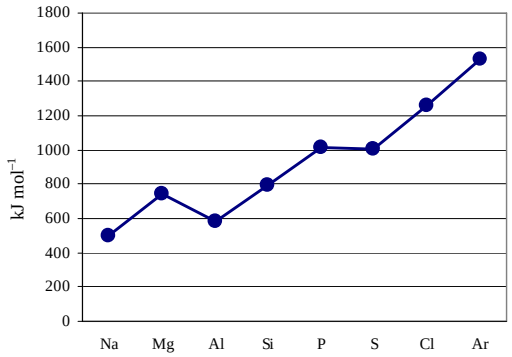
- Write the ground state electron configuration of the Ca^{2+} cation. **2**

List the quantum numbers (n, l, m_l, m_s) that describe any one of the electrons in the ground state Ca^{2+} cation.

- Write down the ground state electron configuration of the iron atom.

1

• Give the ground-state electron configuration of the aluminium atom.	**Marks 2**
Provide one set of valid quantum numbers (n, l, m_l, m_s) for the highest energy electron.	

	Marks
• In general terms, which elements in the periodic table are likely to be essential elements for living species and which ones are likely to be toxic. Explain.	**2**
• The diagram below shows the general trend for the first ionisation energy for some *s* and *p* block elements.  How will the general trend differ for the second ionisation energy of these elements (*i.e.* $X^+(g) \rightarrow X^{2+}(g) + e^-$)? Explain.	**3**

Marks 5

- The radioactive isotopes ^{131}I and ^{137}Cs have been detected in drinking water near the Japanese Fukushima nuclear reactor. They have half lives of 8 days and 30 years, respectively. What is the definition of half-life?

What percentage of both isotopes will still be detectable after 25 years?

^{131}I:	^{137}Cs:

If you were exposed to equal concentrations of both isotopes for 1 hour, which isotope would do more damage? Explain.