

1. **June/2022/Paper\_11/No.18**

Which statement for the element in Period 3 and Group 13 of the Periodic Table is correct?

- A It has the highest melting point of the elements in its period.
- B It has exactly one electron in its shell with principal quantum number 3.
- C It forms an oxide that reacts with aqueous sodium hydroxide.
- D It forms a chloride that dissolves in water to give a neutral solution.

2. **June/2022/Paper\_11/No.19**

A student reacts 0.100 mol of each of sodium, magnesium and phosphorus atoms separately with an excess of oxygen.

Which rows are correct?

	oxide	mass of oxide formed / g
1	sodium	3.10
2	magnesium	4.03
3	phosphorus	7.10

- A 1, 2 and 3    B 1 and 2 only    C 1 and 3 only    D 2 and 3 only

3. **June/2022/Paper\_12/No.17**

$\text{NH}_3(\text{aq})$  is added to separate samples of  $\text{NaCl}(\text{aq})$ ,  $\text{MgCl}_2(\text{aq})$ ,  $\text{BaCl}_2(\text{aq})$  and  $\text{SiCl}_4(\text{l})$ . Under the conditions of this experiment, only two samples will produce a white precipitate when  $\text{NH}_3(\text{aq})$  is added.

What are these two samples?

- A  $\text{MgCl}_2(\text{aq})$  and  $\text{BaCl}_2(\text{aq})$
- B  $\text{MgCl}_2(\text{aq})$  and  $\text{SiCl}_4(\text{l})$
- C  $\text{NaCl}(\text{aq})$  and  $\text{BaCl}_2(\text{aq})$
- D  $\text{NaCl}(\text{aq})$  and  $\text{SiCl}_4(\text{l})$

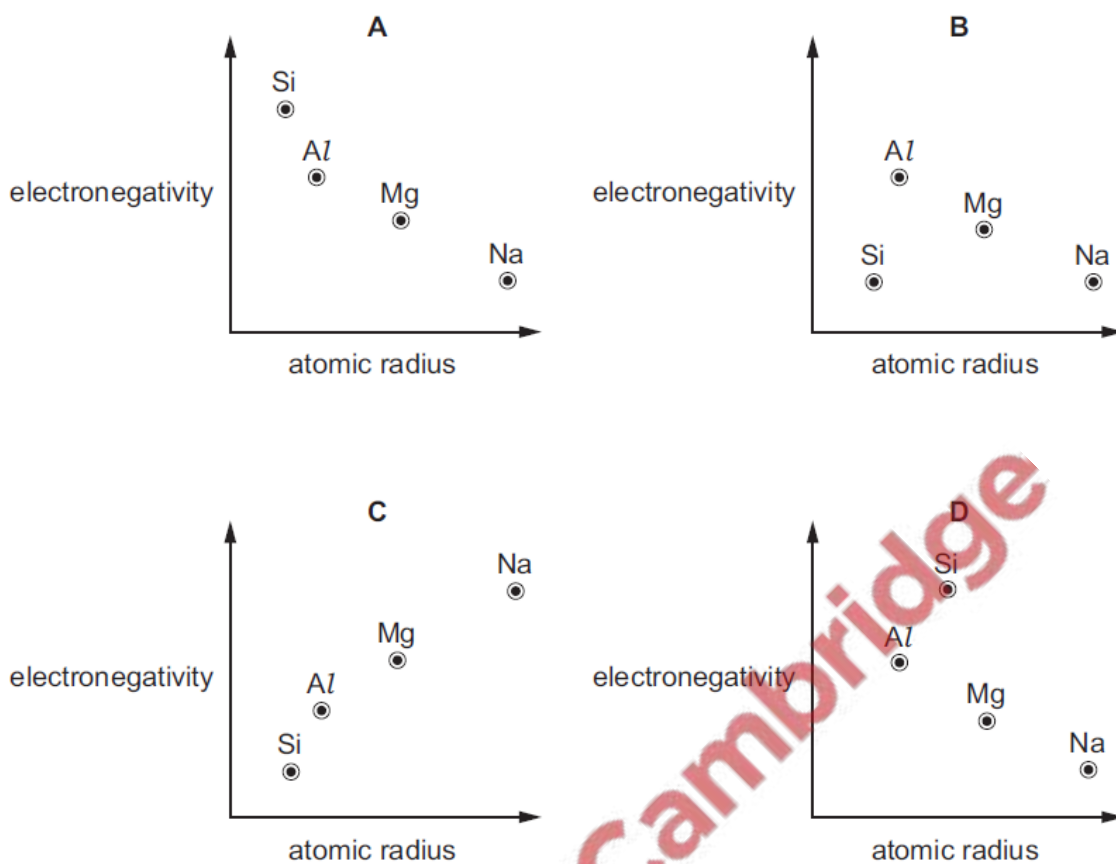
4. **June/2022/Paper\_12/No.18**

Why is the ionic radius of a sulfide ion larger than the ionic radius of a potassium ion?

