



ALEXANDER ROAD HIGH SCHOOL

FEBRUARY 2019

60 MIN

PHYSICAL SCIENCE CONTROL TEST

MH

TOTAL = 60

GRADE 10

Instructions

- The question paper consists of 4 questions.
- Answer all the questions.
- Answer section A on the answer sheet provided AND section B on folio sheets.
- A non-programmable calculator may be used.
- Number the answers correctly according to the numbering system.
- Round off to two (2) decimal places where necessary.

SECTION A

- Answer on the answer sheet -

QUESTION 1: Multiple choice

Four possible options are provided as answers to the following questions. Each question has only 1 correct answer. Choose the correct answer and write the letter (A – D) next to the relevant question number (1.1 – 1.10) on the answer sheet.

- 1.1 Which of the following scientists was responsible for discovering that the electrons in an atom are not randomly scattered, but are fixed in energy levels around the nucleus?
- A James Chadwick
B Ernest Rutherford
C JJ Thomson
D Niels Bohr
- 1.2 Which of the following compounds are most likely to be covalent ...
- i CO₂ ii Li₂O iii MgO iv N₂O₄
- A i and iii
B ii and iii
C iii and iv
D i and iv

- 1.3 Which of the following scientists discovered that the positive charge in an atom is concentrated into the centre of the atom in a place called the nucleus?
- A Ernest Rutherford
 - B Niels Bohr
 - C James Chadwick
 - D John Dalton
- 1.4 A certain element has an atomic number **Z** and mass number **A**. One atom of the element contains
- A **A** neutrons
 - B **A** electrons
 - C [**A** – **Z**] neutrons
 - D [**A** – **Z**] electrons
- 1.5 Atoms of the isotopes of hydrogen
- A have the same mass.
 - B have one proton each but different number of electrons.
 - C have one proton each but different number of neutrons.
 - D have different number of protons and neutrons
- 1.6 The elements of group 18 are known as
- A noble gases.
 - B transition elements.
 - C isotopes.
 - D alkali metals.
- 1.7 When an atom X of an element in Group 2 reacts to become X^{2+} , the...
- A mass number of X increases
 - B atomic number of X decreases
 - C number of occupied energy levels decreases
 - D charge of the nucleus increases

- 1.8 What type of bond will form between nitrogen and hydrogen atoms in ammonia?
- A pure covalent
 - B polar covalent
 - C ionic
 - D metallic
- 1.9 The number of neutrons in an atom of ${}_{11}^{23}\text{Na}$ is ...
- A 1
 - B 11
 - C 12
 - D 23
- 1.10 Which ONE of the following groups of elements shows the correct trend of the atomic radii of elements?
- A $\text{F} > \text{Cl} > \text{Br} > \text{I}$
 - B $\text{I} > \text{Br} > \text{Cl} > \text{F}$
 - C $\text{Li} < \text{Be} < \text{B} < \text{N}$
 - D $\text{Li} > \text{B} > \text{N} > \text{Be}$

SECTION B

-Answer on folio paper-

QUESTION 2:

Potassium chloride is a salt that forms when potassium reacts with chlorine.

2.1 For the potassium atom:

2.1.1 Write down the chemical symbol (1)

2.1.2 Draw its Aufbau diagram (3)

2.1.3 How many valence electrons does it have? (1)

2.2 For the chloride ion:

2.2.1 How many protons does it have? (1)

2.2.2 Write down the electron configuration (sp-notation) (2)

2.2.3 The chloride ion has the same electron configuration as which atom? (1)

- 2.3 The information of six elements, represented as **P, Q, R, S, T** and **U**, are given in the table below.

