

## ATOMIC STRUCTURE Core (SL & HL)

1. (a) Using the Periodic Table in the data booklet give **the symbol of:**

(i) An element with ground state electron configuration  $[\text{Kr}] 5s^2 4d^1$

[1]

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(ii) An ion with electron configuration  $1s^2 2s^2 2p^6$ , with a 2– charge

[1]

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(iii) **Two** elements with outer electron configuration  $ns^2 np^2$

[1]

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(b) Show the outer electron configurations for iron and its ions, including electron spin, by completing the table below with arrows to represent electrons:

[3]

	4s	3d				
Fe						
Fe <sup>2+</sup>						
Fe <sup>3+</sup>						

2. (a) A sample of oxygen in a lab contains isotopes in the following percentages:

<sup>16</sup> O	98.20%
<sup>17</sup> O	1.50%
<sup>18</sup> O	0.30%

(i) Calculate the relative atomic mass of this sample of oxygen to four significant figures.

[2]

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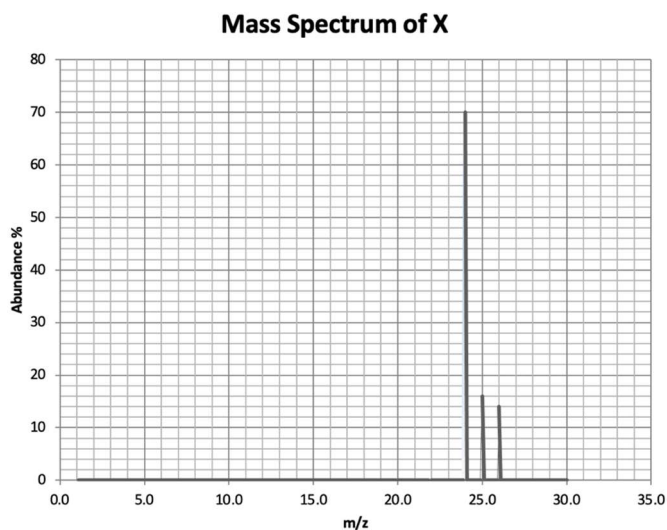
(ii) Determine the number of neutrons in the atom of the least abundant oxygen isotope.

[1]

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3. (a) The mass spectrum of a sample of an element, X, is given below:



(i) Explain why there is more than one peak.

[1]

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(ii) Calculate the relative atomic mass of the sample of the element to two decimal places.

[2]

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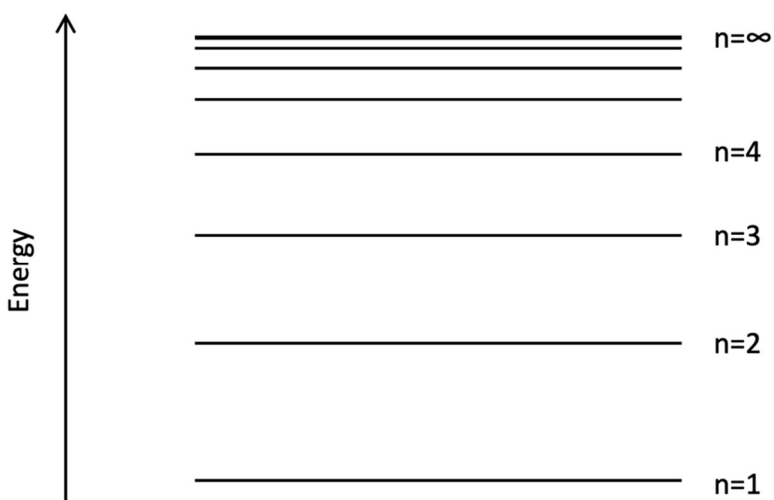
PTO

4. (a) Hydrogen gas may be placed in an electric discharge tube to generate an emission spectrum.  
(i) Describe the emission spectrum of hydrogen.

[2]

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(b) The diagram below represents some of the electronic energy levels in a hydrogen atom.



(i) Draw an arrow on the diagram to represent any electron transition in the absorption spectrum of hydrogen. Label the arrow A.

[1]

(ii) Draw an arrow on the diagram to represent the lowest energy transition in the visible emission spectrum of hydrogen. Label the arrow B.

[1]

(c) State how a continuous spectrum is different from the hydrogen emission spectrum.

[1]

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PTO

5, (a) Define the term *isotopes*.

[1]

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(b) A sample of copper has a relative atomic mass of 63.60 and consists of two stable isotopes, copper-63 and copper-65. What is the relative percentage abundance of the two isotopes?

[2]

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(c) State the electron configuration of the copper isotopes copper-63 and copper-65.

[1]

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(d) State a physical property that is different for isotopes of the same element.

[1]

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Total 22 marks (33 minutes)