Introducing Chemical reactions – 2022 GCSE Gateway Chemistry Combined Science A

1. June/2022/Paper_ J250/03/No.2

What is the test for **oxygen** gas?

A It goes 'pop' when lit.

B It relights a glowing splint.

C It turns damp red litmus paper blue.

D It turns limewater cloudy.

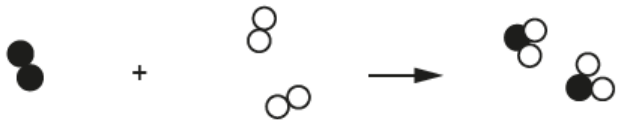
Your answer ☐ **[1]**

2. June/2022/Paper_ J250/03/No.11(a, b)

Nitrogen dioxide, NO_2, is formed when nitrogen, N_2, reacts with oxygen, O_2.

Fig. 11.1 shows the particle model diagram for the formation of nitrogen dioxide.

Fig. 11.1



Nitrogen Oxygen Nitrogen dioxide

(a) Complete each sentence to describe the formation of nitrogen dioxide.

Use the words or phrases in the list.

break apart
change of state
chemical change
dissolve
freeze
join together
physical change

The molecules of nitrogen and oxygen ..... .

The atoms then ..... to form nitrogen dioxide.

This is called a ..... .

[3]

(b) The equation shows the formation of nitrogen dioxide.

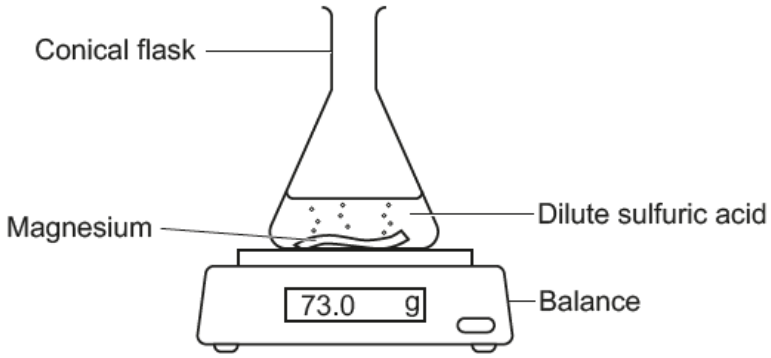
$$N_2 + \ldots\ldots O_2 \rightarrow \ldots\ldots NO_2$$

Complete the **balanced symbol** equation for the reaction.
Use **Fig. 11.1**. **[1]**

3. June/2022/Paper_ J250/03/No.13

A student investigates how the mass changes as magnesium reacts with excess dilute sulfuric acid.

The diagram shows the apparatus they use.



The student measures the mass every minute for 8 minutes.

Table 13.1 shows their results.

Table 13.1

Time (minutes)	Mass (g)
0	73.0
1	71.5
2	70.5
3	.....
4	69.6
5	69.4
6	69.3
7	69.3
8	69.3

(a) Complete the table with an estimate of the missing mass at **3 minutes**.

Write your answer in the box in **Table 13.1**. **[1]**

(b) The equation shows the reaction between magnesium, Mg, and dilute sulfuric acid, H_2SO_4.

$Mg(s) + H_2SO_4(aq) \longrightarrow MgSO_4(aq) + H_2(g)$

Describe and explain how the mass changes during the reaction.

Use information in **Table 13.1** and the equation in your answer.

.....

.....

.....

.....

..... **[3]**

(c) The student thinks that the results show that all the magnesium had reacted.

Explain why the student is correct. Use data from **Table 13.1**.

.....

..... **[1]**

(d) The student repeats the experiment three times.

Table 13.2 shows the results of the three experiments at 1 minute.

Table 13.2

Mass in experiment 1 (g)	Mass in experiment 2 (g)	Mass in experiment 3 (g)
71.5	71.4	71.8

Calculate the **mean** mass in the three experiments.

Give your answer to **1** decimal place.

Mean mass = ... g **[3]**

4. June/2022/Paper_ J250/09/No.7

The ionic equation shows the reaction of chlorine, Cl_2, with sodium bromide, NaBr.

$$Cl_2 + 2Na^+ + 2Br^- \longrightarrow Br_2 + 2Na^+ + 2Cl^-$$

What is the **simplest** ionic equation for this reaction?

A $Cl_2 + 2NaBr \longrightarrow Br_2 + 2NaCl$

B $Cl_2 + Na^+ + Br^- \longrightarrow Br_2 + Na^+ + Cl^-$

C $Cl_2 + Br^- \longrightarrow Br_2 + Cl^-$

D $Cl_2 + 2Br^- \longrightarrow Br_2 + 2Cl^-$

Your answer ☐ **[1]**

5. June/2022/Paper_ J250/09/No.10

What is the definition of the **mole**?

A One mole contains 1 g of atoms.

B One mole contains 6.022×10^{23} particles.

C One mole is equal to the relative atomic mass of an element.

D One mole is the number of atoms contained in one molecule.

Your answer ☐ **[1]**

6. June/2022/Paper_ J250/09/No.14(c, d)

(c) Calcium reacts with water to form a solution of calcium hydroxide, $Ca(OH)_2$, and hydrogen.

(i) Write the **balanced symbol** equation for the reaction of calcium with water.

Include **state symbols** in your equation.

..... **[3]**

(ii) A solution of calcium hydroxide is also called **limewater**.

Name the gas limewater is used as a test for.

..... **[1]**

(d) 250 cm^3 of a solution contains 1.88 g of calcium hydroxide, $Ca(OH)_2$.

(i) Calculate the **number of moles** in 1.88 g of calcium hydroxide.

Give your answer to **2** significant figures.

Relative atomic mass (A_r): H = 1.0 O = 16.0 Ca = 40.1

Number of moles of calcium hydroxide = ... **[3]**

(ii) Use your answer to part **(d)(i)** to calculate the concentration of calcium hydroxide in the solution formed.

Give your answer in mol / dm^3.

Concentration of solution = ... mol / dm^3 **[2]**