

EDUZEDCO
233/2 CHEMISTRY
Paper 2
Form 1 End Term Examination

Time: 2 ½ Hours

Name:

Adm No:

School:

Class:

Signature:

Date:

INSTRUCTIONS TO CANDIDATES

- (a) Write your name and index number in the spaces provided at the top of this page.
- (b) Write your school name, sign and write the date of the examination in the spaces provided above.
- (c) This paper consists of **Two** sections: **Section I** and **Section II**.
- (d) Answer **ALL** questions in Section I and any **five questions** from Section II.
- (e) Marks may be given for correct working, relevant points, and clear presentation.
- (f) Non-programmable silent electronic calculators may be used where necessary.
- (h) This paper consists of **8 printed pages**.
- (i) Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.
- (j) Candidates should answer the questions in English.

For Examiner's Use Only

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total

SECTION II

21	22	23	24	25	26	27	Total	Grand Total

SECTION I (50 Marks)

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

1. (a) Define chemistry. (1 mark) (b) Name two branches of chemistry. (2 marks) (3 mks)
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(b) Name two branches of chemistry. (2 marks)
2. The diagram below shows some laboratory apparatus. Study it and answer the questions that follow. [Diagram: A beaker, a measuring cylinder, and a conical flask are shown.] (a) Identify apparatus A, B, and C. (3 marks) (b) State one use of apparatus B. (1 mark) (4 mks)
(a) Identify apparatus A, B, and C. (3 marks)
(b) State one use of apparatus B. (1 mark)
3. Distinguish between a pure substance and a mixture. Give one example of each. (2 marks) (2 mks)
4. Using the kinetic theory of matter, explain why a liquid expands when heated. (3 marks) (3 mks)
5. Define each of the following terms: (i) Element (ii) Compound (iii) Mixture. (3 marks) (3 mks)
(i) Element
(ii) Compound
(iii) Mixture
6. Write the chemical symbols for the following elements: (i) Sodium (ii) Potassium (iii) Calcium. (3 marks) (3 mks)
(i) Sodium
(ii) Potassium
(iii) Calcium

7. State the three subatomic particles in an atom and their charges. (3 marks) (3 mks)
8. What is a period in the periodic table? How many periods are there? (3 marks) (3 mks)
9. State the approximate percentage by volume of oxygen in air. (1 mark) (1 mks)
10. Name three methods used in water treatment to make it safe for drinking. (3 marks) (3 mks)
11. A solution turns blue litmus paper red. Is the solution acidic or basic? (1 mark) (1 mks)
12. Write a word equation for the reaction between magnesium and oxygen. (2 marks) (2 mks)
13. Convert 2500 millilitres to litres. (1 mark) (1 mks)
14. Give two safety precautions that should be observed when heating a liquid in a test tube. (2 marks) (2 mks)

15. Explain why a drop of ink spreads in water. (2 marks) (2 mks)

16. Classify the following substances as either element or compound: (i) Water (3 mks)
(ii) Copper (iii) Carbon dioxide. (3 marks)

(i) Water

(ii) Copper

(iii) Carbon dioxide

17. An atom of chlorine has atomic number 17 and mass number 35. Determine the number of protons, neutrons, and electrons in this atom. (3 marks) (3 mks)

18. Element X is in group I and period 3. Predict its chemical reactivity compared to an element in group II period 3. (2 marks) (2 mks)

19. State two conditions necessary for rusting to occur. (2 marks) (2 mks)

20. Describe a chemical test for water. (2 marks) (2 mks)

SECTION II (50 Marks)

Answer any **five** questions from this section in the spaces provided.

