**Atomic theory teat: 50 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_**

**SECTION A – Multiple-choice questions**

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| **Instructions for Section A**Answer **all** questions. Choose the response that is **correct** or **best answers** the question. A correct answer scores 1, an incorrect answer scores 0. No mark will be given if more than one answer is completed for any question. Marks will **not** be deducted for incorrect answers.  |

**Question 1**

Which one of the following elements is considered to be ‘endangered’?

**A**. helium

**B**. carbon

**C**. oxygen

**D**. sodium

**Question 2**

A trend in Period 3 of the periodic table is shown below.



The property on the vertical axis is likely to be

**A**. electronegativity values

**B**. atomic radius

**C**. metallic nature

**D**. first ionisation energy

**Question 3**

In comparison to fluorine, iodine will have a

**A**. lower electronegativity but a higher first ionisation energy.

**B**. higher electronegativity and a lower first ionisation energy.

**C**. lower electronegativity and a lower first ionisation energy.

**D**. greater atomic radius and a higher chemical reactivity.

**Question 4**

Which element is found in Period 4 and Group 16?

**A**. sulfur

**B**. chlorine

**C**. selenium

**D**. tellurium

**Question 5**

The atomic notation for the element argon is shown below:

$$$$

This atom of argon will have with strontium, magnesium will have

**A**. 18 protons, 18 neutrons and 18 electrons

**B**. 18 protons, 22 neutrons and 18 electrons

**C**. 18 protons, 18 neutrons and 22 electrons

**D**. 18 protons, 22 neutrons and 22 electrons

**Question 6**

An electron orbital is best defined as a

**A**. shell in an atom that can hold several pairs of electrons.

**B**. region around a nucleus that contains two electrons.

**C**. region around a nucleus that can hold up to two electrons.

**D**. region around a nucleus that can hold up to eight electrons.

**Question 7**

The ground state electron configuration of 1s22s22p63s23p6 3d84s2  represents

**A**. calcium

**B**. cobalt

**C**. nickel

**D**. strontium

**Question 8**

As you move down a group of the Periodic Table the electronegativity will

**A**. drop as the outer shell is more shielded from the nucleus.

**B**. decrease as the number of outer shell electrons has increased

**C**. increase as the core charge of the atom is increasing.

**D**. increase as the number of protons in the nucleus has increased.

**Question 9**

The number of orbitals containing electrons in an atom of chlorine will be

**A**. 3

**B**. 5

**C**. 6

**D**. 9

**Question 10**

An α-particles can be described as a nucleus of a helium atom. An α-particle will contain

**A**. 2 protons

**B**. 2 protons and 2 neutrons

**C**. 2 protons, 2 neutrons and 2 electrons

**D**. 4 protons

**SECTION B- Short-answer questions**

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| **Instructions for Section B**Questions must be answered in the spaces provided in this book. To obtain full marks for your responses you should * Give simplified answers with an appropriate number of significant figures to all numerical questions; unsimplified answers will not be given full marks.
* Show all workings in your answers to numerical questions. No credit will be given for an incorrect answer unless it is accompanied by details of the working.

Make sure chemical equations are balanced and that the formulas for individual substances include an indication of state; for example, H2(g); NaCl(s)  |

**Question 1** (6 marks)

In Ernest Rutherford’s famous experiment, his team of researchers directed α-particles (alpha) at a thin film of gold foil. A representation of the experiment is shown below.



1. One of the observations of the team was that most of the particles seemed to pass through the foil with a small deviation in their path.

 **i**. What conclusion did Rutherford draw about the atom from the fact that most particles

 passed through easily? 1 mark

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 **ii**. What conclusion did Rutherford draw from the fact that the particles deviated slightly

 in their path? 1 mark

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1. Another observation was that a very occasional particle rebounded strongly from the foil.

What conclusion did Rutherford draw from the observation that some of the particles rebounded strongly? 2 marks

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1. Make a sketch of how atoms were perceived after the release of Rutherford’s conclusions.

 2 marks

**Question 2** (7 marks)

A diagram from a chemistry text is shown below:



**a**. Explain what this diagram is summarizing. 2 marks

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**b**. The term ‘electronegativity’ is used in the diagram.

 **i**. What is electronegativity? 1 mark

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 **ii.** Explain the trend is electronegativity shown. 2 marks

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 **c**. Explain why the atomic size has the trend shown. 2 marks

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**Question 3** (6 marks)

The diagram below can be a useful tool when studying atomic structure.

**a**. Explain what this diagram is showing. 2 marks

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**b**. **i**. Write the ground state electron configuration for the element scandium. 1 mark

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  **ii**. Name the element with the electron configuration of 1s22s22p63s23p64s2 . 1 mark

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 **iii.** Which subshell is being filled in the outer shell of Group 13 elements? 1 mark

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 **iv**. Explain why there are 10 elements in each of the rows of transition metals. 1 mark

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**Question 4** (5 marks)

**a**. The atom copper has two forms $ $or$ $**.**

 **i**. What is the term used to describe elements with more than one form? \_\_\_\_\_\_\_\_\_\_\_\_\_ 1 mark

 **ii**. Explain how these two forms of copper are different. 2 marks

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 **iii**. Give an example of how this property of some atoms might be useful. 1 mark

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**b**. Use atomic notation to represent an atom of fluorine. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 mark

**Question 5** (10 marks)

An outline of the Periodic Table is drawn below with some letters to represent elements on it.

Refer to this diagram to answer the questions below.



**a.** Identify the elements; 3 marks

 **i**. A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **ii**. C \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

  **iii**. D \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**b**. **i.** Element C is in Period \_\_\_\_ and Group \_\_\_\_\_\_. 1 mark

 **ii**. Element G is in Period \_\_\_\_ and Group \_\_\_\_\_\_. 1 mark

**c. i.** What section of the Periodic Table is element D in? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 mark

 **ii**. Which type of subshell is being filled in this section? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 mark

**d. i**. Which element on the table above is the most reactive metal? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 mark

 **ii**. Which element on the table above is the least reactive? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 mark

 **iii**. List an element on the table above that is an alkali earth metal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 mark

**Question 6** (6 marks)

**a**. Croup 18 of the periodic table is often referred to the Noble gases.

 Why is this term used and what is the reason for their behaviour? 2 marks

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 **b**. The noble gases were discovered around the 1890 AD. Why did it take so long for scientists to identify

 them? 2 marks

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 c. The electronegativity values of the Noble gases are often not listed. Explain why. 2 marks

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**End of test**

**Mark out of 50:**