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

032/1 **CHEMISTRY 1**
(For Both School and Private Candidates)

TIME: 3 Hours **2006/10/10 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. All questions carry equal marks.
4. Cellular phones are **not** allowed in the examination room.
5. Electronic calculators are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).
7. In your calculations you may use the following constants:

Atomic masses:
H = 1, C = 12, O = 16, Na = 23, N =14,
Mg = 24, S = 32, Ca = 40, Ar = 40, K = 39.

Avogadro's constant	=	6.02×10^{23}.
G.M.V. at s.t.p.	=	22.4 dm^3.
1 Faraday	=	96500 Coulombs.
	=	
Standard temperature	=	273 K.
Standard pressure	=	760 mmHg.
1 Litre = I dm^3	=	1000cm^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 from among the given alternatives and write its letter beside the item number.

(i) Addition of sulphate of ammonia to the soil corrects the deficiency of
- A oxygen and nitrogen
- B nitrogen and hydrogen
- C nitrogen and sulphur
- D sulphur and oxygen
- E sulphur and hydrogen.

(ii) When substances A and B react to form a new substance C the reactants A and B are said to
- A undergo a chemical change
- B form a solution C
- C undergo a physical change
- D form a mixture
- E undergo dissociation.

(iii) When an alcohol reacts with a carboxylic acid they form an organic compound called
- A an alkyne
- B an ester
- C a haloalkane
- D an alkene
- E an alkane.

(iv) The reaction between iodine and hydrogen is represented by the equation

$I_2 + H_2 \rightleftharpoons 2HI \quad \Delta H = -x \text{ kJmol}^{-1}$.

This shows that the reaction is
- A an endothermic reaction
- B a replacement reaction
- C a neutralization reaction
- D a thermal decomposition reaction
- E an exothermic reaction.

(v) A molar solution was found to have a pH of 5. The most correct explanation about the solution is this, the solution is
- A a base
- B neutral
- C a very strong base
- D an acid
- E a very weak base.

(vi) A solution of sodium carbonate was prepared in order to get a 2 M solution. 200 cm^3 of this solution was used in a titration experiment. The number of mole(s) present in 200 cm^3 of 2 M solution used in the titration will be
- A 4.0
- B 0.04
- C 0.45
- D 0.045
- E 0.40.

(vii) The net ionic equation for the reaction between ammonium chloride and sodium hydroxide solution on warming is

A $H^+ + OH^- \rightarrow H_2O$

B $NH_4^+ + OH^- \rightarrow NH_3 + H_2O$

C $Na^+ + Cl^- \rightarrow NaCl$

D $2NH_4^+ + 2Cl^- \rightarrow 2NH_3 + Cl_2 + H_2$

E $NH_3 + H_2O \rightarrow NH_4OH$.

(viii) Alkynes are organic compounds whose homologous series has a general molecular formula of

A $C_n H_{2n}$

B $C_n H_{(2n+2)}$

C $C_n H_{(2n-2)}$

D $C_n H_{(2n+1)}$

E $C_n H(n+2)$.

(ix) When chlorine gas is passed though a green solution of iron (II) chloride, it changes its colour from green to yellowish brown because

A Fe^{2+} ions were oxidized to Fe^{3+}

B Fe^{3+} ions were reduced to Fe^{2+}

C Fe^{2+} ions were reduced to Fe^{3+}

D Fe^{3+} ions were oxidized to Fe^{2+}

E Fe^{2+} ions were reduced to Fe.

(x) An element with atomic number l0 is likely to have chemical properties which are similar to the properties of an element whose atomic number is

A 9

B 16

C 20

D 22

E 18.

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

(i) Chain reaction between methane and chlorine gas

(ii) Favoured by lowering of temperature

(iii) Crystallization

(iv) Acid rain

(v) Carbon monoxide

(vi) Chlorine gas

(vii) Suspension

(viii) Immiscible liquids

(ix) Slaked lime

(x) Class C fire

LIST B

A	Heterogeneous mixture
B	Homogenous mixture
C	Burning material in a liquefied gas state
D	Burning material in charcoal
E	Alcohol and water
F	Kerosene and water
G	Takes place in presence of diffused sunlight
H	Takes place in presence of sunlight as well as in darkness
I	A process of changing liquid to solid by evaporation process
J	$N_2(g) + 3H_2(g) \longrightarrow 2NH_3$ DH = – x kJ/mol
K	$NH_4Cl + H_20 \longrightarrow NH_4^+ + Cl^-$ DH = XkJ/mol
L	Turns yellow potassium dichromate paper geen
M	Calcium hydroxide
N	Bleaches moist litmus paper
O	A pair of electrons remains unshared in covalent compounds
P	A pair of electrons which are not equally shared in a covalent bond
Q	Chemical change
R	Caused by the presence of dissolved CO_2 and SO_2
S	An oxidizing agent in the production of iron
T	A reducing agent in the production of iron.

