Stoichiometry – 2022J O Level 5070

1. June/2022/Paper_11/No.14

The relative molecular mass, M_r, of liquid Z is 60. Z contains 40.0% carbon, 6.70% hydrogen and 53.3% oxygen.

Which row shows the correct empirical and molecular formulae of Z?

	empirical formula	molecular formula
A	CH_2O	CH_2O
B	CH_2O	$C_2H_4O_2$
C	$C_2H_4O_2$	$C_2H_4O_2$
D	CH_3O	$C_2H_6O_2$

2. June/2022/Paper_11/No.15

How many tonnes of aluminium oxide, Al_2O_3, are required to produce 27 tonnes of aluminium?

A 27 **B** 51 **C** 54 **D** 102

3. June/2022/Paper_12/No.13

What is the relative formula mass of anhydrous sodium carbonate?

A 51 **B** 83 **C** 106 **D** 124

4. June/2022/Paper_12/No.14

What contains the greatest mass of solute?

A 100 cm^3 of 1.00 mol / dm^3 sodium hydroxide, NaOH

B 500 cm^3 of 0.05 mol / dm^3 sulfuric acid, H_2SO_4

C 1.00 dm^3 of 0.10 mol / dm^3 potassium hydroxide, KOH

D 2.00 dm^3 of 0.01 mol / dm^3 hydrochloric acid, HCl

5. June/2022/Paper_12/No.15

How many tonnes of aluminium oxide, Al_2O_3, are required to produce 27 tonnes of aluminium?

A 27 **B** 51 **C** 54 **D** 102

6. June/2022/Paper_21/No.2(f)

(f) Calculate the volume, in dm^3, of 19.2 g of nitrogen at room temperature and pressure.

Give your answer to **two** significant figures.

volume ..... dm^3 [3]

7. June/2022/Paper_21/No.5(b)

(b) Iron reacts with dilute sulfuric acid to make aqueous iron(II) sulfate, $FeSO_4$.

(i) Construct the ionic equation, with state symbols, for this reaction.

..... [2]

(ii) Describe a chemical test to confirm that iron(II) sulfate is formed instead of iron(III) sulfate.

.....

.....

.....

..... [2]

(iii) The aqueous iron(II) sulfate formed is crystallised to make hydrated iron(II) sulfate, $FeSO_4 \cdot 7H_2O$.

Calculate the relative formula mass of hydrated iron(II) sulfate.

relative formula mass = ... [1]

(iv) A student uses 2.80 g of iron to make 12.5 g of hydrated iron(II) sulfate crystals.

This is a 90% yield.

Calculate the mass of hydrated iron(II) sulfate crystals made from 2.80 g of iron if the yield is 100%.

mass = ... g [1]

8. June/2022/Paper_21/No.7(e)

(e) A sample of 2.34 g of aluminium is reacted with 50.0 cm^3 of 2.00 mol / dm^3 sulfuric acid.

$$2Al(s) + 3H_2SO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + 3H_2(g)$$

Show by calculation that the aluminium is in excess in this reaction.

[3]

9. June/2022/Paper_21/No.8d(ii)

(ii) Compound **X** contains 85.7% carbon by mass and 14.3% hydrogen by mass.

Calculate, using the percentage composition data, the empirical formula of **X**.

Show your working.

State the molecular formula of **X**.

empirical formula .....

molecular formula .....

[3]

10. June/2022/Paper_22/No.2(f)

(f) Calculate the volume, in dm^3, of 30.2 g of oxygen at room temperature and pressure.

Give your answer to **two** significant figures.

volume ..... dm^3 [3]

11. June/2022/Paper_22/No.6(c)

(c) The aqueous aluminium sulfate formed is crystallised to make hydrated aluminium sulfate, $Al_2(SO_4)_3 \cdot xH_2O$.

The relative formula mass of hydrated aluminium sulfate is 666.

Calculate the value of x in the formula $Al_2(SO_4)_3 \cdot xH_2O$.

x = ... [2]

12. June/2022/Paper_22/No.8(d)

(d) A sample of 2.34 g of zinc is reacted with 50.0 cm^3 of 2.00 mol / dm^3 hydrochloric acid.

$$Zn(s) + 2HCl(aq) \longrightarrow ZnCl_2(aq) + H_2(g)$$

Show by calculation that the hydrochloric acid is in excess in this reaction.

[3]

13. June/2022/Paper_22/No.9d(ii)

(ii) One of these products contains 37.8% carbon by mass, 6.30% hydrogen by mass and 55.9% chlorine by mass.

Calculate the empirical formula of the product.

Deduce the molecular formula of the product.

empirical formula .....

molecular formula .....

[3]