CHEMISTRY ENTRANCE TEST SAMPLE PAPER

sample paper only provides
10 MCQ and 2 SAQ

Actual Paper
Total 30 MCQ + 4 SAQ

Each MCQ is 2 marks
Each SAQ is 10 marks

Instructions

1. This is a **closed-book** test.

2. It has a time limit of **90 minutes** and allows for only **ONE attempt (submission)**.

3. Alert the invigilator if you are facing technical difficulties.

4. You are to **ensure** that:

   - your laptops, computers and any other devices used for this test is in good functioning order and have uninterrupted power supply and internet connection throughout the duration of the test.
   - you are in a conducive environment throughout the duration of the test.
   - your answers are correctly saved by the end of the test.

5. You are **allowed** to use:

   - a scientific calculator.
   - A blank piece of paper (no larger than A4 size) for rough work. The paper will not be accepted for submission at the end of the test.

6. You are **not allowed** to:

   - leave the test or leave your devices throughout the duration of the test.
   - use the washroom throughout the duration of the test.
   - communicate with any person, either face-to-face or through any communication device, other than the invigilator.
   - refer to any references, e.g. textbooks, resources from a laptop or smart devices etc.
   - share materials (e.g. electronic calculator) during the test.
   - use any communication devices such as mobile phones, tablets, smart watches, headsets during the test.

7. Enter the password provided by the invigilator to start Test paper.

SECTION A (20 MARKS)

Answer **ALL** questions in this section in the spaces provided.

A1. Methanol boils at 65°C and water boils at 100°C. Given that methanol and water are completely miscible with each other, which is the **MOST SUITABLE** method to separate a mixture of these two liquids?

a. Evaporation
b. Crystallisation
c. Fractional distillation
d. Paper chromatography ( )

A2. A stopper was removed from a bottle containing perfume **A** and the time taken for the scent to reach the opposite side of the room was noted. The experiment was repeated using perfume **B**, which had a **LOWER** molecular mass than perfume **A**. Based on the information provided, predict the time taken for perfume **B** to reach the opposite side of the room compared to perfume **A**.

a. Same as perfume **A**.
b. Shorter than perfume **A**.
c. Longer than perfume **A**.
d. Insufficient data to compare the time taken by perfume **A** and **B**. ( )

A3. Two isotopes of carbon are $^{12}_{6}C$ and $^{13}_{6}C$. Which statement about the isotopes is **TRUE**?

a. They have the same number of electrons and neutrons.
b. They have the same number of electrons and protons.
c. They have the same number of neutrons and protons.
d. They have the same number of neucleons and electrons. ( )

A4. A label is missing from a bottle of green solution **C**. In order to identify the solution, two chemical tests are carried out.

Test 1: A few drops of aqueous sodium hydroxide are added to a sample of solution **C**. A green precipitate is formed.

Test 2: Excess aqueous sodium hydroxide and aluminium are added to another sample of solution **C** and heated. A pungent gas, which turns damp red litmus paper blue, is produced.

What is **C**?

a. Iron(II) nitrate
b. Iron(III) nitrate
c. Iron(II) sulfate
d. Iron(III) sulfate ( )

A5. Which statement describes the formation of a covalent bond?

a. Electrons are shared between metallic atoms.
b. Electrons are shared between non-metallic atoms.
c. Electrons are transferred from a metallic atom to a non-metallic atom.
d. Electrons are transferred from a non-metallic atom to a metallic atom.
( )

A6. The electronic configuration of atom **D** is 2, 7. The electronic configuration of atom **E** is 2, 6. What is the formula of the compound formed between atoms **D** and **E**?

a. $\mathbf{D_2E}$
b. $\mathbf{DE_2}$
c. $\mathbf{D_6E}$
d. $\mathbf{DE_7}$ ( )

A7. Manganese(III) sulfate has the formula, $Mn_2(SO_4)_3$. What is the charge on the manganese ion?

a. 2+
b. 3+
c. 2-
d. 3- ( )

A8. Dissolving sodium carbonate in water is an exothermic process. Which row shows the change in temperature of solution and the direction of heat flow when sodium carbonate is dissolved in a beaker of water?

	Temperature of solution	**Direction of heat flow**
a.	Increase	To surrounding
b.	Decrease	To surrounding
c.	Increase	From surrounding
d.	Decrease	From surrounding

( )

A9. In which equation is copper reduced?

I: $CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(g)$
II: $2Cu^{2+}(aq) + 4I^-(aq) \rightarrow 2CuI(s) + I_2(aq)$
III: $CuSO_4(aq) + 2NH_4OH(aq) \rightarrow Cu(OH)_2(s) + (NH_4)_2SO_4(aq)$

a. **I & II**
b. **I & III**
c. **II & III**
d. **I, II & III** ( )

A10. The following reactions are carried out.

