Periodic Table: Chemical Periodicity – 2022 Nov AS Chemistry 9701

1. Nov/2022/Paper_11/No.17

The electrical conductivities of two compounds, Y and Z, are shown.

	for Y	for Z
conductivity of the compound in the liquid state	good	does not conduct
conductivity of the mixture obtained by adding the compound to water	good	good

What are compounds Y and Z?

	Y	Z
A	Al_2O_3	$SiCl_4$
B	$NaCl$	Al_2O_3
C	$NaCl$	$SiCl_4$
D	$SiCl_4$	Al_2O_3

2. Nov/2022/Paper_11/No.18

Which row describes the relative sizes of the ionic radii of Na^+, Mg^{2+} and S^{2-}?

	smallest ⟶		largest
A	Na^+	Mg^{2+}	S^{2-}
B	Mg^{2+}	Na^+	S^{2-}
C	S^{2-}	Na^+	Mg^{2+}
D	S^{2-}	Mg^{2+}	Na^+

3. Nov/2022/Paper_11/No.19

The oxides BaO, CaO, MgO and SrO all produce alkaline solutions when added to water.

Which oxide produces the saturated solution with the highest pH?

A BaO **B** CaO **C** MgO **D** SrO

4. Nov/2022/Paper_11/No.25

Separate 1.0 g samples of Na_2O, MgO, Al_2O_3, SiO_2, NaCl, $MgCl_2$, Al_2Cl_6 and $SiCl_4$ are added to separate beakers containing water and stirred.

The number of beakers containing a white solid is Q.

An excess of NaOH(aq) is then added to each beaker and stirred.

The number of beakers now containing a white solid is R.

Which row is correct?

	Q	R
A	3	2
B	3	3
C	4	3
D	4	4

5. Nov/2022/Paper_12/No.17

Element X requires strong heating to react with oxygen.

Element X reacts with chlorine to give a covalently-bonded chloride.

What could be the identity of element X?

A magnesium

B phosphorus

C sodium

D silicon

6. Nov/2022/Paper_12/No.18

The melting points of the Period 3 elements sodium to aluminium are shown in the table.

element	Na	Mg	Al
melting point / K	371	923	932

Which factor explains the **increase** in melting points from sodium to aluminium?

A the change in first ionisation energy from sodium to aluminium

B the increase in electronegativity from sodium to aluminium

C the increase in the A_r of the elements from sodium to aluminium

D the increase in the number of outer electrons in each atom from sodium to aluminium

7. Nov/2022/Paper_12/No.25

T is an element in Period 3.

The first ionisation energy of T is lower than that of the element with one less proton.

The oxide of T does not react with water.

What is the identity of T?

A aluminium

B silicon

C sodium

D sulfur

8. Nov/2022/Paper_21/No.3(a, b)

Some of the common chlorides of Period 3 elements are shown in the list.

$NaCl$ $MgCl_2$ $AlCl_3$ $SiCl_4$ PCl_5

(a) From this list, identify:

(i) all the chlorides that have giant ionic structures in the solid state

..... [1]

(ii) all the chlorides that react vigorously with water to form strongly acidic solutions

..... [1]

(iii) the chloride that dissolves in water to form a neutral solution

..... [1]

(iv) the chloride formed from the **element** with the highest melting point.

..... [1]

(b) $NaCl$ is one product of the reaction of chlorine gas and cold aqueous sodium hydroxide.

Identify the other products.

..... [1]

9. Nov/2022/Paper_22/No.2(a, b)

The chlorides of some of the Period 3 elements are shown in Table 2.1.

Table 2.1

Period 3 chloride	NaCl	$AlCl_3$	$SiCl_4$	PCl_5	PCl_3	SCl_2
bonding					C	C
structure					S	S
oxidation state of Period 3 element						

(a) Complete Table 2.1.

- Identify the bonding shown by each chloride under standard conditions.
  Use C = covalent, I = ionic, M = metallic.
- Identify the structure shown by each chloride under standard conditions.
  Use G = giant, S = simple.
- Deduce the oxidation state of the Period 3 element in each chloride.

[4]

(b) Write equations for the reactions of NaCl and PCl_5 with water.
Include state symbols in both equations.

NaCl .....

PCl_5 .....

[3]