



Questions

Q1.

Ionisation energies provide information about the number of electrons and the arrangement of the electrons in an atom of an element.

Estimate a value for the first ionisation energy of oxygen given the data in the table.

(1)

Element	First ionisation energy / kJ mol^{-1}
carbon	1086
nitrogen	1402
oxygen

(Total for question = 1 mark)



Q2.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

Sulfur is a bright yellow crystalline solid at room temperature.

Sulfur forms rings of 8 sulfur atoms so the formula of the yellow solid is S₈.

A section of a periodic table showing values of first ionisation energy in kJ mol⁻¹ is shown.

N 1400	O 1310	F 1680
P 1010	S 1000	Cl 1250
As 950	Se 940	Br 1140

(i) Which equation represents the first ionisation energy of sulfur?

(1)

- A $S(s) \rightarrow S^+(g) + e^-$
- B $S_8(s) \rightarrow S_8^+(g) + e^-$
- C $S(g) \rightarrow S^+(g) + e^-$
- D $S_8(g) \rightarrow S_8^+(g) + e^-$

(ii) Explain the trend in the values of the first ionisation energies for the group containing sulfur.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....



(iii) Explain why the first ionisation energy of sulfur is lower than that of chlorine.

(2)

.....

.....

.....

.....

.....

.....

(iv) Explain why the first ionisation energy of sulfur is lower than that of phosphorus.

(2)

.....

.....

.....

.....

.....

.....

(Total for question = 8 marks)



Q3.

Give the meaning of the term 'periodicity'.

Illustrate your answer by referring to the atomic radii of the Period 2 and Period 3 elements.
Specific values of atomic radii are not required.

(3)

.....

.....

.....

.....

.....

.....

.....

(Total for question = 3 marks)



Q4.

This question is about hydrogen, the element with atomic number $Z = 1$.

Hydrogen can be placed in several different positions in periodic tables. One is immediately above lithium in Group 1. Another is in the centre of the first row, as shown in the Periodic Table on the back cover.

Criticise the position of hydrogen immediately above lithium by giving one reason in favour and two against.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 3 marks)

**Q5.**

* The melting temperatures of the Period 2 elements are shown.

Symbol of the element	Li	Be	B	C _(diamond)	N	O	F	Ne
Melting temperature / K	454	1551	2573	3970	63	55	53	25

Explain the trend in melting temperatures across the elements of Period 2 in terms of their structure and bonding.

(6)

(Total for question = 6 marks)



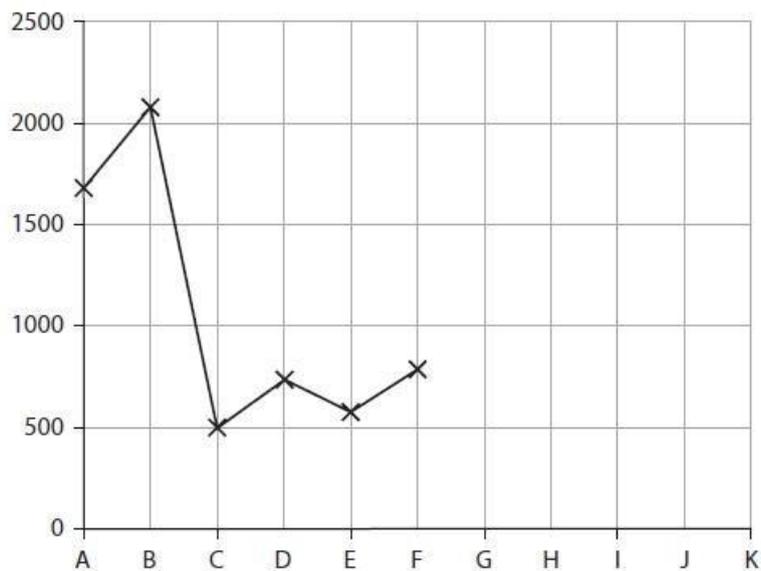
Q6.

Electrons in atoms occupy orbitals.

(i) The graph shows the first ionisation energies for a series of six consecutive elements A–F. The letters are not their chemical symbols.

Complete the graph of the first ionisation energies for the next five elements.

(3)



(ii) Explain why the value of the first ionisation energy for **D** is **greater** than for **C**.

(2)

.....

.....

.....

.....

.....

(iii) Explain why the value of the first ionisation energy of **E** is **less** than for **D**.

(2)

.....

.....

.....

.....

.....

(Total for question = 7 marks)



Q7.

This question is about trends within Group 2 of the Periodic Table.

Describe, with the aid of a labelled diagram, how you would compare the thermal stability of two different Group 2 nitrates using simple laboratory equipment.

Your answer **must** include **one** safety precaution (excluding the use of gloves, laboratory coat and eye protection).

(4)

.....

.....

.....

.....

.....

.....

.....

