Compounds, Formulae and Equations

1(a). Zinc carbonate, $ZnCO_3$, reacts with dilute hydrochloric acid.

A student reacts a sample of $ZnCO_3$ 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 $ZnCO_3$ and dilute hydrochloric acid.

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[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.

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[1]

ii. Calcium phosphide, Ca_3P_2, is an ionic compound used in rat poison.

Calcium phosphide can be prepared by reacting calcium metal with phosphorus, P_4.

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

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[1]

iii. Draw a '*dot-and-cross*' diagram to show the bonding in calcium phosphide, Ca_3P_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.

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[1]

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.

_____ **[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 $H_4N_2O_3$.

Suggest the formulae of the ions present in this salt.

_____ **[2]**

6. A chemist carries out reactions of barium and barium nitride, Ba_3N_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°C, forming barium peroxide, BaO_2.

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

Ignore state symbols.

Reaction 1:
.....

Reaction 2:
.....

[3]

ii. Predict the structure and bonding of Ba_3N_2.

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[1]

iii. BaO_2 formed in **Reaction 3** contains barium and peroxide ions.
The peroxide ion has the structure $[O-O]^{2-}$.

Suggest a '*dot-and-cross*' diagram for 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.

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[1]

END OF QUESTION PAPER