

CHEMISTRY ENTRANCE TEST SAMPLE PAPER

Sample paper only provides:

Section **A** - 5 multiple choice questions.

Section **B** - 5 multiple answer questions

Section **C** - 1 fill-in-the-blank question.

Section **D** - 1 short answer question.

Actual Paper

Section **A** contains 15 multiple choice questions each worth 2 marks (Total 30 marks).

Section **B** contains 15 multiple answer questions each worth 2 marks (Total 30 marks).

Section **C** contains 4 fill-in-the-blank questions each worth 5 marks (Total 20 marks).

Section **D** contains 4 short answer questions each worth 5 marks (Total 20 marks).

TIME ALLOWED: 1.5 HOURS

INSTRUCTIONS TO CANDIDATES

1. This paper consists of **14** pages (excluding the cover page).
2. This paper is divided into Sections **A, B, C and D**.

Section **A** contains 15 multiple choice questions each worth 2 marks (Total 30 marks).

Section **B** contains 15 multiple answer questions each worth 2 marks (Total 30 marks).

Section **C** contains 4 fill-in-the-blank questions each worth 5 marks (Total 20 marks).

Section **D** contains 4 short answer questions each worth 5 marks (Total 20 marks).

3. A Periodic Table is provided on page **14**.
4. Answer **ALL** the questions in Sections **A, B, C and D**.

SECTION A – MULTIPLE CHOICE QUESTIONS (30 MARKS)

Answer **ALL** questions in this section.

- A1. Which of the following statements **BEST** explains the interconversion between the solid and liquid states of matter?
- Particles in a solid move slower than in a liquid due to attractive forces.
 - Particles in a solid lose energy and become less dense to become a liquid.
 - Particles in a solid lose energy and form a rigid structure to become a liquid.
 - Particles gain kinetic energy and overcome attractive forces in a solid to become a liquid.
- A2. Which of the following statements describing the bonding in a molecule of water (H_2O) is **TRUE**?
- Water forms an ionic bond between hydrogen and oxygen atoms.
 - Water molecules form covalent bonds in a giant covalent structure like diamond.
 - Water molecules form metallic bonds between hydrogen atoms.
 - Water molecules form covalent bonds where hydrogen and oxygen atoms share electrons.
- A3. Which of the following statements regarding the properties of graphite is **TRUE**?
- Graphite is hard because of its giant covalent structure like diamond.
 - Graphite has a high melting point due to weak forces between its layers.
 - Graphite is a good insulator because it does not have free-moving electrons.
 - Graphite conducts electricity because of delocalised electrons between layers of carbon atoms.
- A4. What is the empirical formula of a compound containing 40% sulfur and 60% oxygen by mass? (A_r of S = 32, A_r of O = 16)
- SO_2
 - SO_3
 - S_2O_2
 - S_2O_3

- A5. Which of the following substances is commonly used to neutralise excess acidity in soils?
- a. Sulfuric acid
 - b. Sodium chloride
 - c. Calcium hydroxide
 - d. Ammonium sulfate

----- End of Section A -----

SECTION B – MULTIPLE ANSWER QUESTIONS (30 MARKS)

Answer **ALL** questions in this section. Note that there are **MORE THAN ONE ANSWER** for **EACH** question.

- B1. Which of the following statements regarding isotopes are **TRUE**?
- a. Isotopes of an element have the same chemical properties.
 - b. Isotopes have different proton numbers but the same mass number.
 - c. Isotopes have the same number of protons but different numbers of neutrons.
 - d. Isotopes have the same number of neutrons but different numbers of protons.
- B2. Which of the following statements about the structure of ionic compounds are **TRUE**?
- a. Ionic compounds conduct electricity in the solid state.
 - b. Ionic compounds are soluble in water but not in organic solvents.
 - c. Ionic compounds consist of a giant lattice of oppositely charged ions.
 - d. Ionic compounds have high melting and boiling points due to strong electrostatic attractions.
- B3. Which of the following statements about alloys are **FALSE**?
- a. Alloys are mixtures of a metal with other elements.
 - b. Alloys are poor conductors of electricity due to impurities.
 - c. Alloys are compounds formed by chemical reactions between metals and non-metals.
 - d. Alloys have different properties than their constituent elements due to the different sizes of atoms.
- B4. Which of the following statements describing relative atomic mass (A_r) and relative molecular mass (M_r) are **TRUE**?
- a. The M_r of H_2O is $[(2 \times 1) + 16] = 18$.
 - b. A_r compares the mass of an atom to $\frac{1}{12}$ th the mass of a carbon-12 atom.
 - c. M_r is the sum of the relative atomic masses of all atoms in a molecule.
 - d. M_r is calculated by dividing the total mass of a compound by its atomic number.

B5. Which of the following oxides are classified as **BASIC** oxides?

- a. K_2O
- b. CaO
- c. MgO
- d. Na_2O

----- End of Section B -----

SECTION C – FILL IN THE BLANK (20 MARKS)

Fill in the blanks in the questions. Answer **ALL** questions in this section.

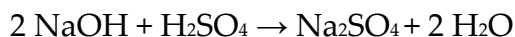
- C1. Atoms are made up of subatomic particles, protons, neutrons, and electrons. The number of protons in an atom's nucleus defines its (1)_____ number. Electrons are arranged in energy levels or (2)_____ around the nucleus, and their distribution determines the chemical properties of an element. In metallic bonding, metal atoms lose electrons to form a lattice of (3)_____ ions surrounded by a sea of delocalised electrons that move freely, allowing metals to conduct electricity. Unlike metals, covalent substances like methane consist of discrete molecules with shared pairs of electrons. The physical state of molecular substances at room temperature depends on the strength of their (4)_____ forces, which are weaker than the bonds in ionic or metallic structures. The relative weakness of these forces in simple covalent molecules explains why substances like methane exist in the (5)_____ state at room temperature.

----- End of Section C -----

SECTION D – SHORT ANSWER QUESTIONS (20 MARKS)

Answer **ALL** questions in this section in the spaces provided. Express the answers of any calculation questions to **3 SIGNIFICANT FIGURES** unless otherwise stated.

- D1. A student carried out an experiment to produce sodium sulfate (Na_2SO_4) by reacting 8.0 g of sodium hydroxide (NaOH) with sulfuric acid (H_2SO_4). The reaction takes place according to the chemical equation shown below.



- (a) Calculate the molar mass of NaOH . (1 mark)
- (b) Calculate the number of moles of NaOH used in the reaction. (1 mark)
- (c) Using the balanced equation, calculate the number of moles of Na_2SO_4 expected to form. (1 mark)
- (d) Calculate the theoretical mass of Na_2SO_4 expected to form. (1 mark)
- (e) The student obtained 9.5 g of Na_2SO_4 after purification. Calculate the percentage yield of Na_2SO_4 for this experiment. (1 mark)

----- **End of Paper** -----

The Periodic Table of the Elements

Group																	
I	II	1 H hydrogen 1										III	IV	V	VI	VII	0
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	101 Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 Po polonium 84	210 At astatine 85	210 Rn radon 86
Fr francium 87	Ra radium 88	Ac actinium 89															
*58-71 Lanthanoid series																	
†90-103 Actinoid series																	

Key

a	X
b	

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number