SECTION B (60 marks)

Answer **all** questions in this section.

3. (a) State whether each of the following processes involves a chemical or physical change.
   - (i) Paper burning.
   - (ii) Glass breaking.
   - (iii) Changing liquid to solid.
   - (iv) Rusting of iron. **(02 marks)**

   (b) Ethyl alcohol, which is present in many beverages has a molecular formula C_2H_6O. If 9.2 g of ethyl alcohol are available, calculate the
   - (i) number of molecules of ethyl alcohol in 9.2 g of ethyl alcohol.
   - (ii) percentage by weight of oxygen in 9.2 g of ethyl alcohol. **(06 marks)**

   (c) Give the meaning of the following terms:
   - (i) An element.
   - (ii) A compound. **(02 marks)**

4. (a) T and K are elements found in the periodic table. The atomic number of T is 16 and that of K is 19.
   - (i) In which group and period of the periodic table does element T appear?
   - (ii) Is element T a metal or non-metal?
   - (iii) Write the molecular formula of a compound formed between T and K. **(04 marks)**

   (b) (i) Which particles are atoms of the same element in the list of the particles given below:

   $^{40}_{18}A$; $^{38}_{20}B$; $^{38}_{18}C$ and $^{19}_{18}D$?

   (ii) Give the electronic configuration of sodium and neon if the atomic number of sodium is 11 and that of neon is 10.

   (iii) Why can't neon react with sodium? **(03 marks)**

   (c) Give **three (3)** differences of physical properties of a metal and a non-metal. **(03 marks)**

5. (a) Explain briefly the following observations with the help of equations.

(i) White anhydrous copper (II) sulphate changes its colour to blue when water is added.

(ii) Vigorous reaction takes place when a small piece of sodium metal is placed in water.

(iii) Addition of zinc metal into a solution of copper (II) sulphate results into decolourisation of the solution and deposition of a brown solid substance. **(06 marks)**

(b) Define the following terms and give **one (1)** example in each case.

(i) Weak acid.

(ii) Acidic salt. **(01 mark)**

(c) Write ionic net equations for the following reactions:

(i) Barium chloride when reacting with sodium sulphate.

(ii) Sodium hydroxide when neutralizing hydrochloric acid.

(iii) Calcium metal when reacting with dilute hydrochloric acid. **(03 marks)**

6. (a) Group the following plant nutrients into macro-nutrients and micro-nutrients:
S, Zn, Mo, N, Cl, P, Co K and Ca. **(04 marks)**

(b) Give one function of each of the following essential plant nutrients:

(i) N.

(ii) P.

(iii) Zn. **(03 marks)**

(c) A certain soil requires 40 kg of nitrogen per hectre in order to fulfil the plant requirement of nitrogen. Calculate in kg the quantity of ammonium sulphate $((NH_4)_2 SO_4)$ fertilizer required to meet the demand. **(03 marks)**

7. (a) State Faraday's **(02 marks)**

(i) first law of electrolysis.

(ii) second law of electrolysis.

(b) Explain the meaning of **(02 marks)**

(i) electrolysis.

(ii) electroplating.

(c) (i) Write chemical equations for the discharging process at the anode and cathode when dilute sulphuric acid is electrolysed by using platinum electrodes.

(ii) 0.2 Faraday of electricity was passed through a solution of copper sulphate, calculate the mass of copper deposited. **(06 marks)**

8. (a) Define the following:

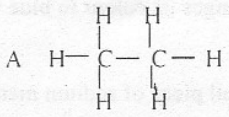
(i) a homologous series.

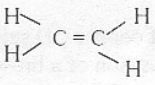
(ii) Hydrocarbons.

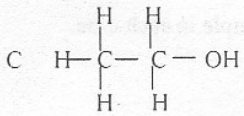
(iii) isomerism. **(03 marks)**

(b) Write the structural formula of all possible isomers of hydrocarbons whose molecular formula is $C_4 H_{10}$ and give them IUPAC names. **(04 marks)**

(c) You are provided with the following compounds:

A 

B 

C 

D $H - C \equiv C - H$

(i) Give the systematic IUPAC names of the compounds A, B, C and D.
(ii) How can you distinguish compound A from D? . **(03 marks)**

SECTION C (20 marks)

Answer **two (2)** questions from this section.