21. The table below shows the pH values of four solutions A, B, C, and D. (8 mks)
- | Solution | pH |
|----------|----|
| A | 2 |
| B | 7 |
| C | 10 |
| D | 5 |
- (a) Classify each solution as acidic, basic, or neutral. (4 marks) (b) Which solution is the strongest acid? (1 mark) (c) What colour would solution C turn red litmus paper? (1 mark) (d) Name the indicator that can be used to test for acidity. (1 mark) (e) Give one use of an acid in everyday life. (1 mark)
- (a) Classify each solution as acidic, basic, or neutral. (4 marks)
- (b) Which solution is the strongest acid? (1 mark)
- (c) What colour would solution C turn red litmus paper? (1 mark)
- (d) Name the indicator that can be used to test for acidity. (1 mark)
- (e) Give one use of an acid in everyday life. (1 mark)
22. (a) Write word equations for the following reactions: (i) Iron + Sulphur $\rightarrow$ Iron(II) sulphide. (1 mark) (ii) Hydrogen + Oxygen $\rightarrow$ Water. (1 mark) (b) Write a balanced chemical equation for the reaction between zinc and hydrochloric acid to produce zinc chloride and hydrogen. (3 marks) (c) State three observable changes that indicate a chemical reaction has taken place. (3 marks) (8 mks)
- (a)(i) Word equation for iron + sulphur (1 mark)
- (a)(ii) Word equation for hydrogen + oxygen (1 mark)
- (b) Balanced equation for zinc + HCl (3 marks)
- (c) Three observable changes indicating chemical reaction (3 marks)
23. An element X has atomic number 12 and mass number 24. (a) Write the electronic configuration of X. (2 marks) (b) Which group and period does X belong to? (2 marks) (c) State the number of valence electrons. (1 mark) (d) Predict whether X is a metal or non-metal. Give a reason. (2 marks) (e) Write the formula of the ion formed by X. (1 mark) (8 mks)
- (a) Electronic configuration (2 marks)

- (b) Group and period (2 marks)
- (c) Number of valence electrons (1 mark)
- (d) Metal or non-metal with reason (2 marks)
- (e) Formula of ion formed (1 mark)

- 24.** The diagram below shows an experiment to determine the percentage of oxygen in air. [Diagram: A candle placed in a trough of water, covered by a gas jar. Water level rises after candle goes out.] (a) Describe what is observed during the experiment. (3 marks) (b) Explain why the water rises in the gas jar. (2 marks) (c) What is the expected percentage decrease in air volume? (1 mark) (d) Name one gas in air that does not support combustion. (1 mark) (e) State one precaution when carrying out this experiment. (1 mark) (8 mks)

- (a) Observations during experiment (3 marks)
- (b) Explanation of water rise (2 marks)
- (c) Expected percentage decrease (1 mark)
- (d) Gas that does not support combustion (1 mark)
- (e) One precaution (1 mark)

- 25.** The diagram below shows the preparation of hydrogen gas in the laboratory. [Diagram: A flask containing zinc granules and dilute hydrochloric acid, connected to a delivery tube going into a trough of water, with a gas jar collecting gas over water.] (a) Identify the chemicals labelled A and B. (2 marks) (b) Write a word equation for the reaction. (1 mark) (c) Explain why hydrogen is collected over water. (2 marks) (d) State two physical properties of hydrogen. (2 marks) (e) Give one use of hydrogen. (1 mark) (8 mks)

- (a) Identify A and B (2 marks)
- (b) Word equation (1 mark)
- (c) Why collected over water (2 marks)
- (d) Two physical properties (2 marks)
- (e) One use (1 mark)

26. (a) What is meant by the term 'separation technique'? (1 mark) (b) Name the suitable method for separating each of the following mixtures: (i) Sand and water. (1 mark) (ii) Ethanol and water. (1 mark) (iii) Salt from a salt solution. (1 mark) (c) Describe how you would separate a mixture of iron filings and sulphur powder. (4 marks) (d) Give one application of fractional distillation in everyday life. (2 marks) (10 mks)

- (a) Definition of separation technique (1 mark)
(b)(i) Sand and water (1 mark)
(b)(ii) Ethanol and water (1 mark)
(b)(iii) Salt from salt solution (1 mark)
(c) Separation of iron filings and sulphur (4 marks)
(d) Application of fractional distillation (2 marks)

27. (a) Explain why chemistry is considered a central science. (2 marks) (b) State three career fields that require knowledge of chemistry. (3 marks) (c) Describe two ways in which chemistry has improved human health. (3 marks) (8 mks)

- (a) Why chemistry is a central science (2 marks)
(b) Three career fields requiring chemistry (3 marks)
(c) Two ways chemistry improved health (3 marks)

233/2 CHEMISTRY MARKING SCHEME

Form 1 Paper 2

SECTION I (50 marks)

1. (a) Define chemistry. (1 mark) (b) Name two branches of chemistry. (2 marks) (3 marks)

Definition of chemistry: study of matter, its composition, structure, properties, and changes it undergoes. (1 mark for any correct definition mentioning matter and its changes) [1]

Naming two branches: e.g., organic chemistry, inorganic chemistry, physical chemistry, analytical chemistry, biochemistry. (1 mark each, any two) [2]

Alternative method/answer:

Definition: Chemistry is the branch of science that deals with the composition, structure, and properties of substances and the reactions they undergo.

