Level: CIE AS and A Level (9701)
Subject: Chemistry
Topic: CIE Chemistry
Type: Topic Question

2002

XVIII

1583

Chemistry CIE AS & A Level
To be used for all exam preparation for 2025+

CHEMISTRY

AS and A

This to be used by all students studying CIE AS and A level Chemistry (9701) But students of other boards may find it useful

Question 1.

(a) Give the number of particles in one mole of a chemical.

(1 mark)

(b) i) Give the number and type of atoms present in a molecule of water.

[2]

ii) Calculate the total number of particles and atoms present in one mole of water.

[1]

(3 marks)

(c) i) Give the number and type of ions present in one mole of sodium carbonate, Na_2CO_3.

[2]

ii) Calculate the number of metal ions present in **two** moles of sodium carbonate.

[2]

(4 marks)

(d) i) State the conditions when one mole of a gas occupies a volume of 24.0 dm^3.

[2]

ii) Complete Table 2.1.

Table 2.1

Gas	Number of moles	Volume of gas (dm^3)	Number of molecules present
Nitrogen	2.0	48.0	
Sulfur dioxide		1.8	
Carbon monoxide			9.03×10^{23}

[5]

(7 marks)

Question 2.

(a) 5.0 g of an unknown Group 2 nitrate was decomposed to produce 0.0843 moles of gas.

$$2X(NO_3)_2 \text{ (g)} \rightarrow 2XO \text{ (s)} + 4NO_2 \text{ (g)} + O_2 \text{ (g)}$$
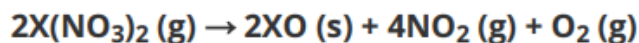
i)   Calculate the amount, in moles, of the unknown Group 2 nitrate.

.... moles
[1]

ii)   Calculate the number of ions in the unknown Group 2 nitrate.

.... ions
[2]

(3 marks)

(b) Identify the unknown element in the unknown Group 2 in part **(a)**.

X = ...

(1 mark)

(c) State and explain whether strontium nitrate would need to be heated more or less strongly than $X(NO_3)_2$ to decompose.

Relative strength of heating ....

Explanation ....

(2 marks)

Question 3.

(a) Barium sulfate is a white insoluble solid and is used in stomach X-rays and as a pigment for paint.

Calculate the number of atoms in 74 mg of barium sulfate.

.... particles

(2 marks)

(b) State the ionic equation for the formation of barium sulfate.

(1 mark)

(c) A different barium compound, barium carbonate, was reacted with hydrochloric acid.

i) Write the balanced symbol equation for this reaction.

[1]

ii) 0.03 moles of carbon dioxide were formed in this reaction. Calculate the number of hydrogen ions that reacted.
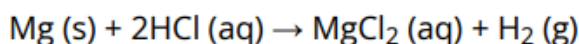
[2]

(3 marks)

Question 4.

(a) When magnesium reacts with hydrochloric acid, the following reaction occurs:

$$Mg \text{ (s)} + 2HCl \text{ (aq)} \rightarrow MgCl_2 \text{ (aq)} + H_2 \text{ (g)}$$

During the reaction, the hydrogen produced occupies 103 cm^3 at 25.0 °C and 100 kPa.

Calculate the amount, in moles, of hydrogen gas produced during the reaction.

.... moles

(3 marks)

(b) A student completed the same reaction as in part **(a)**, using 3.75 g of magnesium.

Calculate the mass, in grams, of magnesium chloride produced by the student during this reaction. Give your answer to 3 significant figures.

.... g

(2 marks)

(c) Calculate the number of hydrogen atoms produced during the student's reaction in part **(b)**.

(2 marks)