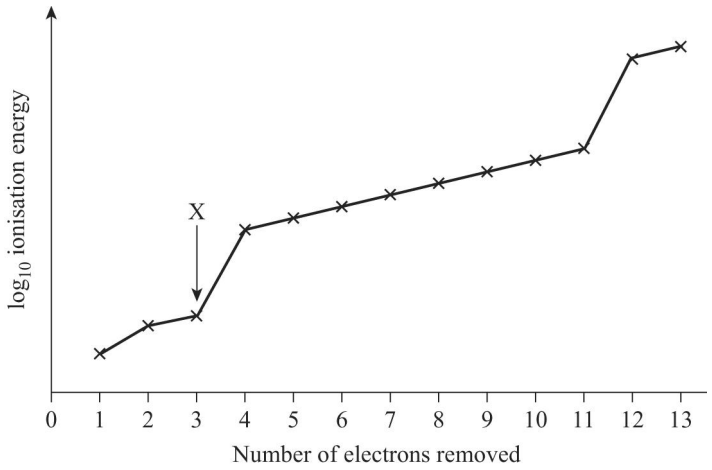
Worksheet 3.5

Patterns in ionisation energy

1 The sketch graph shows the logarithm ($\log_{10}$) of successive ionisation energies of aluminium plotted against the number of electrons removed. Use this sketch graph to answer the following questions.



a Explain why the first three electrons are relatively easy to remove. [3]
b Why is there a sharp rise in ionisation energy when the fourth electron is removed? [3]
c What information does the graph give about the electronic structure of aluminium? [7]
d Give the equation for the ionisation energy marked X (the 3rd ionisation energy). [2]

2 The table below shows the first seven successive ionisation energies of a particular element.

Electron removed	1	2	3	4	5	6	7
H_i **/ kJ mol** $^{-1}$	1310	3390	5320	7450	10 990	13 330	71 340

a Why do the successive ionisation energies increase in value? [5]
b To which Group in the Periodic Table is the element likely to belong? Explain your answer. [3]

3 **a** Use the information in Data Sheet 2 to answer this question.
On the same piece of graph paper, plot graphs of the first ionisation energy of the Group II and Group VII elements. Plot ionisation energy on the vertical axis and period number on the horizontal axis. [4]
b Describe and explain the general trend in the values you plotted in part **a**
i down each Group [5]
ii comparing Group II to Group VII. [5]
c Use your graph to suggest a value for the first ionisation energy of astatine. [1]