Branches: organic, inorganic, physical, analytical, biochemistry (any two)

2. The diagram below shows some laboratory apparatus. Study it and answer the questions that follow. [Diagram: A beaker, a measuring cylinder, and a conical flask are shown.] (a) Identify apparatus A, B, and C. (3 marks) (b) State one use of apparatus B. (1 mark) (4 marks)

A: Beaker (1 mark) [1]

B: Measuring cylinder (1 mark) [1]

C: Conical flask (1 mark) [1]

Use of B: Measuring volume of liquids (1 mark) [1]

Alternative method/answer:

B: Graduated cylinder

Use: To measure accurate volumes of liquids

3. Distinguish between a pure substance and a mixture. Give one example of each. (2 marks) (2 marks)

Pure substance: consists of only one kind of particle, has fixed composition and definite properties. (1 mark) [1]

Mixture: consists of two or more substances physically combined, variable composition, retains properties of components. (1 mark) [1]

Alternative method/answer:

Examples: pure water (pure), salt solution (mixture) – not required for marks but acceptable if given.

4. Using the kinetic theory of matter, explain why a liquid expands when heated. (3 marks) (3 marks)

Particles gain kinetic energy when heated (1 mark) [1]

They move faster and spread further apart (1 mark) [1]

Volume increases, causing expansion (1 mark) [1]

Alternative method/answer:

Accept: particles vibrate more, increase in average distance between particles.

5. Define each of the following terms: (i) Element (ii) Compound (iii) Mixture. (3 marks) (3 marks)

Element: pure substance made of one type of atom, cannot be broken down chemically. (1 mark) [1]

Compound: pure substance made of two or more elements chemically combined in fixed proportions. (1 mark) [1]

Mixture: combination of two or more substances not chemically combined. (1 mark) [1]

Alternative method/answer:

Element: simplest form of matter; Compound: can be decomposed into elements; Mixture: can be separated by physical means.

- 6.** Write the chemical symbols for the following elements: (i) Sodium (ii) Potassium (3 marks)
(iii) Calcium. (3 marks)

(i) Na (1 mark) [1]

(ii) K (1 mark) [1]

(iii) Ca (1 mark) [1]

- 7.** State the three subatomic particles in an atom and their charges. (3 marks) (3 marks)

Proton: positive charge (1 mark) [1]

Neutron: no charge/neutral (1 mark) [1]

Electron: negative charge (1 mark) [1]

Alternative method/answer:

Accept: proton (+1), neutron (0), electron (-1)

- 8.** What is a period in the periodic table? How many periods are there? (3 marks) (3 marks)

A period is a horizontal row in the periodic table (1 mark) [1]

There are seven periods (2 marks for correct number, 1 mark if only number stated without definition) [2]

Alternative method/answer:

Period: elements with same number of electron shells.

- 9.** State the approximate percentage by volume of oxygen in air. (1 mark) (1 marks)

21% (1 mark) [1]

Alternative method/answer:

Accept: about 21%, 21% by volume

- 10.** Name three methods used in water treatment to make it safe for drinking. (3 marks) (3 marks)

Any three methods: filtration, chlorination, boiling, sedimentation, aeration, distillation (1 mark each, max 3) [3]

Alternative method/answer:

Accept: addition of alum, use of ultraviolet light, reverse osmosis

- 11.** A solution turns blue litmus paper red. Is the solution acidic or basic? (1 mark) (1 marks)

Acidic (1 mark) [1]

- 12.** Write a word equation for the reaction between magnesium and oxygen. (2 marks) (2 marks)

Magnesium + Oxygen → Magnesium oxide (2 marks: correct reactants and product, arrow, no balancing required for word equation) [2]

Alternative method/answer:

Accept: Magnesium and oxygen react to form magnesium oxide.

- 13.** Convert 2500 millilitres to litres. (1 mark) (1 marks)

2.5 L (1 mark for correct conversion, accept 2.5 litres) [1]

Alternative method/answer:

Working: $2500 \div 1000 = 2.5$

- 14.** Give two safety precautions that should be observed when heating a liquid in a test tube. (2 marks) (2 marks)

Point test tube away from yourself and others (1 mark) [1]

Wear safety goggles (1 mark) [1]

Alternative method/answer:

Use a test tube holder, heat gently, do not point at anyone, wear lab coat

15. Explain why a drop of ink spreads in water. (2 marks) (2 marks)

Ink particles diffuse through water (1 mark) [1]

They move from high concentration to low concentration (1 mark) [1]

Alternative method/answer:

Accept: particles spread out due to random motion.

