ATOMIC STRUCTURE AHL (HL only)

Please ensure that you have also completed the Atomic Structure Core (SL & HL) questions

1. (a) Give the definition of *first ionisation energy*:

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(b) State the electron configurations of sodium and potassium. State **and explain** how the first ionisation energy of sodium compares with potassium.

[3]

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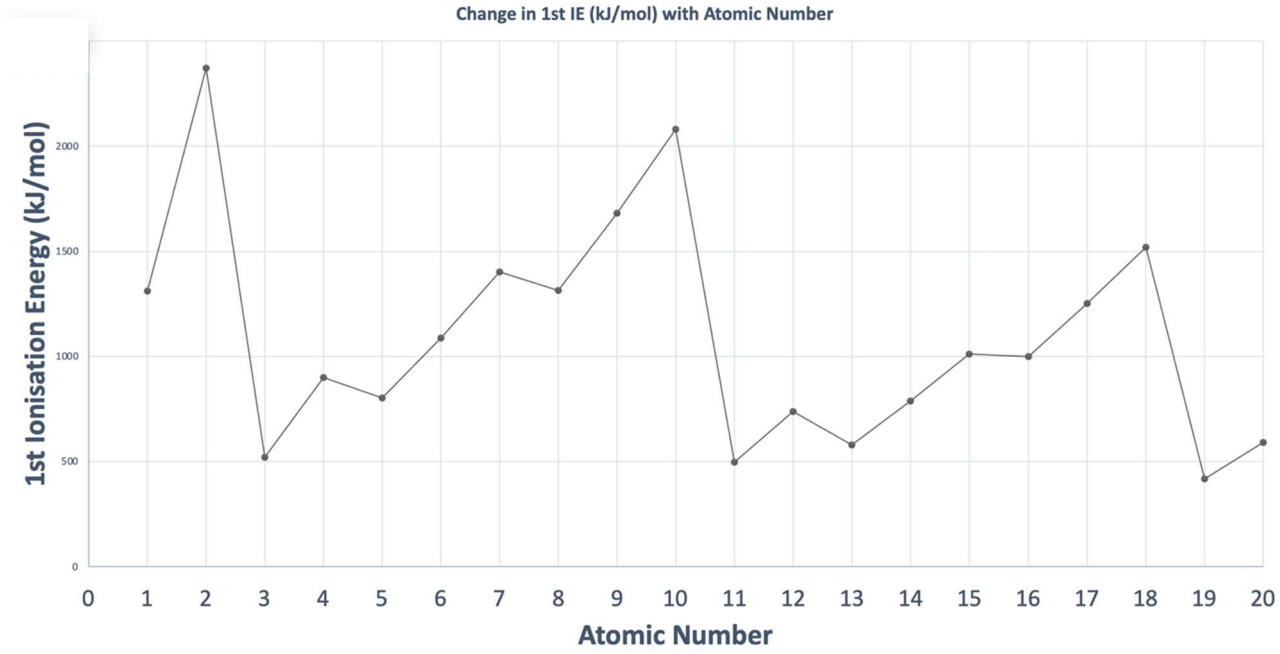
(c) Describe how the first five successive ionisation energies of silicon vary (you may wish to sketch a graph to illustrate your answer).

[3]

2. The chart below shows the first ionisation energies of the elements for the first twenty elements in the period table.



(a) Explain why is there an overall increase in ionisation energy between elements 3 and 10.

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(b) Explain why is there a decrease is ionisation energy between elements 4 and 5.

[1]

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PTO

(c) Explain why is there a decrease in ionisation energy between elements 15 and 16.

[2]

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(d) Explain why there is a large decrease in ionisation energy between elements 10 and 11

[3]

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3. The successive ionisation energies of an element in period 3 are shown in the table:

Ionisation Energy ($kJ\ mol^{-1}$)	1st	2nd	3rd	4th	5th
	578	1817	2745	11578	14831

(a) Identify the period 3 element represented. Explain your answer.

[2]

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(b) Predict a value for the 6^{th} ionisation energy.

[1]

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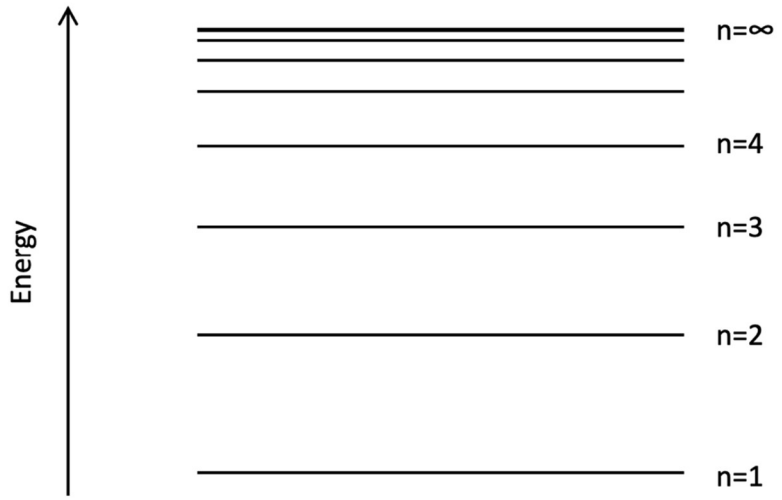
4. The diagram below represents some of the electronic energy levels in a hydrogen atom.



(a) Draw an arrow on the diagram to represent the electron transition for the ionisation of an atom of hydrogen in the ground state.

[1]

(b) The wavelength of the convergence point in the hydrogen emission spectrum is 9.12×10^{-8}m. Using the appropriate values for the speed of light (*c*) and Planck's constant (*h*) given in the data booklet, calculate the value for the first ionisation energy of hydrogen. **Show your working.**

[3]

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Total marks 23 (35 minutes)