

TANZANIA HEADS OF ISLAMIC SCHOOLS COUNCIL
FORM SIX INTER ISLAMIC MOCK EXAMINATION
CHEMISTRY 1

(For Both School and Private Candidates)

132/1

TIME: 3 Hours

Wednesday, 4th March 2026 p.m.

Instructions

1. This paper consists of sections **A** and **B** with a total of **ten (10)** questions.
2. Answer **all** questions in section **A** and **two (2)** questions from section **B**.
3. Each question carries **ten (10)** marks in section A and **fifteen (15)** marks in section B.
4. Mathematical tables and non-programmable calculators may be used.
5. Except drawings that must be drawn in pencil. All writings should be in blue or black ink.
6. Communication devices and any unauthorized materials are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet(s).
8. For calculations you may use the following:
 - Rydberg constant, $R_H = 1.097 \times 10^7 \text{ m}^{-1}$
 - Gas constant, $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$ or $0.0821 \text{ atm mol}^{-1} \text{ K}^{-1} \text{ dm}^3$.
 - Standard temperature = 273 K
 - Standard pressure = $1.01325 \times 10^5 \text{ N m}^{-2} = 1 \text{ atm} = 760 \text{ mmHg}$,
 - Planck's constant, $h = 6.63 \times 10^{-34} \text{ Js}$
 - Velocity of light, $C = 3.0 \times 10^8 \text{ m/s}$
 - Specific heat capacity of water, $C = 4.184 \text{ J g}^{-1} \text{ } ^\circ\text{C}^{-1}$
 - Atomic masses: H=1, C=12, O=16, N=14, Na=23, Cl=35.5, K=39, S=32, Cu=63.5, Br=80, Se=78.8, Ca=40.

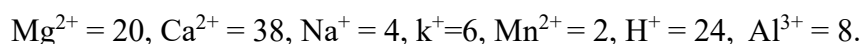
SECTION A (70 Marks)

Answer **all** questions in this section

1.
 - (a) “Dalton’s atomic postulates are no longer applicable nowadays.” Justify this statement by using four points. **(04 marks)**
 - (b) Why does the spacing between lines in the hydrogen spectrum decrease as one goes away from the nucleus? **(03 marks)**
 - (c) A form six student from Mudio Islamic secondary school was given a task of describing the properties of electrons in an atom. She described particular electrons using the following sets:
 - (i) $n=0, \quad l=0, \quad ml=0, \quad ms=+\frac{1}{2}$
 - (ii) $n=1, \quad l=0, \quad ml=0, \quad ms=-\frac{1}{2}$
 - (iii) $n=2, \quad l=1, \quad ml=0, \quad ms=-\frac{1}{2}$With reason(s), state which set is valid or invalid? **(03 marks)**
2.
 - (a) When Mr. Mateso was suffering from respiratory diseases, he was prescribed to attend clinic for oxygen therapy where he swallowed a drop of liquid oxygen (O_2) which had a density of 1.149g/cm^3 . Assuming the drop has a volume of 0.050cm^3 , calculate the volume of a gas that will be in the person’s abdomen at body temperature (37°C) and a pressure of 1 atmosphere. **(02 marks)**
 - (b) A compound contains only nitrogen and hydrogen and is 87.4% Nitrogen by mass. A gaseous sample of the compound has a density of 0.977g/L at 710mmHg and 100°C . Determine the molecular formula of the compound. **(06 marks)**
 - (c) A total volume of $2.50 \times 10^2\text{cm}^3$ of chlorine gas was collected over water at 20°C and total pressure of 1atm . Calculate the mass of chlorine at a given temperature if the vapour pressure of water was 17.5mmHg . **(02 marks)**
3.
 - (a)
 - (i) Why a person suffering from high blood pressure is advised to take minimum quantity of common salt?
 - (ii) Briefly explain why salt water fish die when they are suddenly transferred to a fresh water aquarium.
 - (iii) Will the elevation in boiling point be the same if 0.1mole of sodium chloride or 0.1 mole of sugar is dissolved in 1L of water? Give reasons for your answer. **(03 marks)**

