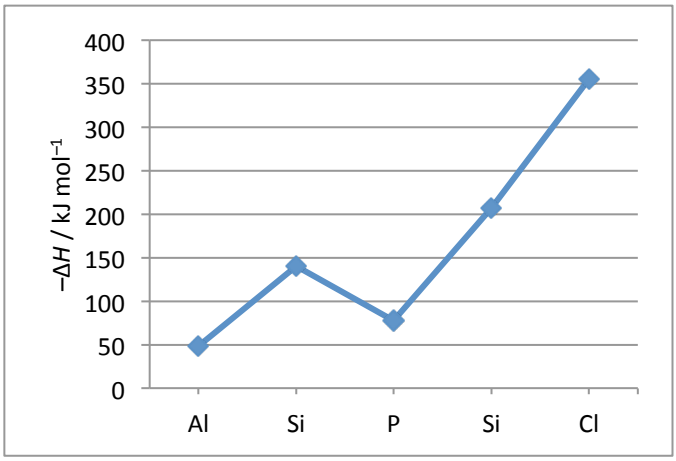
Marks 7

- Electron affinity is the enthalpy change for the reaction $A(g) + e \rightarrow A^-(g)$.
  The graph below shows the trend in electron affinities for a sequence of elements in the third row of the Periodic Table.



Give the electron configurations of the following atoms and singly-charged anions. Use [Ne] to represent core electrons.

Atom	Electron configuration	Ion	Electron configuration
Si		Si^-	
P		P^-	
S		S^-	

Explain why the value for the electron affinity of phosphorus is anomalous.

What trend would you expect for the electron affinities for Si^-, P^- and S^-? Explain your answer.

Marks 5

- The Periodic Table as arranged by Mendeleev allows us to make predictions about the behaviours of elements based on those around them. Briefly describe why the Periodic Table works.

Silicon and tin have the same structure as diamond. Use the information in the following table to predict the density of tin.

Element	Atomic Mass	Density (g cm^{-3})	Bond length (pm)
Si	28	2.329	233
Sn	118		280

Answer:

Explain the trend in the first ionisation energy of these elements.

Marks 6

- The electron affinity is negative if energy is released upon addition of an electron. If it is positive, the resultant anion is unstable. Explain why beryllium has a positive electron affinity, while that of fluorine is highly negative.

Why is the ionisation potential of oxygen slightly smaller than nitrogen, despite being further across the period?

How is this related to the slightly positive electron affinity of nitrogen?

Marks

- Explain the trends in electron affinities for the first 5 elements of the second row of the periodic table, in terms of their electronic configurations.
  i.e. Discuss the trend in ΔH for the following reaction: $A(g) + e^- \rightarrow A^-(g)$

3

Element	Li	Be	B	C	N
ΔH (in kJ mol^{-1})	–60	+241	–27	–122	+8

- Briefly explain the following concepts and their electronic origins.

2

(a) paramagnetism

(b) polar bond

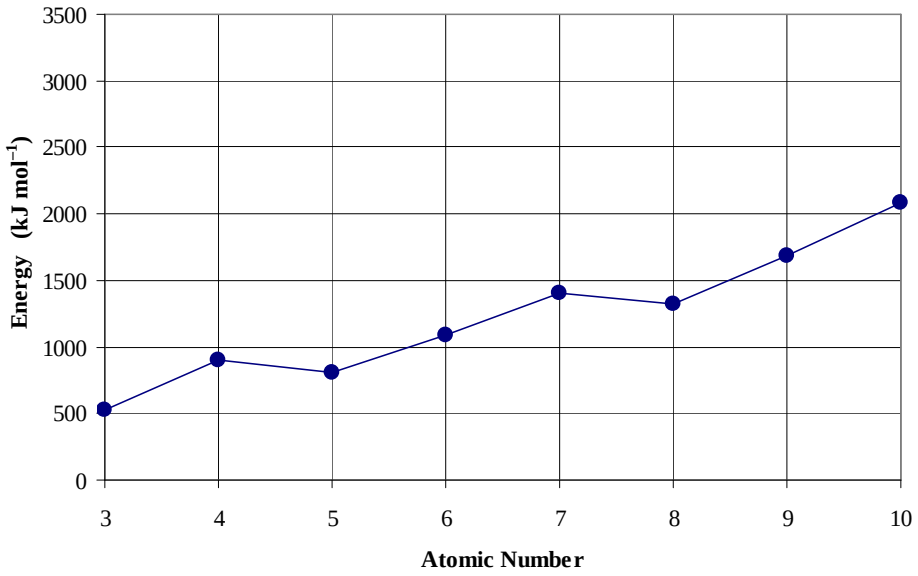
Marks 3

- Explain the trends in electron affinities for the first 5 elements of the second row of the periodic table, in terms of their electronic configurations.
  i.e. Discuss the trend in ΔH for the following reaction: $A(g) + e^- \rightarrow A^-(g)$

Element	Li	Be	B	C	N
ΔH (in kJ mol^{-1})	–60	+241	–27	–122	+8

Marks 6

- The graph shows the first ionisation energies for second row elements of the periodic table.



Explain the general trend and both anomalies.

On the above graph, plot your estimates of the second ionisation energies for the second row elements. Make sure your graph clearly shows the general trends.

	Marks
• Explain why, in general, there is a decrease in atomic radius from left to right across the second row of the periodic table (lithium to neon), but an abrupt increase in radius on going to the next row.	4

THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY