

THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

032/1

CHEMISTRY 1
(For School Candidates Only)

TIME: 3 Hours

Tuesday, 6th October 2009 p.m.

Instructions

1. This paper consists of sections A, B and C.
2. Answer **all** questions in sections A and B, and **two (2)** questions from section C.
3. Electronic calculators and cellular phones are **not** allowed in the examination room.
4. Write your **Examination Number** on every page of your answer booklet(s).
5. The following constants may be used:

Atomic masses: H = 1, C = 12, O = 16, Na = 23, S = 32, Ca = 40, Cu = 63.5.

Avogadro's Number = 6.02×10^{23} .

GMV at s.t.p. = 22.4 dm^3 .

1 Faraday = 96,500 coulombs.

Standard pressure = 760 mm Hg.

Standard temperature = 273 K.

1 litre = $1 \text{ dm}^3 = 1000 \text{ cm}^3$.

This paper consists of 8 printed pages.

SECTION A (20 Marks)

Answer all questions in this section.

1. For each of the items (i) – (x) choose the correct answer among the given alternatives and write its letter beside the item number in the answer booklet(s) provided.

(i) Consider the following:

P has 4 protons, 4 neutrons and 4 electrons. Q has 4 protons, 5 neutrons and 4 electrons. Which of the following statement is true about P and Q?

- A They have the same chemical properties but different mass number
- B They have different chemical and physical properties
- C They all have the same atomic weight
- D They have the same chemical properties but different atomic number
- E They all have the same physical and chemical properties.

(ii) The following set of laboratory equipments, consists of volume measuring items:

- A Beaker, balance, measuring cylinder
- B Burette, pipette, thermometer
- C Burette, pipette, measuring cylinder
- D Cylinder can, balance, volumetric flask
- E Spatula, funnel, conical flask.

(iii) An anhydrous salt X (relative molecular mass = 106) will combine with water to form hydrated salt $X \cdot yH_2O$. It is found that 21.2g of X combine with 36g of water. What is the value of y in the hydrated salt?

- A 2
- B 5
- C 8
- D 10
- E 12.

(iv) Which of the following is true about ionic compounds?

- A They are easily vapourized
- B They easily dissolve in organic solvents
- C They are electronically neutral
- D They are all poor conductors of electricity
- E They form covalent bonds with transition cations.

(v) Precipitation can be represented by the following equation:

- A $H^+_{(aq)} + OH^-_{(aq)} \longrightarrow H_2O_{(l)}$
- B $ROH + R'COOH \longrightarrow R'COOR + H_2O$
- C $Ba^{2+}_{(aq)} + SO_4^{2-}_{(aq)} \longrightarrow BaSO_{4(s)}$
- D $Na^+_{(aq)} + Cl^-_{(aq)} \longrightarrow NaCl_{(aq)}$
- E $2KClO_{3(s)} \xrightarrow{MnO_2} 2KCl_{(s)} + 3O_{2(g)}$

(vi) Which group of organic compounds are prepared by the dehydration of the corresponding alcohol?

- A Alkynes
- B Alkenes
- C Alkanes
- D Esters
- E Carboxylic acids.

(vii) Insoluble salts like barium sulphate, generally can be obtained in the laboratory by

- A evaporation of its concentrated solution
- B crystallization
- C precipitation
- D decomposition
- E decrepitation.

(viii) A mixture of a liquid and insoluble powder which has not settled down is called a

- A solute
- B suspension
- C solvent
- D condensate
- E residue.

(xi) The same current passing through solutions of the same concentrations, of silver nitrate and copper sulphate, liberates 0.23 g of silver (equivalent weight = 108). The weight of copper (equivalent weight = 31.8) that will be liberated will be

- A 31.8 g
- B 0.0677 g
- C 0.23 g
- D 0.033 g
- E 3.180 g.

(x) Which of the following metals is most ductile?

- A Aluminium
- B Silver
- C Copper
- D Tin
- E Mercury.

2. Match the items in List A with the responses in List B by writing the letter of the correct response beside the item number.

List A	List B
(i) Boiling	A Burning of coal
(ii) Hard water	B Artificial fertilizer
(iii) Water pollution	C Macromutrients
(iv) Chlorofluorocarbons	D Removes temporary hardness of water
(v) Mg and S	E Air pollution
(vi) Urea	F Managing the loss of plants nutrients from the soil
(vii) Top dressing	G Untreated sewage
(viii) Recycling of solid materials	H Micronutrients
(ix) Crop rotation	I Preventing terrestrial pollution
(x) $C_7H_{16(l)} + 11O_{2(g)} \rightarrow 7CO_{2(g)} + 8H_2O_{(l)}$	J Has pleasant taste due to the dissolved compounds
	K Fertilizer application method
	L Burning of petrol
	M Removes permanent hardness of water
	N Less soap is used for washing
	O Has sour taste due to the presence of dissolved acid
	P Process of obtaining clean and safe water
	Q Manures

SECTION B (60 Marks)

Answer all questions in this section.

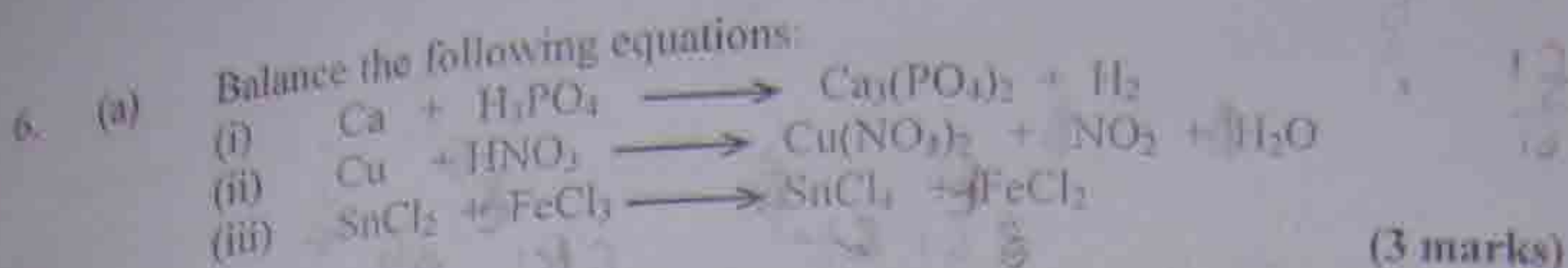
3. (a) Why doesn't water have any effect on litmus paper? (2 marks)
- (b) (i) What would happen to a well stopper bottle full of water left in a deep freezer over night? Why does this happen?
 (ii) Why isn't iron usually recommended in the construction of steam pipes and boilers? Explain. (4 marks)
- (c) (i) Name two ions which cause temporary hardness of water and two ions which cause permanent hardness.
 (ii) Give equations for two ways to remove temporary hardness of water and one way to remove permanent hardness. (4 marks)
4. (a) 0.02 moles of electrons were passed through a solution of sodium hydroxide using platinum electrodes.
 (i) Give the names of the gases evolved at each electrode.
 (ii) Write ionic equations of the reaction taking place at the electrodes.
 (iii) Calculate the number of moles of each gas produced and the volume which each gas would occupy at S.T.P. (6 marks)
- (b) What mass of copper will be liberated during electrolysis of copper sulphate solution by a charge of one faraday? (1 mark)
- (c) An element X has a relative atomic mass of 88. When a current of 0.5A was passed through the fused chloride of X for 32 minutes 10 seconds, 0.44g of X was deposited at the cathode.
 (i) Calculate the number of faradays needed to liberate 1 mole of X.
 (ii) Write the formula for the X ion.
 (iii) Write the formula for hydroxide of X. (3 marks)
5. (a) How can the rates of chemical reactions be increased? Describe at least four factors. (4 marks)
- (b) Study the following reaction equation:

$$\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)} \quad \Delta H = -46.2 \text{ kJmol}^{-1}$$
 Using the Le Chatelier's principle, suggest how you would use temperature and pressure to obtain the highest production of ammonia at equilibrium. (4 marks)
- (c) The formation of methanol from hydrogen and carbon monoxide can be represented by

$$\text{CO}_{(g)} + 2\text{H}_{2(g)} \rightleftharpoons \text{CH}_3\text{OH}_{(l)} \quad \Delta H = 91 \text{ kJmol}^{-1}$$
 What mass of hydrogen would react to cause a heat change of 91kJ? (2 marks)

32
 202
 202

202



(b) Suggest one best method for separating each of the following mixtures:

(i) Sodium chloride and water

(ii) Iodine and sand

(iii) Alcohol and water (3 marks)

(c) When water and kerosene are mixed in the same container, which one forms the upper layer? Give reasons. (4 marks)

7. (a) Describe the effect of

(i) strongly heating a piece of marble in a Bunsen burner flame

(ii) moistening the residue from (i) above with water. (4 marks)

(b) (i) For what reason is slaked lime added to the soil in the gardening?

(ii) Why is concentrated sulphuric acid used as a drying agent? (4 marks)

(c) Why is zinc used as a coat for iron and not vice versa? (2 marks)

8. Table 1 shows a part of periodic table with atomic numbers from 3 to 18. Some elements are shown by letters but the letters are not the true symbols of the elements. Study it, then answer the questions that follow.

Table 1

3 K	4 b	5 bo	6 c	7 N	8 L	9 f	10 MN
11 N	12 O	13 ou	14 P	15 p	16 sa	17 Q	18

(a) Among the elements lettered K to Q, which one

(i) is a halogen

(ii) is a noble gas

(iii) would react most readily with chlorine? (3 marks)

(b) Give the formula of the following:

(i) Hydride of P

(ii) Oxide of O (4 marks)

(c) Indicate whether the bonding in the oxide of O and P will be ionic or covalent. Give reasons for your answer. (3 marks)



SECTION C (20 Marks)

Answer two (2) questions from this section.

9. (a) State the following laws:
(i) Boyle's law
(ii) Charles's law (3 marks)
- (b) A volume of 840cm^3 of gas was collected at 546°C and 2 atmospheric pressure. What would be the volume at S.T.P? (3 marks)
- (c) If the gas in (b) above was collected from the complete thermal decomposition of calcium carbonate:
(i) what is the name of the gas?
(ii) what mass of calcium carbonate produced this amount of gas? (4 marks)
10. (a) Briefly explain each of the following:
(i) Soil pH
(ii) Basic soil
(iii) Terracing (3 marks)
- (b) The weight of a fresh soil sample from a school farm was 55gm. The sample was dried in an oven at 200°C , cooled in a desiccators and reweighed. The weight of the sample, after cooling to constant weight was 46 gm. What was the percentage of water in the soil sample? (5 marks)
- (c) (i) List at least two chemical substances used to neutralize soil acid.
(ii) Why do we classify nitrogen as a macronutrient in regarding plants' nutrients? (2 marks)
11. The preparation of ammonia in the laboratory is done by heating a mixture of ammonium chloride and sodium hydroxide.
- (a) (i) Write a balanced chemical equation for the above reaction.
(ii) Using balanced chemical equations, state how ammonia reacts with hydrogen chloride gas and heated copper (II) oxide. (4 marks)
- (b) (i) State two uses of ammonia.
(ii) Name the catalyst used in the preparation of ammonia. (2 marks)
- (c) Explain each of the following reactions, giving observations and equations.
(i) Aqueous ammonia is added to iron (III) chloride, little by little, until excess.
(ii) Sodium nitrate is strongly heated. (4 marks)

12. (a) Define the following terms:
- (i) standard solution
 - (ii) equivalent point of titration
 - (iii) basicity of an acid

(3 marks)

- (b) 25cm^3 of a solution containing 0.196g of a metal hydroxide YOH, were neutralized by 35cm^3 of a 0.1M hydrochloric acid solution.

- (i) Write down a balanced chemical equation for the reaction.
- (ii) Calculate the molarity of the hydroxide solution.
- (iii) Calculate the relative molecular mass of YOH.

(6 marks)

- (c) Name the indicator you would choose for the following titrations:

- (i) hydrochloric acid versus ammonia solution
- (ii) acetic acid versus sodium hydroxide

(1 mark)