

Name of the Student: _____

Max. Marks : 26 Marks

Time : 26 Minutes

Q1.

The element rubidium exists as the isotopes ^{85}Rb and ^{87}Rb

- (a) State the number of protons and the number of neutrons in an atom of the isotope
- ^{85}Rb

Number of protons _____

Number of neutrons _____

(2)

- (b) (i) Explain how the gaseous atoms of rubidium are ionised in a mass spectrometer

(2)

- (ii) Write an equation, including state symbols, to show the process that occurs when the
- first**
- ionisation energy of rubidium is measured.

(1)

- (c) The table shows the first ionisation energies of rubidium and some other elements in the same group.

Element	sodium	potassium	rubidium
First ionisation energy / kJ mol^{-1}	494	418	402

State **one** reason why the first ionisation energy of rubidium is lower than the first ionisation energy of sodium.

(1)

- (d) (i) State the block of elements in the Periodic Table that contains rubidium.

(1)

- (ii) Deduce the full electron configuration of a rubidium atom.

(1)

- (e) A sample of rubidium contains the isotopes ^{85}Rb and ^{87}Rb only.
The isotope ^{85}Rb has an abundance 2.5 times greater than that of ^{87}Rb

Calculate the relative atomic mass of rubidium in this sample.
Give your answer to one decimal place.

(3)

- (f) By reference to the relevant part of the mass spectrometer, explain how the abundance of an isotope in a sample of rubidium is determined.

Name of relevant part _____

Explanation _____

(2)

- (g) Predict whether an atom of ^{88}Sr will have an atomic radius that is larger than, smaller than or the same as the atomic radius of ^{87}Rb . Explain your answer.

Atomic radius of ^{88}Sr compared to ^{87}Rb _____

Explanation _____

(3)

(Total 16 marks)

Q2.

Trends in physical properties occur across all Periods in the Periodic Table.
This question is about trends in the Period 2 elements from lithium to nitrogen.

- (a) Identify, from the Period 2 elements lithium to nitrogen, the element that has the largest atomic radius.

(1)

- (b) (i) State the general trend in first ionisation energies for the Period 2 elements lithium to nitrogen.

(1)

- (ii) Identify the element that deviates from this general trend, from lithium to nitrogen, and explain your answer.

Element _____

Explanation _____

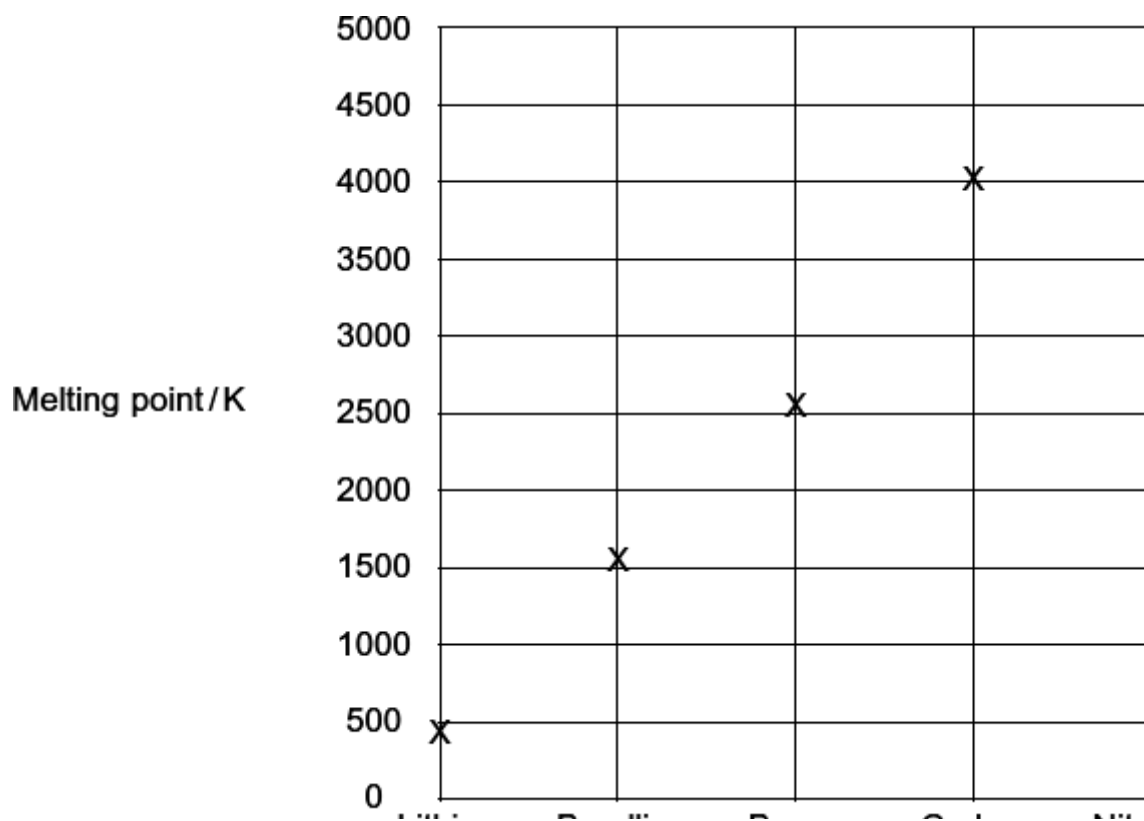
(3)

- (c) Identify the Period 2 element that has the following successive ionisation energies.

	First	Second	Third	Fourth	Fifth	Sixth
Ionisation energy / kJ mol^{-1}	1090	2350	4610	6220	37 800	47 000

(1)

- (d) Draw a cross on the diagram to show the melting point of nitrogen.



(1)

(e) Explain, in terms of structure and bonding, why the melting point of carbon is high.

(3)

(Total 10 marks)