(Total for question = 4 marks)



Q9.

A student stated that 'the elements scandium and zinc are d-block elements but are not transition metals'.

Discuss this statement, using appropriate electronic configurations to support your answer.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 4 marks)

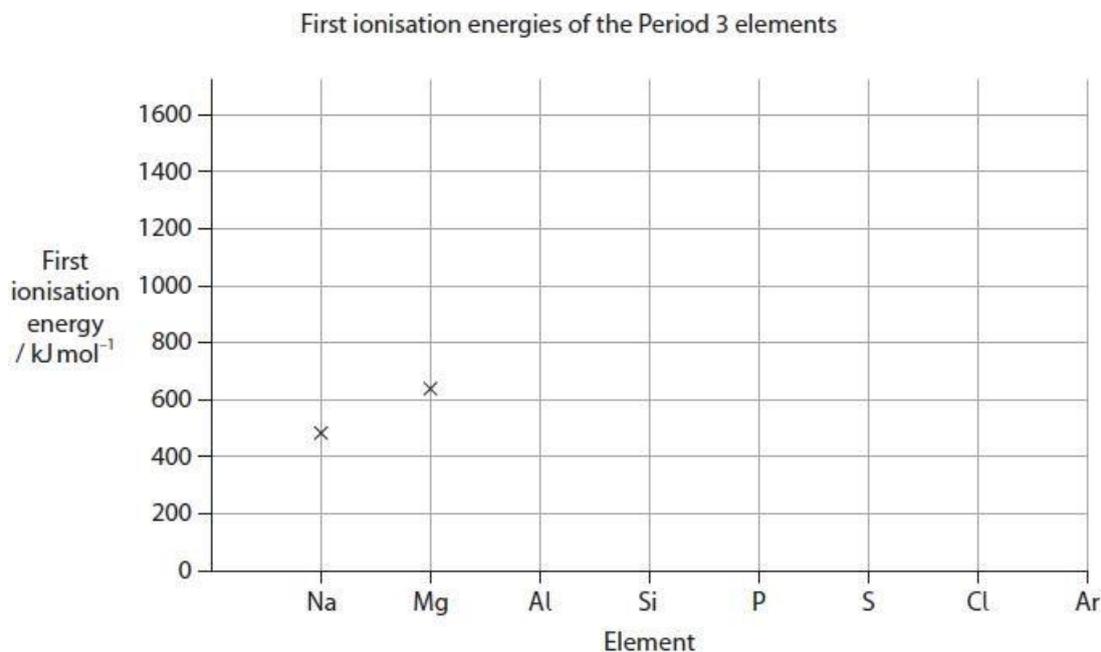


Q11.

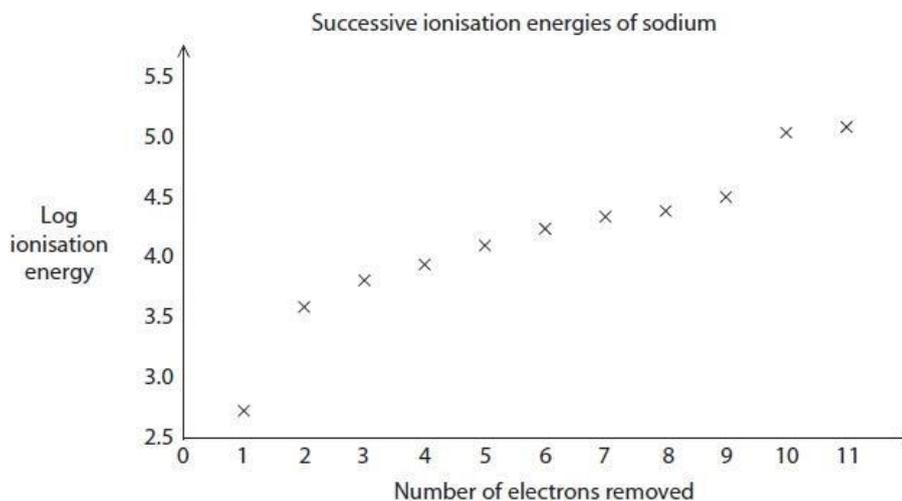
This question is about ionisation energies.

(i) Complete the graph to show how the first ionisation energies of the Period 3 elements change across the period. Precise figures are not required.

(3)



(ii) The successive ionisation energies of sodium are shown on the graph.



State what deductions can be made from this graph.

(2)

.....

.....

.....

.....

(Total for question = 5 marks)



Q12.

This question is about hydrogen, the element with atomic number $Z = 1$.

(i) Write an equation to represent the first ionisation energy of hydrogen. Include state symbols.

(2)

(ii) The sequence of the first three elements in the Periodic Table is hydrogen, helium and then lithium.

Explain why the first ionisation energy of hydrogen is less than that of helium, but greater than that of lithium.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 6 marks)