

**Task 4: Bonding Topic Test**

**Question/Answer Booklet**

**CHEMISTRY UNIT 1**

Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Teacher’s Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# TIME ALLOWED FOR THIS PAPER

Reading time before commencing work: 5 minutes

Working time for the paper: 45 minutes

# MATERIALS REQUIRED/RECOMMENDED FOR THIS PAPER

**To be provided by the supervisor:**

This Question/Answer Booklet

Multiple-choice Zipgrade Answer Sheet

Chemistry Data Book

**To be provided by the candidate:**

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, eraser, correction tape/fluid, ruler, highlighters

Special items: up to three non-programmable calculators approved for use in the WACE examinations

# IMPORTANT NOTE TO CANDIDATES

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

**Part 1: MULTIPLE CHOICE [15 marks]**

1. Molten sodium chloride has a higher electrical conductivity than solid sodium chloride because in molten sodium chloride the

a) electrons are able to move more freely

b) electrostatic forces between the ions are much smaller

c) ions are significantly farther apart

d) ions are able to move more freely

1. Which of the following substances is most likely to be the best electrical conductor in the molten state?

a) potassium fluoride

b) magnesium chloride

c) aluminium bromide

d) sodium iodide

1. A characteristic of metallic elements is that

a) their atoms have only a small number of electrons in the valence shell and these can be removed relatively easily.

b) their valences are high which means they lose electrons easily.

c) their atoms usually share electrons with atoms of non-metals.

1. in the solid state electrostatic forces are not important since strong metallic bonds

hold the atoms together.

1. The low melting and boiling points of covalent molecular compounds are best explained by:
2. The weak intermolecular forces between molecules
3. The fact that covalent molecular compounds are discrete
4. Non-metals elemental forms usually existing in the gaseous state
5. The electrons not being delocalised in covalent bonding
6. An ionic substance can be distinguished from metallic and molecular substances by measuring the electrical conductivity of the substance in
7. the solid state only.
8. the liquid state only.
9. an aqueous solution only.
10. the solid and liquid states.
11. The melting temperature of some common molecular substances are given below:

Substance Melting temperature/◦C

Br2 -7

Cl2 -101

N2 04 -10

HBr -85

Of the four substances listed, the one in which forces between the molecules are least is:

1. Br2
2. Cl2
3. N2O4
4. HBr
5. To determine the type of bonding in sand, a group of year 11 chemistry students tested its hardness, melting point, and electrical conductivity. It was found that the sand was not brittle, had a high melting point, and did not conduct electricity in the solid phase or when mixed into water. What type of bonding would you expect the chemicals in the sand to possess?

1. Covalent molecular
2. Covalent network
3. Ionic
4. Metallic
5. Which one of the following combinations of atoms would form an ionic compound in a one-to-one ratio?

Element Electron configuration of atoms

I 2, 8, 1

II 2, 4

III 2, 8

IV 2, 8, 7

V 2, 8, 5

1. I and IV
2. II and III
3. II and V
4. IV and V

**Questions 9-11 refer to the information in the table below**

Three different substances were put through a series of tests to determine their material properties. The results of those tests are included in the table below

|  |  |  |  |
| --- | --- | --- | --- |
|  | Test 1 | Test 2 | Test 3 |
|  | Hit a small lump of the substance with a hammer | Place substance in a crucible and heat gently | Test some of the substance for electrical conductivity |
| Result for  substance I | flattened | melted easily | non-conductor in both the solid and liquid state |
| Result for  substance II | shattered | no visible change | non-conductor in the solid state: conducted electricity in the liquid state |
| Result for  substance III | shattered | melted easily | non-conductor in both the solid and liquid state |

1. The most probable chemical structure for solid substance I is
2. metallic lattice
3. discrete (individual) molecules
4. covalent network lattice
5. ionic lattice
6. The most probable chemical structure for solid substance II is
7. metallic lattice
8. discrete (individual) molecules
9. covalent network lattice
10. ionic lattice
11. The most probable chemical structure for solid substance III is
12. metallic lattice
13. discrete (individual) molecules
14. covalent network lattice
15. ionic lattice
16. Fluorine, chlorine and bromine are elements which exist as diatomic molecules of general formula X2. The type of bonding involved in each of these molecules is best described as:
17. one atom acquiring a single positive charge and the other a single negative charge
18. the two atoms having an approximately equal share of one electron which is free to move randomly over the molecule
19. the two atoms having an equal share of two electrons which spend most of their time between the two atoms
20. the two atoms having an approximately equal share of all electrons in the outer shell of each atom
21. Which of the following ionic formulae is **not** written correctly?
22. Fe2O3
23. FeCl2
24. Fe2NO3
25. FePO4
26. Copper saucepans conduct heat well because
27. they have a shiny lustrous appearance.
28. they contain dissociated electrons.
29. the metal atoms are free to move around.
30. the delocalised electrons can move freely.
31. When sugar (C12H22O11) is gently heated in a saucepan, it eventually melts to form a thick liquid sugar syrup. When this syrup cools down, it forms hard sheets of toffee.

Classify the liquid sugar syrup according to the properties below.

**Type of bonding Electrical conductor**

1. covalent network no
2. covalent molecular no
3. covalent network yes
4. covalent molecular yes

**Part 2: SHORT ANSWER [21 marks]**

1. Complete the following table:

[10 marks]

|  |  |  |
| --- | --- | --- |
| **Name** | **Formula** | **Type of bonding**  **(ionic / covalent)** |
| potassium iodide |  |  |
|  | CO2 |  |
| copper (II) chloride |  |  |
|  | HCN |  |
| silicon tetrachloride |  |  |

1. Classify the following as either ionic, covalent network, covalent molecular, or metallic substances:

[4 marks]

**N2, SO2, KF, ICl, Al2O3, NH4Cl, SiC, Na**

|  |  |  |  |
| --- | --- | --- | --- |
| **IONIC** | **COVALENT NETWORK** | **COVALENT MOLECULAR** | **METALLIC** |
|  |  |  |  |

1. Explain why ionic substances are only able to conduct electricity in their liquid phase while metals are able to do so in their liquid *and* solid phase.

[4 marks]

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1. Consider the key below, which refers to three (3) common allotropes of carbon; graphite, diamond and buckyballs.

No

A

Is the substance a covalent network?

Yes

B

Is the substance an electrical conductor?

Yes

No

C

Complete the key above, by writing the labels ‘graphite’, ‘diamond’ and ‘buckyballs’ in the appropriate boxes labelled A, B and C.

[3 marks]

**Part 3: EXTENDED QUESTION [9 marks]**

Discuss metallic, ionic, and covalent molecular substances with reference to the following:

* + an example of each
  + elements that make up these substances
  + the bonding involved (you may like to draw diagrams)
  + at least one physical property of each

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