

Chemical Periodicity – 2016

1. 9701/21/M/J/16/No.2

D, E, F, and G are four consecutive elements in the **fourth** period of the Periodic Table. (The letters are **not** the actual symbols of the elements.)

D is a soft, silvery metal with a melting point just above room temperature. Its amphoteric oxide, D_2O_3 , has a melting point of 1900 °C and can be formed by heating **D** in oxygen.

G is a solid that can exist as several different allotropes, most of which contain G_8 molecules. **G** burns in air to form GO_2 which dissolves in water to form an acidic solution. This solution reacts with sodium hydroxide to form the salt Na_2GO_3 .

(a) Suggest the identities of **D** and **G**.

D **G** [1]

(b) Write equations for the reactions of D_2O_3 with

(i) hydrochloric acid,
..... [2]

(ii) sodium hydroxide.
..... [2]

(c) Suggest the type of bonding and structure in D_2O_3 .

..... [1]

(d) Write an equation for the formation of an acidic solution when GO_2 dissolves in water.

..... [1]

[Total: 7]

2. 9701/22/F/M/16/No.1

This question is about Period 3 elements and their compounds.

(a) Give an explanation for each of the following statements.

(i) The atomic radius decreases across Period 3 (Na to Ar).

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

(ii) The first ionisation energy of sulfur is lower than that of phosphorus.

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

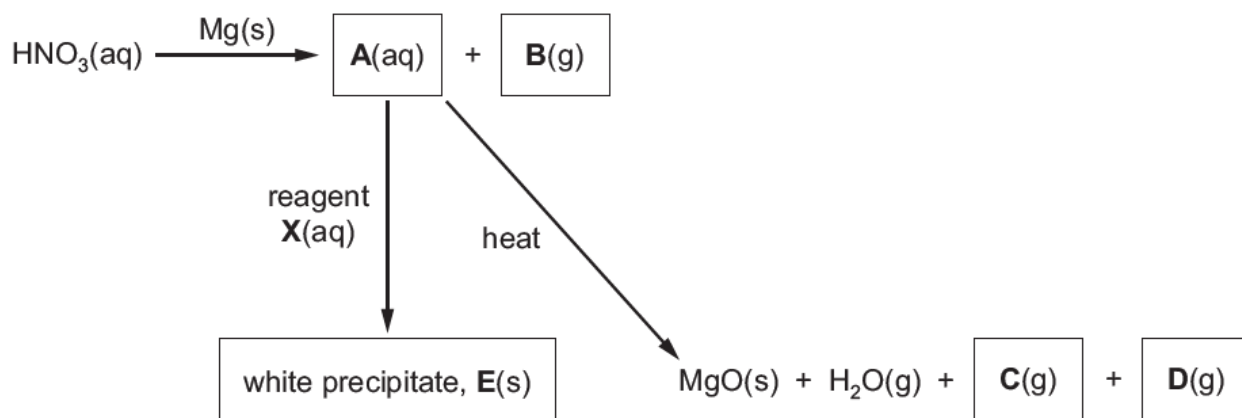
(iii) Sodium is a better electrical conductor than phosphorus.

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

(iv) Magnesium is a better electrical conductor than sodium.

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

(b) The flow chart below shows a series of reactions.



(i) Give the formula of each of the compounds A to D.

A B

C D

[4]

(ii) E reacts with dilute aqueous acid to produce a gas that turns limewater cloudy.

Suggest the identity of reagent X.

..... [1]

[Total: 12]