- A Ionic radius always decreases with increasing atomic number.
- B Positive ions always have smaller radii than negative ions.
- C The potassium ion has more protons in its nucleus than the sulfide ion.
- D The sulfide ion is doubly charged; the potassium ion is singly charged.

5. June/2022/Paper\_12/No.19

Which graph correctly shows relative electronegativity plotted against relative atomic radius for the elements Na, Mg, Al and Si?



6. June/2022/Paper\_13/No.17

Which ion has the smallest radius?

- A  $Al^{3+}$       B  $Ba^{2+}$       C  $Mg^{2+}$       D  $Na^{+}$

7. June/2022/Paper\_13/No.18

Which row is correct?

	element with the greater fifth ionisation energy	element with an amphoteric oxide
A	aluminium	aluminium only
B	aluminium	both aluminium and phosphorus
C	phosphorus	aluminium only
D	phosphorus	both aluminium and phosphorus

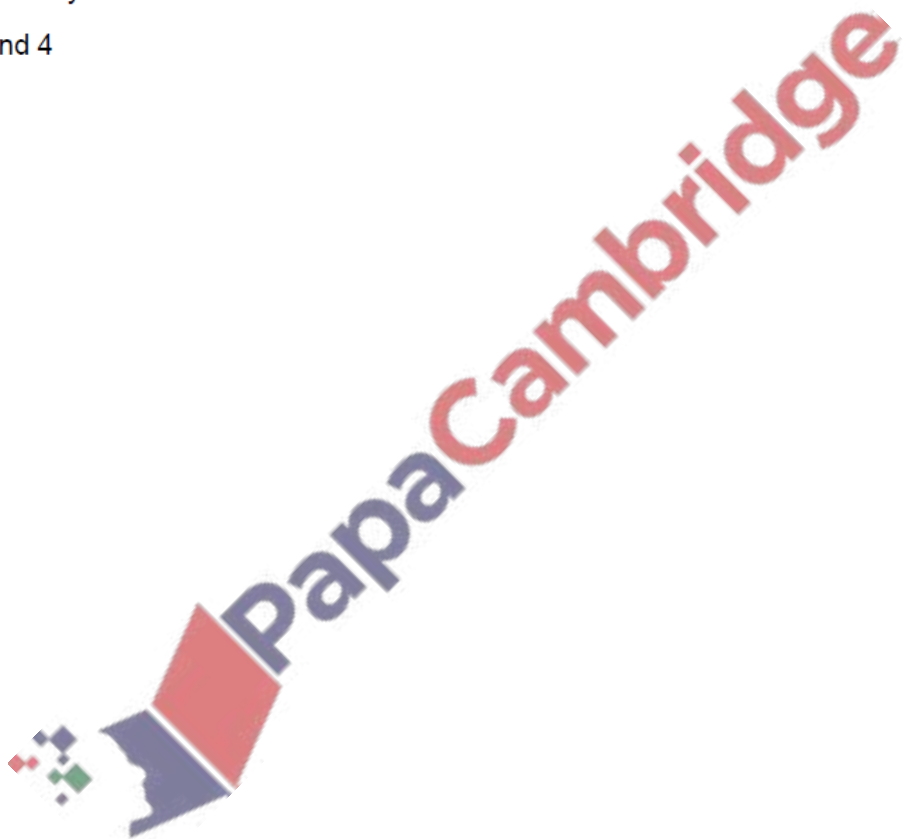
8. June/2022/Paper\_13/No.19

Each of the chlorides listed is added to water.

- 1 aluminium chloride
- 2 magnesium chloride
- 3 silicon tetrachloride
- 4 phosphorus pentachloride

Which chlorides form an aqueous solution that reacts with sodium carbonate to produce carbon dioxide?

