

PERIODICITY Core (SL & HL)

1. (a) With reference to the type of bonding present, explain the following trends across period 3.

(i) The melting point of magnesium is higher than that of sodium.

[2]

<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

(ii) Silicon has the highest melting point of any element in the period.

[2]

<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

(iii) Phosphorus, sulfur, and chlorine all have low melting and boiling points.

[2]

<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

(iv) Chlorine has a higher boiling point than argon.

[2]

<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

(b) Explain why electronegativity increases across period 3 between Na and Cl, and explain why argon does not have an electronegativity value.

[2]

.....

.....

.....

.....

2. (a) Sodium oxide, Na_2O , and phosphorus pentoxide, P_4O_{10} , are both solids at room temperature.

(i) State and explain the electrical conductivity of both sodium oxide and phosphorus pentoxide.

[2]

.....

.....

.....

.....

.....

.....

(ii) Write equations for the reactions of Na_2O (s) and P_4O_{10} (s) with water, including state symbols.

[3]

.....

.....

.....

(iii) Predict how the reactions above in (ii), between Na_2O (s) and P_4O_{10} (s) and water, would affect the pH and the electrical conductivity of water.

[2]

.....

.....

.....

.....

(b) Explain why Na^+ has a smaller ionic radius than O^{2-} .

[2]

.....

.....

.....

.....

(c) Sodium is a soft, shiny, silver-coloured metal.

(i) Write an equation for the reaction of sodium, Na (s) , with water.

[2]

.....

.....

(ii) State two **observations** for the reaction of sodium, Na (s) , with water.

[2]

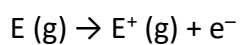
.....

.....

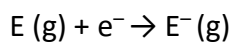
.....

.....

3. Ionisation energy can be represented for an element, E, as shown below:



Electron affinity can be represented for an element, E, as shown below:



(a) State and explain the general trend in first ionisation energy across period 2.

[2]

.....

.....

.....

.....

(b) Predict the general trend in first electron affinity across period 2.

[1]

<p>.....</p> <p>.....</p>

4. Group 17, the halogens, consist of relatively reactive non-metals.

(a) Justify why chlorine is classified as a non-metal by giving two of its **chemical** properties.

[2]

<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

(b) Chlorine is more reactive than bromine and can replace bromine in its compounds. Write an equation to show the reaction between chlorine and sodium bromide.

[2]

<p>.....</p> <p>.....</p>

(c) State and explain the trend in atomic radius going down group 17

[2]

<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

Total 32 marks (48 minutes)