9. (a) (i) Define the term terrestrial pollution.
(ii) Mention **three (3)** materials that contribute to terrestrial pollution.
(iii) Mention **three (3)** gases which cause acid rains. **(05 marks)**

(b) Explain the effect of the following to the environment:
(i) Acid rain.
(ii) Artificial fertilizer.
(iii) plastic containers. **(05 marks)**

10. A piece of marble (calcium carbonate), was placed in a beaker containing excess dilute hydrochloric acid, standing on a direct reading balance. The mass of the breaker and its contents was recorded after every two minutes as shown in the table below when the reaction was proceeding.

Time (minutes)	0	2	4	6	8	10
Mass (g)	126.44	126.31	126.19	126.09	126.00	126.00

(a) (i) Why was there a loss of mass?
(ii) Write a balanced chemical equation for the reaction which took place between the piece of marble and dilute hydrochloric acid.
(iii) Why did the mass remain constant after the eighth second? **(05 marks)**

(b) The solution obtained after mixing dilute hydrochloric acid and marble was allowed to evaporate to dryness in the same breaker. After the evaporation process, the breaker, together with its contents was measured and the total weight obtained was 97.3 g. On the next day the weight of the breaker and its contents was found to be 98.63 g.
(i) Why did the mass increase?
(ii) What is the name of the property shown by the substance left in the breaker?
(iii) What would happen to the rate of the reaction if calcium carbonate powder was used instead of marble? Explain. **(05 marks)**

11. The diagram in figure 1 below represents a blast furnace for the extraction of iron from its ore.

(a) (i) Name the ore used for the extraction of iron.
(ii) What are the **three (3)** substances fed into the furnace at point A?
(iii) Name the substance introduced at point C. **(03 marks)**

(b) Write a balanced chemical equation for the reactions which are taking place at
(i) 1600°C
(ii) 700°C
(iii) 250°C. **(03 marks)**

(c) (i) What are the products produced at point E and D?
(ii) Why was $CaCO_3$ added into the blast furnace?
(iii) What is the function of CO formed in the blast furnace? **(03 marks)**

(d) Give two uses of impure iron metal. **(01 mark)**

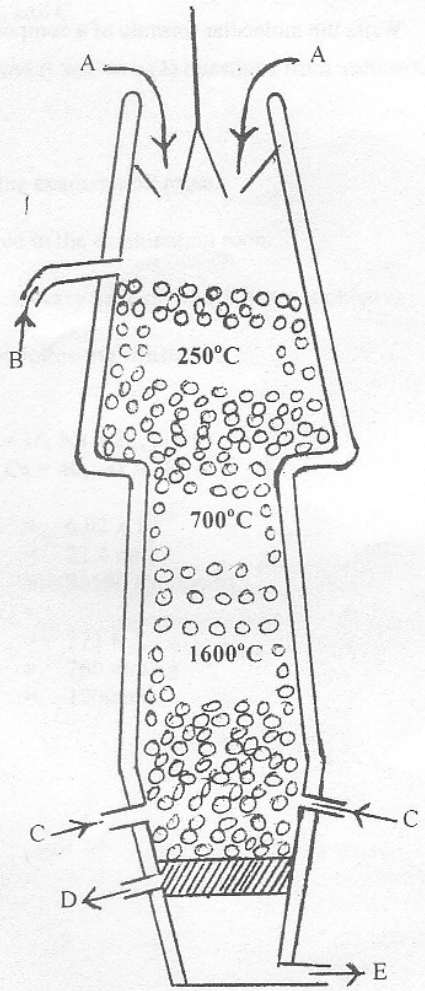


Fig. 1

12. (a) Copy and complete the following table.

Element	A	B	C	D
Atomic number	6		19	
Number of protons				16
Number of neutrons	6	12		
Mass number			39	32
Electronic Configuration		2:8:1		

(06 marks)

(b) (i) Which elements are metals from the list of elements A, B, C and D given in 12 (a) above?

(ii) What are the valencies of elements A, B, C and D?

(iii) Write a balanced chemical equation for the reaction between B and D.

(iv) Write the molecular formula of a compound formed when C combines with D.

(04 marks)