

Group 2 – 2016

1. 9701/11/O/N/16/16

Magnesium nitrate, $\text{Mg}(\text{NO}_3)_2$, will decompose when heated to give a white solid and a mixture of gases. One of the gases released is an oxide of nitrogen, X.

7.4 g of anhydrous magnesium nitrate is heated until no further reaction takes place.

What mass of X is produced?

- A 1.5g B 2.3g C 3.0g D 4.6g

2. 9701/11/O/N/16/18

Which row of the table gives correct comparisons between the solubilities of calcium and barium hydroxide and the thermal stabilities of calcium and barium carbonate?

	solubility		thermal stability	
	calcium hydroxide	barium hydroxide	calcium carbonate	barium carbonate
A	higher	lower	higher	lower
B	higher	lower	lower	higher
C	lower	higher	higher	lower
D	lower	higher	lower	higher

3. 9701/11/O/N/16/35

Water is added to anhydrous aluminium chloride to make a 0.1 mol dm^{-3} solution.

Which observations are correct?

- 1 The reaction is endothermic.
- 2 The solution is acidic.
- 3 The solution contains the ion $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$.

4. 9701/12/O/N/16/17

When heated, magnesium nitrate decomposes.

Which equation for the thermal decomposition of magnesium nitrate is correct?

- A $\text{Mg}(\text{NO}_3)_2 \rightarrow \text{MgO} + \text{NO}_2 + \text{NO} + \text{O}_2$
- B $2\text{Mg}(\text{NO}_3)_2 \rightarrow 2\text{MgO} + 4\text{NO} + 3\text{O}_2$
- C $2\text{Mg}(\text{NO}_3)_2 \rightarrow 2\text{MgO} + 4\text{NO}_2 + \text{O}_2$
- D $3\text{Mg}(\text{NO}_3)_2 \rightarrow \text{Mg}_2\text{N}_3 + \text{MgO} + 3\text{NO} + 7\text{O}_2$

5. 9701/12/O/N/16/35

Equal masses of barium carbonate and magnesium carbonate powders are mixed together. The mixture is then heated using a Bunsen burner flame until there is no further change. A gas is given off.

Which statements are correct?

- 1 The residue left after heating reacts with aqueous hydrochloric acid to produce carbon dioxide.
- 2 The percentage decrease in mass after heating is 26% (to 2 significant figures).
- 3 The gas given off during heating relights a glowing splint.

6. 9701/12/F/M/16/18

River water in a chalky agricultural area contains Ca^{2+} , Mg^{2+} , CO_3^{2-} , HCO_3^- , Cl^- and NO_3^- ions. In a water treatment plant, such water is treated by adding a calculated quantity of calcium hydroxide.

What will be precipitated from the river water following the addition of calcium hydroxide?

- A CaCl_2
- B CaCO_3
- C $\text{Ca}(\text{NO}_3)_2$
- D $\text{Mg}(\text{NO}_3)_2$

7. 9701/12/F/M/16/36

A sample containing 0.40 mol of calcium nitrate was decomposed by heating in a roaring Bunsen burner flame until there was no further decomposition.

What are the products of this reaction?

- 1 0.40 mol of calcium oxide
- 2 0.40 mol of nitrogen, $\text{N}_2(\text{g})$
- 3 0.40 mol of oxygen, $\text{O}_2(\text{g})$

8. 9701/11/M/J/16/14

X and Y are both Group 2 metals.

X and Y both form hydroxide compounds, but $X(OH)_2$ is more soluble in water than $Y(OH)_2$.

If a piece of metal Y is put into cold water a very slow reaction occurs, and only a very few, small hydrogen bubbles can be seen.

What could be the identities of X and Y?

	X	Y
A	barium	magnesium
B	barium	strontium
C	calcium	strontium
D	magnesium	calcium

9. 9701/11/M/J/16/16

In some areas lime, $Ca(OH)_2$, is added to soil to improve crop growth.

Which statement correctly describes a reason why lime improves crop growth?

- A** Lime acts as a catalyst which speeds up the release of nitrates into the soil.
- B** Lime is an effective pesticide and protects the plants from damage.
- C** Lime is used to reduce the acidity of the soil.
- D** Lime lowers the pH of the soil.

10. 9701/12/M/J/16/14

A 0.005 mol sample of anhydrous calcium carbonate was completely thermally decomposed to give 100 cm^3 of gas measured at a certain temperature and pressure.

In a separate experiment carried out at the same temperature and pressure, a 0.005 mol sample of anhydrous calcium nitrate was completely thermally decomposed. The volume of gaseous products was measured.

What total volume of gaseous products was produced from the calcium nitrate?

- A** 50 cm^3 **B** 100 cm^3 **C** 200 cm^3 **D** 250 cm^3

11. 9701/12/M/J/16/16

A solid, **T**, was placed in an excess of the liquid **U**.

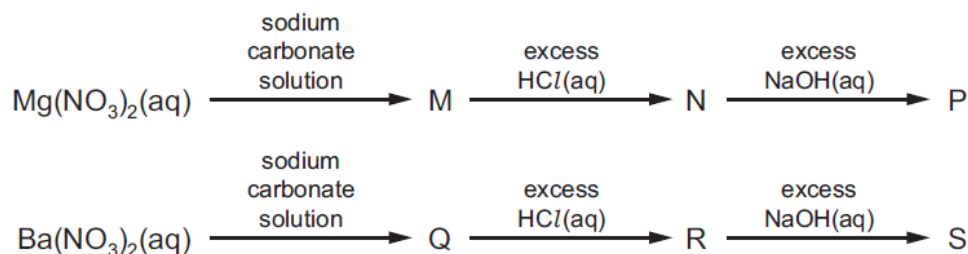
A colourless gas was given off and a white precipitate was seen. The precipitate was not **T**.

What could be the identities of **T** and **U**?

	T	U
A	BaCO ₃	H ₂ O
B	Ca	dilute H ₂ SO ₄
C	Mg	dilute H ₂ SO ₄
D	SrCO ₃	dilute HCl

12. 9701/13/M/J/16/14

Solutions of Mg(NO₃)₂ and Ba(NO₃)₂ separately undergo a series of reactions.



M, N and P are magnesium compounds.

Q, R and S are barium compounds.

How many of M, N, P, Q, R and S are white precipitates?

- A** 2 **B** 3 **C** 4 **D** 5

13. 9701/13/M/J/16/15

Anhydrous magnesium nitrate, Mg(NO₃)₂, will decompose when heated, giving a white solid and a mixture of two gases X and Y.

Y is oxygen.

What is the ratio $\frac{\text{mass of X released}}{\text{mass of Y released}}$?

- A** $\frac{1}{0.174}$ **B** $\frac{1}{0.267}$ **C** $\frac{1}{0.348}$ **D** $\frac{1}{3.43}$