

AHL Worksheet – Chapter 2

1 Write out the full electronic configurations of the following atoms: [8]

- | | | |
|-----------------------------|-------------|-------------|
| a ${}_{16}\text{S}$ | d Sn | g Cu |
| b ${}_{35}\text{Br}$ | e Sr | h Cr |
| c ${}_{26}\text{Fe}$ | f Xe | |

2 Write out the full electronic configuration of the following ions: [5]

- | | | |
|---------------------------|---------------------------|-----------------------|
| a Ca^{2+} | c P^{3-} | e I^- |
| b Br^- | d Sn^{2+} | |

3 Complete the following diagrams, showing electrons in boxes: [3]

- a** Al [Ne]
- b** Co [Ar]
- c** Te [Kr]

4 In each of the following cases identify the element referred to: [3]

- a** X has 10 electrons in d orbitals, 2 unpaired electrons in p orbitals and forms a 2– ion that has a full p subshell.
- b** Q has 12 p electrons, 8 electrons in s orbitals and a half-filled d subshell.
- c** Z has 20 electrons in d orbitals, no unpaired electrons and a total of twice as many electrons in p orbitals as in s orbitals.

5 Write equations to represent the following processes: [3]

- a** the first ionisation energy of sodium
- b** the second ionisation energy of chlorine
- c** the fifth ionisation energy of lead.

6 Explain why the second ionisation energy of an element is always higher than the first. [2]

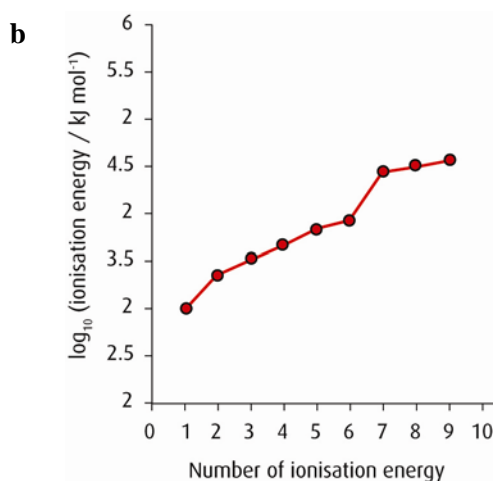
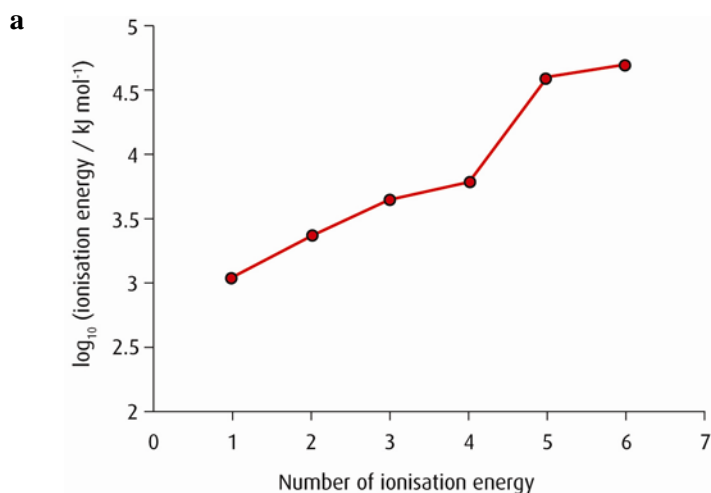
7 The table shows the first four ionisation energies of three consecutive elements in period 3.

| Element | Ionisation energy / kJ mol^{-1} | | | |
|------------|--|--------|-------|--------|
| | First | Second | Third | Fourth |
| aluminium | 577 | 1820 | 2740 | 11600 |
| silicon | 786 | 1580 | 3230 | 4360 |
| phosphorus | 1060 | 1900 | 2920 | 4960 |

Draw graphs of the successive ionisation energies. Identify and explain any features on the graphs. [14]

- 8 From the graphs of successive ionisation energy given below, explain in which group of the periodic table each element is.

[6]



- 9 Use the following data and a software package (such as Microsoft EXCEL™) to plot a graph of the first ionisation energy of the elements in Period 2 and Period 3. Explain the similarities and differences between the graphs. [10]

| Period 2 | First ionisation energy / kJ mol^{-1} | Period 3 | First ionisation energy / kJ mol^{-1} |
|----------|--|----------|--|
| Li | 519 | Na | 495 |
| Be | 898 | Mg | 736 |
| B | 799 | Al | 577 |
| C | 1085 | Si | 785 |
| N | 1400 | P | 1010 |
| O | 1312 | S | 998 |
| F | 1678 | Cl | 1249 |
| Ne | 2077 | | |