- A 1 and 2 only
- B 3 and 4 only
- C 1, 3 and 4 only
- D 1, 2, 3 and 4



- (c) Across Period 3 there is a general trend for first ionisation energies to increase due to the increase in attraction between the nucleus and the outer electron.

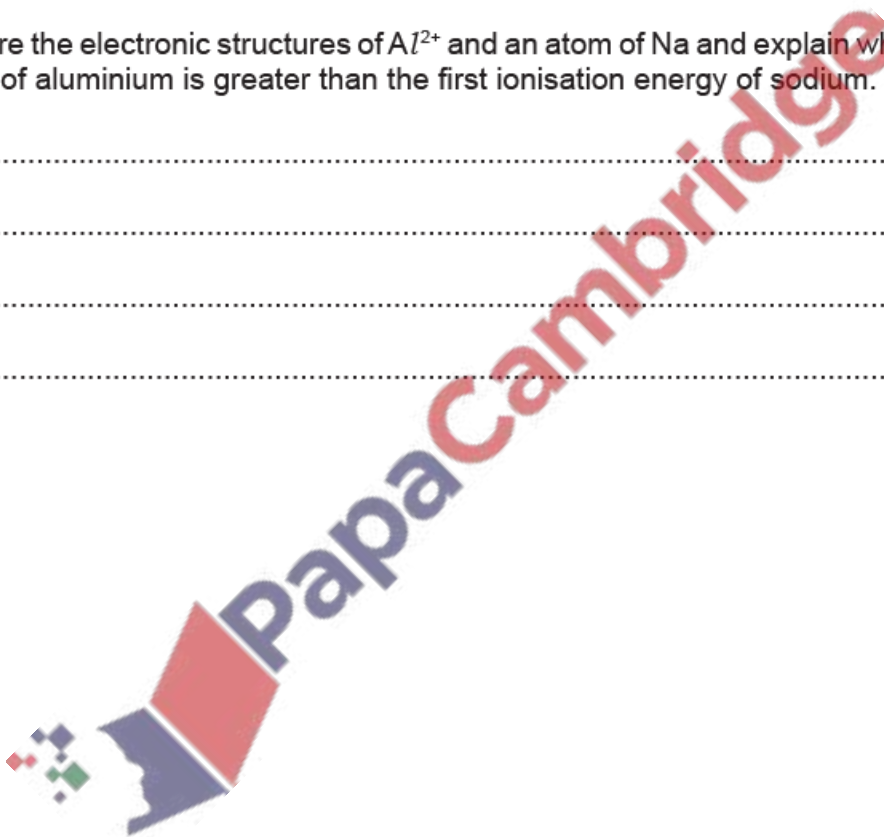
Explain why the first ionisation energy of sulfur is less than the first ionisation energy of phosphorus.

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..... [2]

- (d) In an  $Al^{2+}$  ion the nuclear attraction for the outer electron is stronger than in an atom of Na.

Compare the electronic structures of  $Al^{2+}$  and an atom of Na and explain why the third ionisation energy of aluminium is greater than the first ionisation energy of sodium.

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



(a) Period 3 elements and their compounds show trends in their physical properties.

(i) On Fig. 2.1 sketch a graph to show the melting points of the first five elements in Period 3.

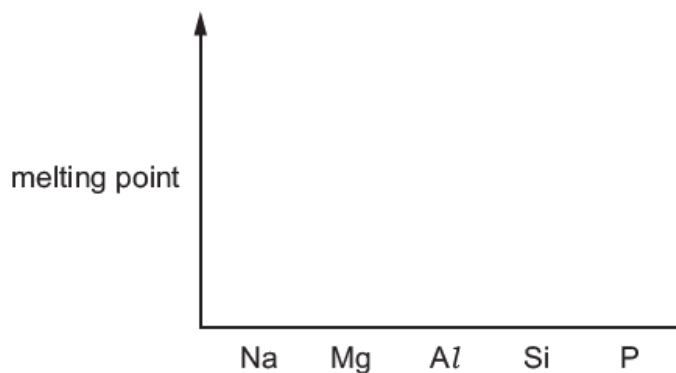


Fig. 2.1

[3]

(ii) Complete Table 2.1 with information for sodium chloride and phosphorus(V) chloride.

Table 2.1

	sodium chloride	phosphorus(V) chloride
state at room temperature		
name of change which occurs on addition of water		
pH of final solution		

[3]