



NYANDO MIXED SECONDARY SCHOOL

233/1 CHEMISTRY

Paper 1

Form 3 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 as instructed in each section.
- (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 **5 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	Total

SECTION II

13	14	15	16	17	18	19	20	Total	Grand Total

SECTION I (50 Marks)

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

1.

(3 mks)

(a) Name the apparatus used for measuring exact volumes of liquids in titration. (1 mark)

(b) State the function of a desiccator. (1 mark)

(c) The diagram below shows a piece of laboratory apparatus. Name it and give one use. (1 mark)

2.

(3 mks)

(a) Define an element. (1 mark)

(b) Classify each of the following substances as an element, a mixture or a compound: salt solution; oxygen gas; sodium chloride. (1 mark)

(c) Give one reason why air is a mixture and not a compound. (1 mark)

3.

(3 mks)

(a) State the colour of litmus paper in an acidic solution. (1 mark)

(b) Describe what happens when dilute hydrochloric acid is added to zinc granules. Write a word equation for the reaction. (2 marks)

4.

(3 mks)

(a) State the percentage of oxygen in air. (1 mark)

(b) The diagram below shows an experiment that can be used to determine the percentage of oxygen in air. Describe how the experiment is carried out and state the expected observation. (2 marks)

5.

(3 mks)

(a) Describe the reaction of sodium with cold water. State the observations made and write the balanced chemical equation. (2 marks)

(b) Name the gas produced and state how it is tested. (1 mark)

6.

(4 mks)

(a) The atomic number of element X is 17 and its mass number is 35. Determine the number of protons, neutrons and electrons in a neutral atom of X. (2 marks)

(b) Define isotope. Chlorine has two isotopes, chlorine-35 and chlorine-37, with abundances 75% and 25% respectively. Calculate the relative atomic mass of chlorine. (2 marks)

7.

(3 mks)

(a) State the trend in atomic radius across a period from left to right. (1 mark)

(b) Explain the trend in metallic character down a group. (1 mark)

(c) Elements A, B, C and D have atomic numbers 9, 10, 11 and 17 respectively. Which one is the most reactive non-metal? Give a reason. (1 mark)

8.

(4 mks)

(a) Draw a diagram to show the bonding in sodium chloride. Use dots and crosses for electrons and indicate the charges on the ions formed. (2 marks)

(b) Explain why solid sodium chloride does not conduct electricity but molten sodium chloride does. (2 marks)

9.

(4 mks)

(a) State Boyle's law. (2 marks)

(b) A gas occupies a volume of 250 cm^3 at a pressure of 80 kPa . Calculate its volume when the pressure is increased to 100 kPa at constant temperature. (2 marks)

10.

(3 mks)

(a) State one physical property of sulfur dioxide. (1 mark)

(b) The diagram below shows the laboratory preparation of a gas from sodium sulfite. Use the diagram to describe how sulfur dioxide is prepared in the laboratory. Write the chemical equation for the reaction. (2 marks)

11.

(2 mks)

(a) Write an equation for the reaction of chlorine with water. (1 mark)

(b) State one use of chlorine in water treatment. (1 mark)

12. (a) Draw a labelled diagram of the apparatus used to electrolyse molten lead(II)

(3 mks)



233/1 CHEMISTRY MARKING SCHEME

Form 3 Paper 1

SECTION I (50 marks)

1. (3 marks)

- (a) Burette (B1) (1)
- (b) A desiccator is used for keeping substances dry / removing moisture (B1) (1)
- (c) Crucible; used for heating solids strongly / ignition (B1) (1)

Alt:

— For (c), accept 'crucible and lid' as the name; accept 'used for heating small quantities of solids to high temperature' or 'used in determining mass of residue after heating' as the use.
— For (a), accept 'burette' with any reasonable spelling that does not change the apparatus.

2. (3 marks)

- (a) An element is a pure substance that cannot be split into simpler substances by chemical means (B1) (1)
- (b) Salt solution – mixture; oxygen gas – element; sodium chloride – compound (B1) (1)
- (c) Air has no fixed formula / variable composition / its components can be separated by physical means (any one) (B1) (1)

Alt:

— Accept 'air is not formed by a chemical reaction' or 'constituents of air retain their individual properties'.
— Award the mark for (b) only if all three classifications are correct.

3. (3 marks)

- (a) Blue litmus paper turns red / red litmus paper remains red (B1) (1)
- (b)i Effervescence / bubbles of gas; zinc granules dissolve; a colourless solution is formed (B1) (1)
- (b)ii zinc + hydrochloric acid $\rightarrow$ zinc chloride + hydrogen (B1) (1)

Alt:

— Accept the balanced symbol equation: $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$, but the word equation is expected.

4. (3 marks)

- (a) About 21% / one-fifth by volume (B1) (1)
- (b)i Measure the initial volume of air in the graduated tube containing moist iron filings; leave the apparatus for several days, then measure the final volume (B1) (1)
- (b)ii Expected observation: water level rises by about one-fifth of the original volume and iron filings rust / turn reddish-brown (B1) (1)

Alt:

- Accept 'the iron filings absorb/use up oxygen' as part of the description.
- Accept 'about 20%' for the percentage of oxygen.

