# THE UNITED REPUBLIC OF TANZANIA
# NATIONAL EXAMINATIONS COUNCIL
# DIPLOMA IN SECONDARY EDUCATION EXAMINATION

## CHEMISTRY 1

232/1

Time: 3 Hours

Monday, 12th May 2014 a.m.

### Instructions

1. This paper consists of sections A, B and C.
2. Answer **all** questions in sections A and **two (2)** questions from each of sections B and C.
3. Section A and B carry **thirty (30)** marks each and section C carries **forty (40)** marks.
4. Cellular phones are **not** allowed in the examination room.
5. Mathematical Tables and non- programmable calculators may be used.
6. Write your **Examination Number** on every page of your answer booklet(s).
7. The following constants may be used:

   Relative Atomic Masses: H = 1; C = 12; O = 16; Na = 23, Ca = 40.08

   1 Faraday = 96500 C.

   1 Litre = $1dm^3 = 1000\ cm^3$.

   R = 8.314J/K/mol.

## SECTION A (30 Marks)

Answer all questions in this section.

1. Giving one example for each, explain in brief three importance of experimentation as a teaching and learning method in Chemistry.

2. (a) State why the transition metals form coloured ions.

   (b) Name the following complex compounds according to IUPAC system of nomenclature

   (i) $([CrCl_2(H_2O)_4])_2SO_4$ (ii) $Na_2[CuCl_4]$

3. List down three curricular materials for Chemistry which fall under teacher-made and non-teacher- made materials.

4. (a) Name two gases that cause ozone layer depletion.

   (b) State two appropriate teaching methods which can be used in the teaching of the effects of land (terrestrial) pollution.

5. Name the process represented by each of the following reactions:

   (a) Catalytic conversion of oil into margarine.

   $$-CH=CH- + H_2 \rightarrow -CH_2-CH_2-$$

   (b) Formation of ethane-1,2-diol.

   $$H_2C=CH_2 + \xrightarrow{H_2O[O]} HOCH_2CH_2OH$$

   (c) Formation of ethylbenzene.

   
   

6. Explain three differences between teacher-constructed test and summative test.

7. (a) State Hess's law of heat summation.

   (b) Find the enthalpy of formation of Carbon monoxide (CO) in the following equation:

   $$C_{(s)} + \frac{1}{2}O_{2(g)} \rightarrow CO_{(g)}$$

   Given that,

   $$C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)} \qquad \Delta H = -393.5\ kJ$$

$CO_{(g)} + \frac{1}{2}O_{2(g)} \rightarrow CO_{2(g)}$ $\Delta H = -283.0$ kJ

Briefly explain how Molarity and Number of moles will be affected if 200 $cm^3$ of distilled water is added into 20 g NaOH. Give reasons for your answer.

Organic compound K undergoes ozonolysis giving propanone and propanoic acid only. Write its:

a) Molecular formula.

b) Condensed structural formula.

c) Systematic IUPAC name.

State three uses of each of the following resources required during scheme of work preparation:

a) Textbook

b) Syllabus.

## SECTION B (30 Marks)

Answer two (2) questions from this section.

In one of the chemical kinetic reaction experiment, the following results were recorded as shown in Table 1.

Table 1: Experimental results

| Experiment | Temperature (T) | | Time of reaction (s) | $\frac{1}{T}(K^{-1})$ | Log t | $\frac{1}{t}(s^{-1})$ | $\log\frac{1}{t}$ |
|---|---|---|---|---|---|---|---|
| | T (°C) | T (K) | | | | | |
| 1. | 50°C | 323 | 42 | | | | |
| 2. | 60°C | 333 | 20 | | | | |
| 3. | 70°C | 243 | 10 | | | | |
| 4. | 80°C | 353 | 5 | | | | |

Complete Table 1 above.

The slope of the graph for this experiment is expressed as $-\frac{Ea}{2.303R}$ and its value is 476K/s, calculate the activation energy (Ea) of the reaction.

