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— **TUITION** —

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CHEMISTRY

PHYSICAL CHEMISTRY

Level & Board

CIE (A-LEVEL)

TOPIC:

ATOMIC STRUCTURE

PAPER TYPE:

QUESTION PAPER - 1

TOTAL QUESTIONS

2

TOTAL MARKS

15

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Atomic Structure

Question 1

This question is about the elements in Group II of the Periodic Table, magnesium to barium.

- (a) Complete the table below to show the electronic configuration of calcium atoms and of strontium ions, Sr^{2+}

	1s	2s	sp	3s	3p	3d	4s	4p	4d
Ca	2	2	6						
Sr^{2+}	2	2	6						

- (b) Explain the following observations. [2]

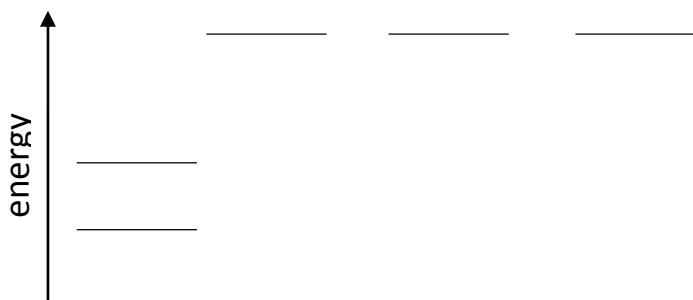
- (i) The atomic radii of Group II elements increase down the Group.
- (ii) The strontium ion is smaller than the strontium atom.
- (iii) The first ionization energies of the elements of Group II decrease with increasing proton number. [4]

Question 2

In the 19th and 20th centuries, experimental results showed scientists that atoms consist of a positive, heavy nucleus which is surrounded by electrons.

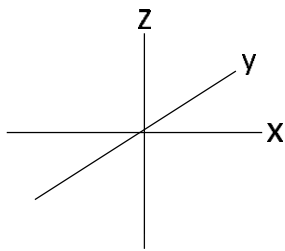
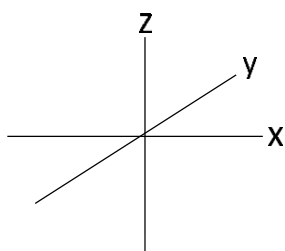
Then in the 20th century, theoretical scientists explained how electrons are arranged in orbitals around atoms.

- (a) The diagram below represents the energy levels of the orbitals present in atoms of the second period (Li to Ne).
- (i) Label the energy levels to indicate the principal quantum number and the type of orbital at each energy level.



- (ii) On the axes below, draw a sketch diagram of **one** of each **different type (shape)** of orbital that is occupied by the electrons in a second – period element.

Label each type.



(ii) Complete the electronic configurations of nitrogen atoms and oxygen atoms on the energy level diagrams below.

Use arrows to represent electrons.



nitrogen



Oxygen

[6]

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(b) (i) Use the Data Booklet to state the value of the first ionization energy of nitrogen and of oxygen.

(ii) Explain, with reference in your answer to (a)(iii), the relative values of these two ionization energies. [3]

I am Sorry !!!!!



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