Introducing Chemical reactions – 2022 GCSE Gateway Chemistry A

1. May/2022/Paper_ J248/01/No.1

Which state symbol is used for liquids?

A (aq)

B (g)

C (l)

D (s)

Your answer ☐ **[1]**

2. May/2022/Paper_ J248/02/No.22(a)

Hydrogen peroxide, H_2O_2, is used as a source of oxygen gas.

Hydrogen peroxide decomposes to make oxygen gas, O_2, and water.

(a) Write the **balanced symbol** equation for this reaction.

..... **[2]**

3. May/2022/Paper_ J248/03/No.9

One mole of hydrogen gas, H_2, fills a volume of 24 dm^3.

How much volume does 2.0 g of hydrogen gas fill?

A 12 dm^3

B 24 dm^3

C 36 dm^3

D 48 dm^3

Your answer ☐ **[1]**

4. May/2022/Paper_ J248/03/No.16(d)

(d) Ethene reacts with bromine to make a product.

The relative formula mass of the product is 187.8.

There are **2** carbon atoms and **4** hydrogen atoms in the product.

Calculate how many bromine atoms are in the product.

Number of bromine atoms = ... **[3]**

5. May/2022/Paper_ J248/03/No.21(a)

Phosphorus can exist as P_4 molecules.

Phosphorus trichloride, PCl_3, is made in the reaction of phosphorus, P_4, and chlorine as shown in the equation.

$$P_4 + 6Cl_2 \rightarrow 4PCl_3$$

(a) (i) A scientist starts the reaction with 2.0 mol of phosphorus, P_4.

Calculate the mass of 2.0 mol of phosphorus.

Mass of phosphorus = ... g **[2]**

(ii) Calculate the maximum mass of phosphorus trichloride, PCl_3, that could be made from 2.0 mol of phosphorus, P_4.

Maximum mass of phosphorus trichloride = ... g **[3]**

(iii) The scientist reacts the 2.0 mol of phosphorus, P_4, with 866.2 g of chlorine, Cl_2.

Which is the **limiting reactant**? Explain your answer.

Limiting reactant .....

Explanation .....

.....

.....

.....

[4]

6. May/2022/Paper_ J248/03/No.22

Compounds that contain the element zinc, Zn, have many uses.

(a) Calculate the mass of one atom of zinc.

The Avogadro constant is 6.02×10^{-23}.

Give your answer to **3** significant figures.

Mass of one atom of zinc = ... g **[3]**

(b) Zinc bromide is an ionic compound made from zinc ions, Zn^{2+}, and bromide ions, Br^-.

(i) Construct a **balanced ionic** equation for the formation of zinc bromide.

..... **[2]**

(ii) Zinc bromide can conduct electricity when aqueous or molten, but not when solid.

Zinc metal can conduct electricity when solid.

Explain why.

Zinc bromide .....

.....

Zinc metal .....

.....

[3]

(c) Zinc oxide, ZnO, is another compound containing zinc.

The table shows some information about four different zinc oxide particles.

Particle	Size of zinc oxide particles (m)	Cost per gram (£/g)	Purity (%)
A	1.85×10^{-7}	0.05	95.00
B	6.54×10^{-9}	0.31	99.99
C	8.52×10^{-7}	0.87	99.99
D	4.02×10^{-8}	1.84	99.99

(i) Which particles are nanoparticles?

Tick (✓) **two** boxes.

A ☐

B ☐

C ☐

D ☐

[1]

(ii) A scientist wants to buy some zinc oxide particles to use in suncream. A large surface area to volume ratio is important.

Which particle, **A**, **B**, **C** or **D**, would be the most suitable for use in suncream?

Explain your answer.

Particle .....

Explanation .....

.....

.....

.....

[3]

7. May/2022/Paper_ J248/04/No.11

Sodium, in Group 1, reacts with fluorine in Group 7.

Sodium fluoride is made.

What is the **balanced symbol** equation for the reaction?

A $Na + F \longrightarrow NaF$

B $2Na + F_2 \longrightarrow 2NaF$

C $Na + F_2 \longrightarrow NaF_2$

D $2Na + F \longrightarrow Na_2F$

Your answer ☐ **[1]**