- (b) A solution prepared by dissolving 0.00895g of a gene fragment in 35.0cm³ of water has an osmotic pressure of 0.335mmHg at 25.°C. Assuming the gene fragment is a non-electrolyte. Determine its molar mass. **(03 marks)**
- (c) Calculate the amount of CaCl₂ which must be added to 500g of water to lower its freezing point by 2°C. Assuming CaCl₂ is completely dissociated.
(K_f for water = 1.86°Ckg/mol). **(04 marks)**
4. (a) Chemistry teacher told his students that, when forming sigma covalent bond orbitals of different atoms overlap in different orientations. With the aid of chemistry sketches, justify this statement. **(03 marks)**
- (b) (i) Both Si and C are elements of group IV whose oxides are covalent compounds but SiO₂ has a very higher melting point and exists in solid state at room temperature while CO₂ in gaseous state. Explain this observation.
- (ii) CO₂ is non-polar while water is a polar molecule. What conclusion can you draw from this fact? **(03 marks)**
- (c) Why are bonds between H and Cl molecules never hundred percentage covalent or electrovalent? **(02 marks)**
- (d) For successfully hybridising an atom, a chemist should follow special rules. As a chemist, justify this statement by giving two points. **(02 marks)**
5. (a) Form six students at Premier High school tried to prepare Iron(III) Carbonate (Fe₂(CO₃)₃) by precipitation reaction of Sodium carbonate (Na₂CO₃) solution with Iron(III) nitrate (Fe(NO₃)₃) solution. Unfortunately, the students failed to obtain (Fe₂(CO₃)₃) by this reaction. With the aid of chemical equation(s) describe why students failed. **(04 marks)**
- (b) (i) When lead carbonate reacts with dilute hydrochloric acid, effervescence is initially observed but the reaction stops after a short time. With the aid of balanced chemical equation, briefly explain this observation. **(02 marks)**
- (ii) Account for this statement; reaction of potassium metal with oxygen gives three types of oxides. **(03 marks)**
6. (a) The farmers from Mtumba village were advised by specialist that, in order to reduce their soil acidity, they must add CaO as liming material because it has high neutralizing value. Farmers asked him that which value making it suitable liming materials. As a specialist provide them with best answer. **(03 marks)**
- (b) If you were told to explain the way interactions between water and both organic and inorganic colloids in the soil affect the soil acidity. With the aid of equation, how would you respond? **(03 marks)**

- (c) A certain soil contains the following cations, where all values are given in meq per 100g of oven-dry soil.



If the PBS of the soil is 68.63%. Calculate the;

- (i) CEC of this soil
- (ii) Quantity of Ca^{2+} ions in grams present in 100g of even-dry soil. **(04 marks)**

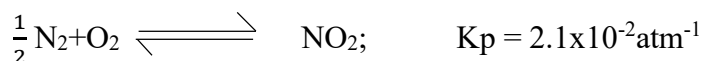
7. (a) How will you distinguish the following organic compounds?
- (i) Pent-1 – ene from n-pentane
 - (ii) Propane from propyne **(02 marks)**
- (b) (i) Between cis and trans isomers of hex-2-ene, which one will have a higher boiling point? Give reason
- (ii) Ozonolysis of an alkene x followed by decomposition with water and a reducing agent gave a mixture of two isomers of the formula $\text{C}_3\text{H}_6\text{O}$. Give the structure of the alkane and its IUPAC name. **(04 marks)**
- (c) An alkyl halide $\text{C}_5\text{H}_{11}\text{Br}$ (A) reacts with ethanolic KOH to give an alkene B which reacts with Br_2 to give a compound C which on dehydrobromination gives an alkyne D. On treatment with sodium metal in liquid ammonia one mole of D gives one mole of the sodium salt of D and half a mole of hydrogen gas. Complete hydrogenation of D yields a straight chain of alkane. Identify compounds A, B, C and D by showing the reactions involved. **(04 marks)**

SECTION B (30 Marks)