Reaction	Result
Ammonium chloride is added to barium hydroxide.	Gas **F** is given off.
Sulfuric acid is added to ammonium carbonate.	Gas **G** is given off.
Hydrochloric acid is added to an aqueous solution of ammonia.	Compound **H** is formed

What are **F**, **G** and **H**?

	Gas F	Gas G	Compound H
a.	Chlorine	Ammonia	Ammonium sulfate
b.	Ammonia	Carbon dioxide	Ammonium sulfate
c.	Carbon dioxide	Ammonia	Ammonium chloride
d.	Ammonia	Carbon dioxide	Ammonium chloride

( )

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

SECTION B (20 MARKS)

Answer **ALL** questions in this section in the spaces provided.

B1. (a) Table 1 describes the properties of compounds. Complete Table 1 by writing True **OR** False in the spaces provided. (2 marks)

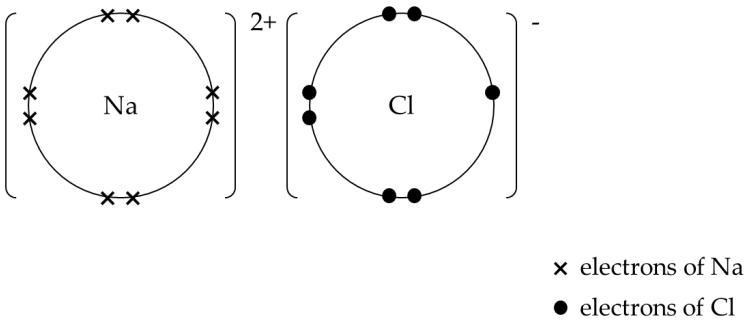
Table 1

Properties of compounds	True / False
A compound has a fixed composition.	True
A compound has a fixed melting/boiling point.	
A compound can only be decomposed by a chemical reaction.	

(b) Sodium chloride and ethene are compounds with different physical and chemical properties. Figures 1 and 2 show the 'dot and cross' diagrams of the outer shell electrons in sodium chloride and ethene. Identify the **TWO** errors in **EACH** figure.

(i) Sodium chloride (2 marks)

Figure 1

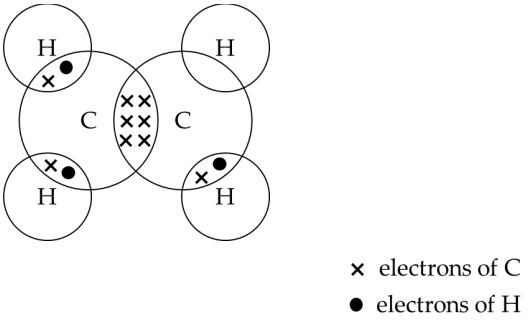


Error 1:

Error 2:

(ii) Ethene (2 marks)

Figure 2



Error 1:

Error 2:

(c) Explain, in terms of structure and bonding, why:

(i) both solid sodium chloride and gaseous ethene do **NOT** conduct electricity. (3 marks)

(ii) molten sodium chloride will conduct electricity. (1 mark)

B2. In thermite welding, iron(III) oxide reacts with aluminium according to the following reaction.

$$Fe_2O_3(s) + 2Al(s) \rightarrow 2Fe(l) + Al_2O_3(s)$$

(a) Fine powders of both iron(III) oxide and aluminium are used in this reaction. State the advantage of using reactants in powder form. (1 mark)

(b) If 9.00 g of iron(III) oxide is reacted with 2.80 g of aluminium, calculate the theoretical yield of molten iron in the reaction. (7 marks)

(c) Determine the percentage yield if 5.23 g of molten iron is obtained from the reaction. (2 marks)

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

Periodic Table

The Periodic Table of the Elements

	Group																	
	I	II									III	IV	V	VI	VII	0
						1 H hydrogen 1										4 He helium 2
	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
4	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
5	85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	– 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
6	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	– Po polonium 84	– At astatine 85	– Rn radon 86
7	– Fr francium 87	– Ra radium 88	– Ac actinium 89 †															

*	140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	– Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
†	232 Th thorium 90	– Pa protactinium 91	238 U uranium 92	– Np neptunium 93	– Pu plutonium 94	– Am americium 95	– Cm curium 96	– Bk berkelium 97	– Cf californium 98	– Es einsteinium 99	– Fm fermium 100	– Md mendelevium 101	– No nobelium 102	– Lr lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

Key: a X b — a = relative atomic mass; X = atomic symbol; b = proton (atomic) number