16. Classify the following substances as either element or compound: (i) Water (ii) (3 marks)

Copper (iii) Carbon dioxide. (3 marks)

(i) Compound (1 mark) [1]

(ii) Element (1 mark) [1]

(iii) Compound (1 mark) [1]

17. An atom of chlorine has atomic number 17 and mass number 35. Determine the (3 marks)
number of protons, neutrons, and electrons in this atom. (3 marks)

Protons = atomic number = 17 (1 mark) [1]

Electrons = protons = 17 (1 mark) [1]

Neutrons = mass number - atomic number = $35 - 17 = 18$ (1 mark) [1]

Alternative method/answer:

Accept: 17p, 17e, 18n

18. Element X is in group I and period 3. Predict its chemical reactivity compared to (2 marks)
an element in group II period 3. (2 marks)

Element X (Group I) is more reactive than the Group II element (2 marks for correct comparison and reasoning) [2]

Alternative method/answer:

Accept: Group I elements have one valence electron, so they lose it more easily than Group II which have two.

19. State two conditions necessary for rusting to occur. (2 marks) (2 marks)

Oxygen (1 mark) [1]

Water (1 mark) [1]

Alternative method/answer:

Accept: moisture, air (but specify oxygen and water)

20. Describe a chemical test for water. (2 marks) (2 marks)

Add anhydrous copper(II) sulfate (1 mark) [1]

It turns from white to blue if water is present (1 mark) [1]

Alternative method/answer:

Accept: Use cobalt chloride paper, turns from blue to pink.

SECTION II (50 marks)

21. The table below shows the pH values of four solutions A, B, C, and D. | Solution | (8 marks)
pH | |-----|----| A | 2 | B | 7 | C | 10 | D | 5 | (a) Classify each solution as acidic,
basic, or neutral. (4 marks) (b) Which solution is the strongest acid? (1 mark) (c) What
colour would solution C turn red litmus paper? (1 mark) (d) Name the indicator that
can be used to test for acidity. (1 mark) (e) Give one use of an acid in everyday life. (1
mark)

(a) A: acidic (1 mark), B: neutral (1 mark), C: basic (1 mark), D: acidic (1 mark) [4 marks] [4]

(b) A (1 mark) – lowest pH [1]

(c) Blue (1 mark) – red litmus turns blue in basic solution [1]

(d) Litmus paper (1 mark) – accept universal indicator, phenolphthalein, methyl orange [1]

(e) Any valid use: e.g., lemon juice in cooking, battery acid, cleaning (1 mark) [1]

Alternative method/answer:

(a) Accept: A acidic, B neutral, C alkaline/basic, D acidic

(d) Accept: indicator solution, pH paper

22. (a) Write word equations for the following reactions: (i) Iron + Sulphur → Iron(II) sulphide. (1 mark) (ii) Hydrogen + Oxygen → Water. (1 mark) (b) Write a balanced chemical equation for the reaction between zinc and hydrochloric acid to produce zinc chloride and hydrogen. (3 marks) (c) State three observable changes that indicate a chemical reaction has taken place. (3 marks)

(a)(i) Iron + Sulphur → Iron(II) sulphide (1 mark for correct word equation) [1]

(a)(ii) Hydrogen + Oxygen → Water (1 mark for correct word equation) [1]

(b) $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$ (3 marks: correct reactants and products 1 mark, balancing 1 mark, state symbols not required but accept if given) [3]

(c) Any three: colour change, gas evolution, temperature change, precipitate formation, odour change (1 mark each, max 3) [3]

Alternative method/answer:

(b) Accept: $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2\uparrow$

(c) Accept: effervescence, heat given out, solid disappears

23. An element X has atomic number 12 and mass number 24. (a) Write the electronic configuration of X. (2 marks) (b) Which group and period does X belong to? (2 marks) (c) State the number of valence electrons. (1 mark) (d) Predict whether X is a metal or non-metal. Give a reason. (2 marks) (e) Write the formula of the ion formed by X. (1 mark)

(a) Electronic configuration: 2.8.2 (2 marks: correct number of electrons in each shell, 1 mark for correct total but wrong distribution) [2]

(b) Group II (1 mark), Period 3 (1 mark) [2 marks] [2]

(c) 2 valence electrons (1 mark) [1]

(d) Metal (1 mark) because it has few valence electrons and tends to lose them (1 mark) [2 marks] [2]

(e) Mg^{2+} (1 mark) – accept Mg^{+2} [1]

Alternative method/answer:

(a) Accept: 2,8,2

(d) Accept: metal because it is in group II and period 3, or because it is a good conductor of electricity