Answer **two (2)** questions in this section

8. (a) (i) One of the remarkable features of equilibrium system is their ability to return to equilibrium after change in conditions which were involved in its establishment. State the principles which govern the returning in equilibrium after changes. **(01 mark)**
- (ii) A student is provided with glassware and other laboratory apparatuses as well as chemicals; Potassium dichromate (VI) ($\text{K}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$), Hydrochloric acid (HCl), sodium hydroxide (NaOH), Cobalt (II) chloride crystals ($\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$) and deionised water (H_2O). Describe clearly how the student could use a selection of the chemicals listed above to establish a chemical equilibrium. Write a balanced equation for the equilibrium. **(01 mark)**

- (b) Calculate the equilibrium constant, K_p for the reaction



- (c) 5.6g of N_2 and 2g of H_2 were allowed to reach equilibrium in 1200cm^3 container at 200°C and 1atm.

- (i) Calculate the equilibrium constant, K_c if 60% of N_2 were dissociated at 200°C .

- (ii) What is the k_p for this equilibrium? **(08 marks)**

9. (a) Write the structural formulae of the following compounds:

- (i) 2, 4-dinitrophenol

- (ii) p – aminophenol **(02 marks)**

- (b) Give the names and structures of three isomers of dimethnhyllbenzene. **(03 marks)**

- (c) Explain with the help of chemical equations which dimethylbenzene in 9 (b) above will yield;

- (i) One (1) mononitro product

- (b) Two (2) mononitro product **(03 marks)**

- (d) The isomeric hydrocarbon K and L have the molecular formula C_9H_{12} . On oxidation K gives a monocarboxylic acid which when heated with excess sodalime yield benzene. When L is oxidized it gives a tricarboxylic acid which can undergo nitration to give nitro derivative. What is the structural formula of K and L? **(03 marks)**

- (e) Write the reaction of chlorination of benzene and methylbenzene

- (i) In the presence of carrier catalyst

- (ii) In the presence of ultra violet light **(04 marks)**

10. (a) Use the data given below to calculate the lattice energy for Barium chloride (BaCl_2).

ΔH for electron affinity of Cl - 364kJ/mol

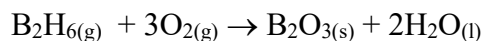
ΔH for 1st Ionization energy of Ba +550kJ/mol

ΔH for formation of BaCl_2 -860kJ/mol

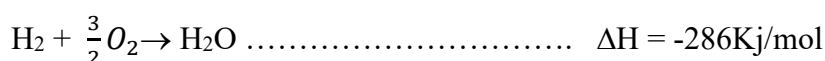
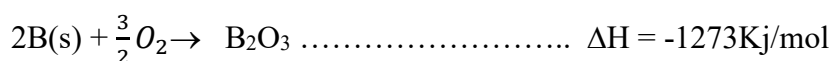
ΔH for atomisation of Cl_2 +121kJ/mol

ΔH for 2 nd ionisation of Ba	+1000kJ/mol	
ΔH for atomisation Ba	+175kJ/mol	(04 marks)

- (b) Diborane is potential rocket fuel which undergoes combustion according to the reaction:



From the following data, calculate the enthalpy change for the combustion of diborane



- (c) The bond enthalpy of $\text{H}_{2(g)}$ is 436Kj/mol and that of $\text{N}_{2(g)}$ is 941.3Kj/mol. Calculate average bond enthalpy of an N-H bond in ammonia. Given that ΔH_f for ammonia (NH_3) = -46Kj/mol. **(03 marks)**

- (d) In one experiment, a student placed 50.0cm³ of 1.00M HCl in a calorimeter and carefully measured its temperature to be 25.5°C. To this acid 50.0cm³ of 1.00M NaOH solution whose temperature was also 25.5°C was also added. The mixture was quickly stirred and the student noticed that the temperature of the mixture rose to 32.4°C. What was the molar heat of neutralization? Assume that specific heat capacity and density of solution are the same as that of water, 4.184Jg⁻¹°C⁻¹ and 1.00gcm⁻³ respectively. **(04 marks)**

Wabillah Tawfiiq