5. (3 marks)

- (a)i Sodium floats, melts into a silvery ball, darts/moves on the water surface with fizzing; a lilac flame may be seen (B1) (1)
- (a)ii $2\text{Na(s)} + 2\text{H}_2\text{O(l)} \rightarrow 2\text{NaOH(aq)} + \text{H}_2\text{(g)}$ (B1) (1)
- (b) Hydrogen; it is tested by a burning splint – a pop sound confirms the gas (B1) (1)

Alt:

- Accept 'the solution turns red litmus blue / is alkaline' as an additional observation but no extra mark.
- Accept 'a lighted splint is extinguished with a pop' for the test for hydrogen.

6. (4 marks)

- (a) Protons = 17; electrons = 17 (B1) (1)
- (a) Neutrons = mass number – atomic number = $35 - 17 = 18$ (B1) (1)
- (b) Isotopes are atoms of the same element with the same number of protons but different numbers of neutrons (B1) (1)
- (b) R.A.M = $(35 \times 75 + 37 \times 25) / 100 = (2625 + 925) / 100 = 35.5$ (M1/A1) (1)

Alt:

- Accept 'isotopes have the same atomic number but different mass numbers'.
- For the calculation, accept the weighted-average method shown correctly with final answer 35.5.

7. (3 marks)

- (a) Atomic radius decreases from left to right across a period (B1) (1)
- (b) Metallic character increases down a group because atomic size increases, so outer electrons are lost more easily (B1) (1)
- (c) Element A (fluorine, atomic number 9); it has the smallest atomic radius / highest electronegativity among the non-metals, so it gains an electron most readily (B1) (1)

Alt:

- Accept 'fluorine' for Element A without giving the name if the symbol F is clearly shown.
- Accept 'increases down the group because ionisation energy decreases' as the explanation.

8. (4 marks)

- (a) Sodium atom (2.8.1) loses one electron to form Na^+ ; chlorine atom (2.8.7) gains one electron to form Cl^- (B1) (1)
- (a) Correct dot-and-cross diagram showing electron transfer and charges Na^+ and Cl^- (B1) (1)

■ (b) Solid sodium chloride does not conduct because its ions are fixed in the lattice and cannot move (B1) (1)

■ (b) Molten sodium chloride conducts because the lattice is broken and the ions become free/mobile to carry charge (B1) (1)

Alt:

— Accept 'carbon/platinum electrodes'? No, this question is about bonding, not electrolysis. Diagrams may use circles with dots/crosses; charges must be shown.

9. (4 marks)

■ (a) Boyle's law: for a fixed mass of gas at constant temperature, the volume is inversely proportional to pressure / $PV = \text{constant}$ (B2) (2)

■ (b) $P_1V_1 = P_2V_2$: $80 \times 250 = 100 \times V_2$ (M1) (1)

■ (b) $V_2 = (80 \times 250) / 100 = 200 \text{ cm}^3$ (A1) (1)

Alt:

— Award B2 if the law is correctly stated but no equation is written.

— Accept 200 cm^3 without working only if the final answer is correct; otherwise award M1 for correct substitution.

10. (3 marks)

■ (a) Sulphur dioxide is a colourless gas with a pungent/choking smell; denser than air; soluble in water (any one) (B1) (1)

■ (b)i Add dilute sulphuric acid to sodium sulphite in a flask; collect the gas by upward delivery because it is denser than air (B1) (1)

■ (b)ii $\text{Na}_2\text{SO}_3(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{Na}_2\text{SO}_4(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{SO}_2(\text{g})$ (B1) (1)

Alt:

— Accept the ionic equation: $\text{SO}_3^{2-} + 2\text{H}^+ \rightarrow \text{SO}_2 + \text{H}_2\text{O}$, but the full equation is expected at Form 3.

— Accept 'sodium sulphite' spelling as sodium sulfite.

11. (2 marks)

■ (a) $\text{Cl}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{HCl}(\text{aq}) + \text{HOCl}(\text{aq})$ (B1) (1)

■ (b) To kill bacteria / disinfect / purify drinking water (B1) (1)

Alt:

— Accept HClO instead of HOCl .

— Accept 'to kill germs' for the use.

12. (a) Draw a labelled diagram of the apparatus used to electrolyse molten lead(II) bromide (3 marks)

■ Diagram shows a crucible/porcelain vessel containing molten lead(II) bromide (B1) (1)

■ Two inert electrodes (carbon/platinum) dip into the molten electrolyte and are connected to a battery (B1) (1)

■ Correct labels: battery, electrodes, molten lead(II) bromide, crucible (B1) (1)

Alt:

- Accept electrodes labelled anode and cathode, with anode connected to the positive terminal and cathode to the negative terminal.
- If the diagram is unlabelled, award at most 1 mark for the apparatus shape.