24. The diagram below shows an experiment to determine the percentage of oxygen in air. [Diagram: A candle placed in a trough of water, covered by a gas jar. Water level rises after candle goes out.] (a) Describe what is observed during the experiment. (3 marks) (b) Explain why the water rises in the gas jar. (2 marks) (c) What is the expected percentage decrease in air volume? (1 mark) (d) Name one gas in air that does not support combustion. (1 mark) (e) State one precaution when carrying out this experiment. (1 mark)

(a) Observations: candle burns for some time then goes out (1 mark), water rises inside the gas jar (1 mark), water level rises to about 1/5 of jar (1 mark) [3 marks] [3]

(b) Oxygen is used up during combustion (1 mark), pressure inside decreases, so water rises (1 mark) [2 marks] [2]

(c) About 21% (1 mark) – accept 20% or 1/5 [1]

(d) Nitrogen (1 mark) – accept carbon dioxide, noble gases [1]

(e) Ensure the gas jar is airtight (1 mark) – accept: use a fresh candle, allow time for cooling [1]

Alternative method/answer:

(a) Accept: candle flame extinguishes, water level rises

(b) Accept: oxygen is consumed, creating a partial vacuum

25. The diagram below shows the preparation of hydrogen gas in the laboratory. (8 marks)

[Diagram: A flask containing zinc granules and dilute hydrochloric acid, connected to a delivery tube going into a trough of water, with a gas jar collecting gas over water.]

(a) Identify the chemicals labelled A and B. (2 marks) (b) Write a word equation for the reaction. (1 mark) (c) Explain why hydrogen is collected over water. (2 marks) (d) State two physical properties of hydrogen. (2 marks) (e) Give one use of hydrogen. (1 mark)

(a) A: Zinc granules (1 mark), B: Dilute hydrochloric acid (1 mark) [2 marks] [2]

(b) $\text{Zinc} + \text{Hydrochloric acid} \rightarrow \text{Zinc chloride} + \text{Hydrogen}$ (1 mark for correct word equation) [1]

(c) Hydrogen is insoluble in water (1 mark) and does not react with water (1 mark) [2 marks] [2]

(d) Any two: colourless, odourless, lighter than air, insoluble in water (1 mark each, max 2) [2]

(e) Any one: used as fuel, in hydrogenation of oils, in weather balloons (1 mark) [1]

Alternative method/answer:

(a) Accept: A: zinc metal, B: hydrochloric acid

(c) Accept: hydrogen is less dense than air and does not dissolve in water

26. (a) What is meant by the term 'separation technique'? (1 mark) (b) Name the (10 marks)

suitable method for separating each of the following mixtures: (i) Sand and water. (1

mark) (ii) Ethanol and water. (1 mark) (iii) Salt from a salt solution. (1 mark) (c)

Describe how you would separate a mixture of iron filings and sulphur powder. (4

marks) (d) Give one application of fractional distillation in everyday life. (2 marks)

(a) A method used to separate the components of a mixture (1 mark for correct definition) [1]

(b)(i) Filtration (1 mark) [1]

(b)(ii) Fractional distillation (1 mark) – accept distillation if specified for ethanol-water [1]

(b)(iii) Evaporation (1 mark) – accept crystallisation [1]

(c) Use a magnet to attract the iron filings (2 marks), the sulphur remains (2 marks) [4 marks] [4]

(d) Any one: separation of crude oil into fractions, production of alcoholic beverages, purification of air (2 marks for clear application) [2]

Alternative method/answer:

(b)(ii) Accept: distillation (if they specify fractional, accept; simple distillation not effective but may be accepted at Form 1 level)

(c) Accept: add carbon disulfide to dissolve sulphur, then filter; but magnet method is simpler.

(d) Accept: obtaining pure water from sea water, separating nitrogen and oxygen from air

27. (a) Explain why chemistry is considered a central science. (2 marks) (b) State three (8 marks)

career fields that require knowledge of chemistry. (3 marks) (c) Describe two ways in

which chemistry has improved human health. (3 marks)

(a) Chemistry connects to other sciences like biology and physics (1 mark), it helps understand matter and its interactions (1 mark) [2 marks] [2]

(b) Any three: medicine, pharmacy, agriculture, chemical engineering, food science, environmental science (1 mark each, max 3) [3]

(c) Development of medicines and vaccines (1.5 marks), production of disinfectants and antiseptics (1.5 marks) [3 marks] [3]

Alternative method/answer:

(a) Accept: chemistry is the central science because it overlaps with other disciplines.

(c) Accept: improved sanitation through water treatment, development of fertilizers to increase food production