Chapter 11: Group 2

Homework questions

1 The table below shows the metallic radii of Group 2 elements beryllium to barium.

Group 2 element	Be	Mg	Ca	Sr	Ba
Metallic radius / nm	0.122	0.160	0.197	0.215	0.217

a **i** Explain the trend in metallic radius as the group is descended. [2]

ii Predict the metallic radius of radium. [1]

iii Describe the physical structure of Group 2 metals. [2]

iv Explain why Group 2 metals are good electrical conductors and are ductile. [3]

v State the electronic configuration of the calcium atom (atomic number 20). [1]

vi State the electronic configuration of the calcium ion. [1]

b Magnesium reacts slowly with water whereas strontium reacts very quickly.

i Explain the difference in reactivity between magnesium and strontium. [3]

ii Write the equation for the reaction of strontium with water. [1]

iii When strontium reacts with water, the solution formed produces a purple colour with universal indicator paper. Explain this observation. [1]

iv The solution formed when strontium reacts with water turns cloudy when carbon dioxide is bubbled through it. Explain this observation and write an ionic equation for the reaction taking place. [2]

v Calculate the volume of hydrogen produced at room temperature and pressure when 0.44 g of strontium is reacted with excess water. [3]

Total = 20

2 Magnesium nitrate, $Mg(NO_3)_2$, relative formula mass 148.3, decomposes when heated. The products of this thermal decomposition are magnesium oxide, nitrogen dioxide gas and oxygen gas.

a Write the balanced symbol equation for this reaction. [2]

b **i** Calculate the volume of oxygen produced when 0.890 g of anhydrous magnesium nitrate is heated. The oxygen is collected at room temperature and pressure. [3]

ii What volume of nitrogen dioxide gas is collected under the same conditions? [2]

iii Magnesium nitrate is usually found as the hydrated solid. This hydrated solid contains 42.14% of water by mass. Calculate the empirical formula of the hydrated magnesium nitrate. [3]

c Radium is in the same group as magnesium and lies below barium in the Periodic Table. Estimate the ease of decomposition of radium nitrate compared with that of magnesium nitrate. Explain your answer. [2]

d Radium nitrate is soluble in water to form a colourless solution. Predict what would happen when the following solutions are added to aqueous radium nitrate. Explain your predictions.

i aqueous sodium hydroxide [2]

ii aqueous sodium sulfate. [2]

e Radium oxide is a white solid that reacts with water to give an alkaline solution.

i Name the substance formed in this reaction and give an ionic equation for the reaction taking place. [2]

ii Give a dot-and-cross diagram (outer electrons only) to show the bonding in radium oxide. [3]

Total = 21