\text{aq})$  is then added slowly to each reaction mixture until in excess.

What is observed at the end of the reaction sequence?

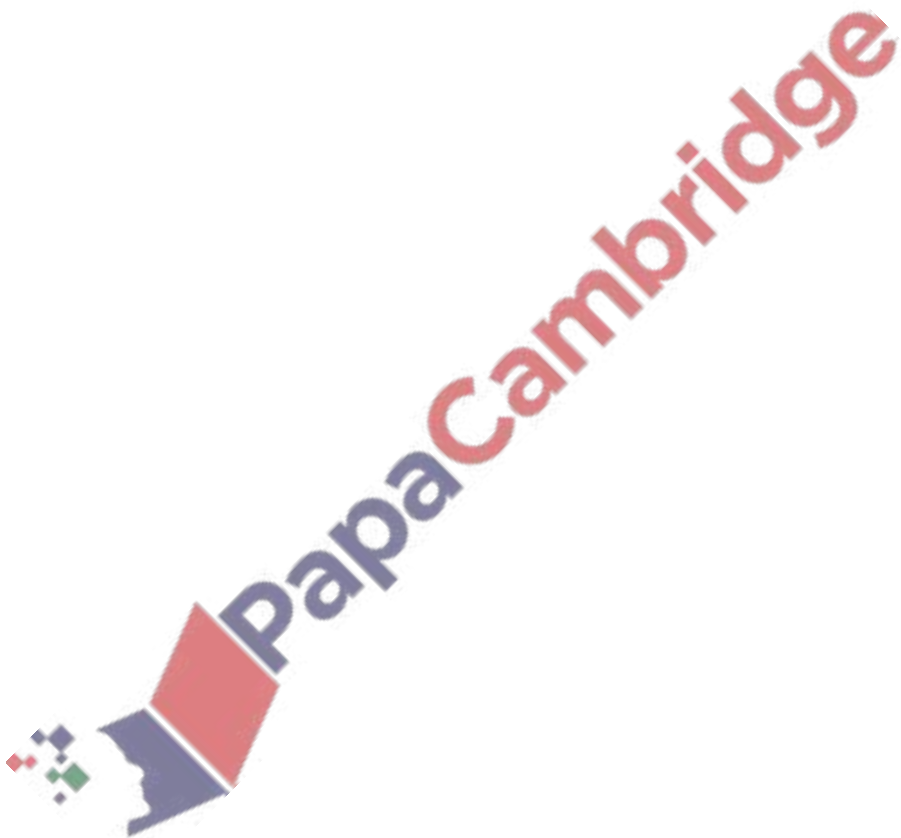
	$\text{MgCl}_2(\text{aq})$	$\text{BaCl}_2(\text{aq})$
A	colourless solution only	colourless solution only
B	colourless solution only	white precipitate
C	white precipitate	colourless solution only
D	white precipitate	white precipitate

6. June/2022/Paper\_13/No.21

A 4.00 g sample of an anhydrous Group 2 metal nitrate, Z, is heated strongly until there is no further change of mass. A solid residue of mass 1.37 g is formed.

Which metal is present in Z?

- A barium
- B calcium
- C magnesium
- D strontium



Calcium, magnesium and radium are Group 2 elements. Radium follows the same trends as the other members of Group 2.

- (a) Identify the highest energy orbital which contains electrons in a calcium atom. Sketch the shape of this orbital.

identity of highest energy orbital in Ca .....

shape

[1]

- (b) (i) Write the equation for the thermal decomposition of calcium nitrate.

..... [1]

- (ii) Suggest which of the Group 2 nitrates, calcium, magnesium or radium, requires the highest temperature to decompose. Explain your answer.

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

- (c) Predict what you would observe when aqueous radium chloride is added to aqueous sodium sulfate.

Do not refer to temperature changes in your answer.

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

- (d) (i)  $^{25}_{12}\text{Mg}$  is an isotope of magnesium.

Determine the number of protons and neutrons in an atom of  $^{25}_{12}\text{Mg}$ .

number of protons .....

number of neutrons .....

[1]

- (ii) State the full electronic configuration of an atom of  $^{25}_{12}\text{Mg}$ .

..... [1]

8. June/2022/Paper\_22/No.2(a, b)

Radium, Ra, is an element found in Group 2 of the Periodic Table. It is a crystalline solid at room temperature and conducts electricity.

Radium chloride,  $\text{RaCl}_2$ , has a melting point of  $900^\circ\text{C}$  and is soluble in water.

(a) Predict the lattice structure of  $\text{RaCl}_2(\text{s})$  based on the properties described.

..... [1]

(b) Draw a dot-and-cross diagram to show the arrangement of outer electrons in  $\text{RaCl}_2$ .

[1]

