Chemical Periodicity – 2016

1. 9701/12/F/M/16/12

Consecutive elements **X**, **Y** and **Z** are in Period 3 of the Periodic Table. Element **Y** has the highest first ionisation energy and the lowest melting point of these three elements.

What are the identities of **X**, **Y** and **Z**?

A sodium, magnesium, aluminium

B magnesium, aluminium, silicon

C aluminium, silicon, phosphorus

D silicon, phosphorus, sulfur

2. 9701/12/F/M/16/13

When dealing with a spillage of metallic sodium it is important that no toxic or flammable products are formed.

Which material should be used if there is a spillage of metallic sodium?

A dilute hydrochloric acid

B ethanol

C sand

D water spray

3. 9701/11/M/J/16/12

Why is the ionic radius of a chloride ion larger than the ionic radius of a sodium ion?

A A chloride ion has one more occupied electron shell than a sodium ion.

B Chlorine has a higher proton number than sodium.

C Ionic radius increases regularly across the third period.

D Sodium is a metal, chlorine is a non-metal.

4. 9701/11/M/J/16/13

Elements D and E are both in Period 3. Element D has the smallest atomic radius in Period 3. There are only two elements in Period 3 which have a lower melting point than element E. Elements D and E react together to form compound L.

Which compound could be L?

A $MgCl_2$ **B** MgS **C** Na_2S **D** PCl_3

5. 9701/11/M/J/16/34

A little water is added to each of the following compounds and the mixture warmed.

For which compounds will an acidic gas be evolved?

1 aluminium chloride

2 silicon tetrachloride

3 phosphorous pentachloride

6. 9701/12/M/J/16/12

Sodium and sulfur react together to form sodium sulfide, Na_2S.

How do the atomic radius and ionic radius of sodium compare with those of sulfur?

	atomic radius	ionic radius
A	sodium < sulfur	sodium > sulfur
B	sodium < sulfur	sodium < sulfur
C	sodium > sulfur	sodium > sulfur
D	sodium > sulfur	sodium < sulfur

7. 9701/13/M/J/16/12

The oxide and chloride of an element **X** are separately mixed with water. The two resulting solutions have the same effect on litmus.

What could element **X** be?

A Al **B** Ca **C** Na **D** P

8. 9701/13/M/J/16/16

Steam is passed over heated magnesium to give compound J and hydrogen.

What is **not** a property of compound J?

A It has an M_r of 40.3.

B It is basic.

C It is a white solid.

D It is very soluble in water.

9. 9701/13/M/J/16/35

Why is the first ionisation energy of aluminium less than that of magnesium?

1 The outer electron in the aluminium atom is more shielded from the nuclear charge.

2 The outer electron in the aluminium atom is in a higher energy orbital.

3 The outer electron in the aluminium atom is further from the nucleus.