

# Compounds, Formulae and Equations

1(a). Zinc carbonate,  $\text{ZnCO}_3$ , reacts with dilute hydrochloric acid.

A student reacts a sample of  $\text{ZnCO}_3$  with an excess of dilute hydrochloric acid in a test-tube.

i. Describe what the student would see during this reaction.

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----- [1]

ii. Write the equation for the reaction between  $\text{ZnCO}_3$  and dilute hydrochloric acid.

----- [1]

(b). Compounds of calcium have many uses.

i. Identify a compound of calcium that could be used to convert a soil pH from 5.8 to 7.5.

----- [1]

ii. Calcium phosphide,  $\text{Ca}_3\text{P}_2$ , is an ionic compound used in rat poison.

Calcium phosphide can be prepared by reacting calcium metal with phosphorus,  $\text{P}_4$ .

Write the equation for the reaction of calcium with phosphorus to form calcium phosphide.

----- [1]

iii. Draw a 'dot-and-cross' diagram to show the bonding in calcium phosphide,  $\text{Ca}_3\text{P}_2$ .

Show **outer** electrons only.

[2]

2. Gallium, atomic number 31, is in Period 4 of the Periodic Table. Gallium is a Group 3 element.

Predict the formula of a gallium ion.

----- [1]

## 2.1.2 Compounds, Formulae and Equations

3. This question is about compounds of Group 3 elements.

Aluminium will combine directly with fluorine.

Write the equation for the reaction between aluminium and fluorine.

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[1]

4. A molecule of an alkane has 24 carbon atoms.

State the empirical formulae of this alkane.

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[1]

5. A salt used as a fertiliser has the empirical formula  $\text{H}_4\text{N}_2\text{O}_3$ .

Suggest the formulae of the ions present in this salt.

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[2]

6. A chemist carries out reactions of barium and barium nitride,  $\text{Ba}_3\text{N}_2$ .

**Reaction 1** Barium is reacted with water.

**Reaction 2** Barium nitride is reacted with water, forming an alkaline solution and an alkaline gas.

**Reaction 3** Barium is reacted with an excess of oxygen at  $500^\circ\text{C}$ , forming barium peroxide,  $\text{BaO}_2$ .

- i. Write equations for **Reaction 1** and **Reaction 2**.

Ignore state symbols.

Reaction 1:

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Reaction 2:

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[3]

## 2.1.2 Compounds, Formulae and Equations

- ii. Predict the structure and bonding of  $\text{Ba}_3\text{N}_2$ .

----- [1]

- iii.  $\text{BaO}_2$  formed in **Reaction 3** contains barium and peroxide ions.  
The peroxide ion has the structure  $[\text{O}-\text{O}]^{2-}$ .

Suggest a '*dot-and-cross*' diagram for  $\text{BaO}_2$ .

Show outer shell electrons only.

[1]

7. Bromine and mercury react with many elements and compounds.

Predict the formula of the compound formed when bromine reacts with aluminium.

----- [1]

**END OF QUESTION PAPER**