ELEMENT	ATOMIC NUMBER	MASS NUMBER
P	16	32
Q	3	7
R	20	40
S	18	40
T	17	37
U	19	39

Which element:

- 2.3.1 is a noble gas? (2x1)
- 2.3.2 has two (2) core electrons in each atom? (2x1)
- 2.3.3 Two of the elements are in the same group on the periodic table. Identify the two elements by writing down the letter representing them. (1)
- 2.3.4 In which group on the periodic table are the two elements mentioned in 2.3.3 in? (1)
- 2.3.5 Identify element S and write down its nuclear notation (E_Z^A). (3)

- 2.4 Another element, X, occurs in nature as two isotopes, X-23 and X-25. The drawing shown below represents a sample of the element.



- 2.4.1 Define the term **isotope**. (2)
- 2.4.2 Use the above information to calculate the relative atomic mass of element X. (4)
- [22]**

QUESTION 3:

- 3.1 Explain the difference between ionisation energy and electron affinity. (2)
- 3.2 The first ionisation energy and electron affinity of the period 3 elements are shown in the table below.

ELEMENT	FIRST IONISATION ENERGY (kJ.mol ⁻¹)	ELECTRON AFFINITY (kJ.mol ⁻¹)
Sodium	496	53
Magnesium	738	0
Aluminium	578	44
Silicon	786	134
Phosphorus	1012	72
Sulphur	1000	200
Chlorine	1251	349
Argon	1521	0

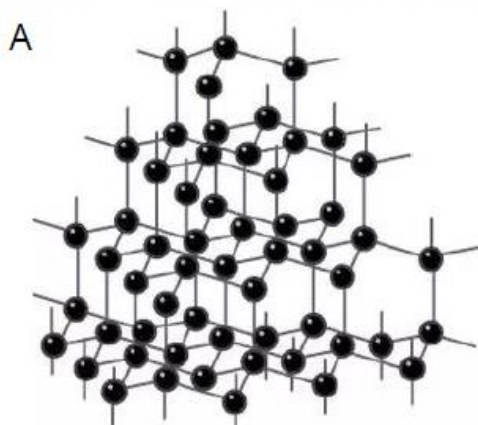
- 3.2.1 Give a reason for the trend in the first ionisation energy as seen in the table. (1)
- 3.2.2 How will the **SECOND** ionisation energy of sodium compare to that of magnesium?
Write down EQUAL TO, HIGHER THAN or LOWER THAN.
Give a reason for your answer. (3)

[6]**QUESTION 4:**

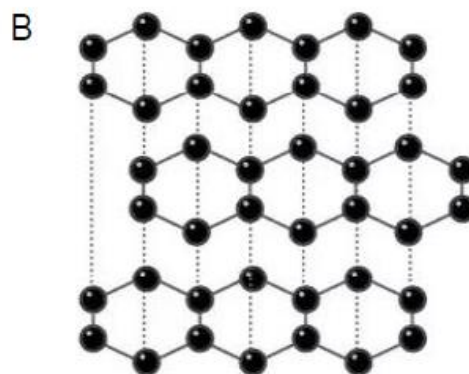
- 4.1.1 What type of bonding exists between the oxygen and hydrogen atoms in a water molecule? (1)
- 4.1.2 By using Lewis diagrams, show the formation of the water molecule from hydrogen and oxygen atoms. (3)
- 4.1.3 Show the Couper notation for water. (1)
- 4.2 Draw Lewis diagrams for the following:
- 4.2.1 Oxygen molecule (2)
- 4.2.2 carbon dioxide molecule (2)

4.3 The element Carbon has the ability to bond in more than one way. These are called the allotropes of Carbon. Charcoal or coal is one form of carbon.

The diagrams A & B below are common representations of two other allotropes of carbon.



Each carbon bonded tetrahedrally to 4 others in a giant molecule



Layers of carbon atoms each bonded to 3 others. Layers weakly held together by delocalized electrons.

4.3.1 Identify the allotrope in diagram A. (1)

4.3.2 Identify the allotrope in diagram B. (1)

4.3.3 Name the type of structure that A and B are examples of. (1)

[12]

TOTAL SECTION B [60]