Giving two reasons, explain whether the reaction was endothermic or exothermic.

12. (a) Describe any six preliminary tests.

(b) With the aid of molecular equations, explain what you would expect to observe in each of the following experiments:

(i) Barium nitrate solution is mixed with iron (II) sulphate solution.

(ii) Sodium hydroxide solution is added to a solution of copper (II) sulphate.

(iii) Lead carbonate is strongly heated in the test tube.

13. (a) (i) Define the term "electroplating".

(ii) What is the equivalent mass of $Ca^{2+}$?

(b) Calculate the mass of calcium deposited during electrolysis when electric current of 45 amperes passes through calcium electrolyte for 20 minutes.

(c) Using the Standard Reduction Potentials (SRP) in Table 2, justify which method between nickel-plating and zinc-plating is suitable to protect iron from rusting.

Table 2: Standard electrode potentials for zinc, iron and nickel

| SN | Half- reactions | $E^o$ (V) |
|---|---|---|
| 1 | $Zn^{2+}_{(aq)} + 2e \longrightarrow Zn_{(s)}$ | -0.76 |
| 2 | $Fe^{2+}_{(aq)} + 2e \longrightarrow Fe_{(s)}$ | -0.44 |
| 3 | $Ni^{2+}_{(aq)} + 2e \longrightarrow Ni_{(s)}$ | -0.25 |

(d) A galvanaic cell consists of Copper electrode in a 1 M $Cu(NO_3)_2$ and Zinc electrode in 1 M $ZnSO_4$. Find the standard emf of the electrochemical cell at 25 °C and state whether the cell will be feasible. The standard reduction potential of electrodes at 25 °C are as follows:

$Zn^{2+}_{(aq)} + 2e \rightarrow Zn_{(s)}$ $\quad E^o = -0.76$ V

$Cu^{2+}_{(aq)} + 2e \rightarrow Cu_{(s)}$ $\quad E^o = +0.34$ V

14. (a) (i) Differentiate between isotope and isotopy.

(ii) State the cause of isotopy.

(b) State the four postulates of Dalton's atomic theory.

(c) Silver exists naturally as a mixture of two isotopic forms represented as E and F. E is $^{107}_{47}Ag$ and F is $^{109}_{47}Ag$. State the number of:

(i) protons in atom F

(ii) neutrons in atom E

(iii) neutrons in atom F

(iv) protons in atom E

(v) electrons in both atoms.

(d) The abundance of three isotopes of neon are: $^{20}_{10}Ne$ (90.92%); $^{22}_{10}Ne$ (8.82%) and $^{21}_{10}Ne$ (0.26%). Calculate relative atomic mass of neon from its isotopes.

## SECTION C (40 Marks)

Answer two (2) questions from this section.

Imagine you are planning a lesson to teach 'Chemical equations' to your Form III class. Identify and describe possible:

(a) Three competences to be developed by learners.

(b) Three (specific) learning objectives to be attained after the lesson.

(c) Three relevant learning activities that learners may engage in.

(d) The relevant Teaching/learning aids.

(a) Outline in ascending order, the four upper levels of cognitive taxonomy according to Benjamin Bloom.

(b) Analyse the elements of the specific objectives.

7. "A marking scheme has two basic parts, *answer/solution* to the question; and *marks* distribution to each answer/solution". Construct a sample marking scheme for each of the questions given below. Take the total marks for this question as 11.

(a) With the aid of chemical equation, outline four chemical properties of acid.

(b) Write two possible isomers of the hydrocarbon with molecular formula $C_4H_{10}$

(c) Briefly describe any three methods of salt preparation. Support your answer with relevant chemical equation.

8. (a) State the best method of teaching abstract topic like atomic structure and give reasons for your answer.

(b) Assuming that you want to arouse interest of Form I class to study Chemistry. Convince the class by describing six significances of the subject in real life situation.