MARKING SCHEME

Index No.....……. /…….. Class……

Candidate's Signature…….

KASSU JOINT EXAMINATION TEST

(The Kenya Certificate of Secondary Education)

233/1

CHEMISTRY

Paper 1

(Theory)

JUNE 2024

Time 2 Hours

Instructions to Candidates

1. ***Write your name and index number in the spaces provided above.***
2. ***Answer all the questions in the spaces provided.***
3. ***All working must be clearly shown.***
4. ***Non-programmable silent electronic calculators and KNEC mathematical tables may be used.***

For Examiner's Use only

Questions	Maximum score	Candidates score
1 - 28	**80**	**80**

This paper consists of 14 printed pages. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

1. a) **Hygroscopy (Reject hygroscopic)**

   b) **Drying agent** for those gases that do not react with it.

   c) 2S +7(-2) = -2

   2S = -2 +14

   S =+ $\frac{12}{2}$ = **+6** , penalize ½ if sign is missing

2. a) Q- Concentrated nitric (V) acid
   R- Ammonia solution
   b) $Cu(OH)_2$ (aq) + $4NH_3$ (aq) ⟶ $[Cu(NH_3)]^{2+}$ (aq) + $2OH^-$ (aq)
3. The volume of a given mass of a gas is directly proportional to its absolute temperature, its pressure kept constant.
   b) $\frac{V1}{T1} = \frac{V2}{T2}$

   $\frac{9.6X10^{-2}}{298} = \frac{6.4X10^{-2}}{T2}$

   T2 = $\frac{6.4X10^{-2}}{9.6\ X\ 10^{-2}}$ x 298

   T2 = 198.6667 K

4. a) -Chlorophyll
      -Xanthophylls
   b) -Solubility
      - Adsorption/ stickiness
5. (a) RMM; CO_2 =12+ (16x2) =44, H_2O =(2x1) +16) =18
   Mass of carbon in CO_2 = $\frac{12}{44}$ x4.4 = 1.2g ½
   Mass of H in H_2O = $\frac{2}{18}$ x2.25 = 0.25 g ½
   (b)

Element	C	H
Mass	1.2	0.25
RAM	12	1
Moles	$\frac{1.2}{12}$ = 0.1	$\frac{0.25}{1}$ = 0.25
Mole ratio	$\frac{0.1}{120.1}$ = 1	$\frac{0.25}{0.1}$ = 2.5
Number of atoms	1x2 =2	2.5x2=5

   E. F= C_2H_5
   M.F = $(C2H_5)$ n =58
   [24+(1x5)] n = 58
   29n= 58; n = $\frac{58}{29}$
   n = 2; Molecular Formular = C_4H_{10}

6. (a) Compounds which are made up of carbon and hydrogen atoms only
   b) i) 2,2-dimethylpropane
      ii) Hex-1-ene // Hexene
7. Manufacture of:
   - drugs to fight diseases
   - detergents for cleaning
   - plastics for roofing, packaging and domestic uses
   - cheaper alternative fabrics such as nylon, Dacron, polyester…

   Food production to fight diseases

   Production of fuels for transport and domestic uses

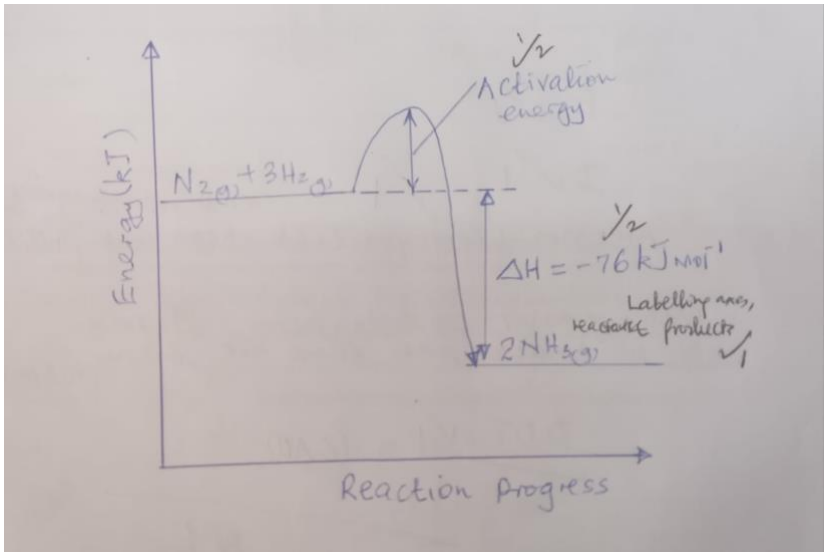
8. (a)

Bond breaking	**Bond formation**
N-N = 944	2[3(N-H)] = 2 (3X388) =2328
3(H-H) = 1308	
2252	

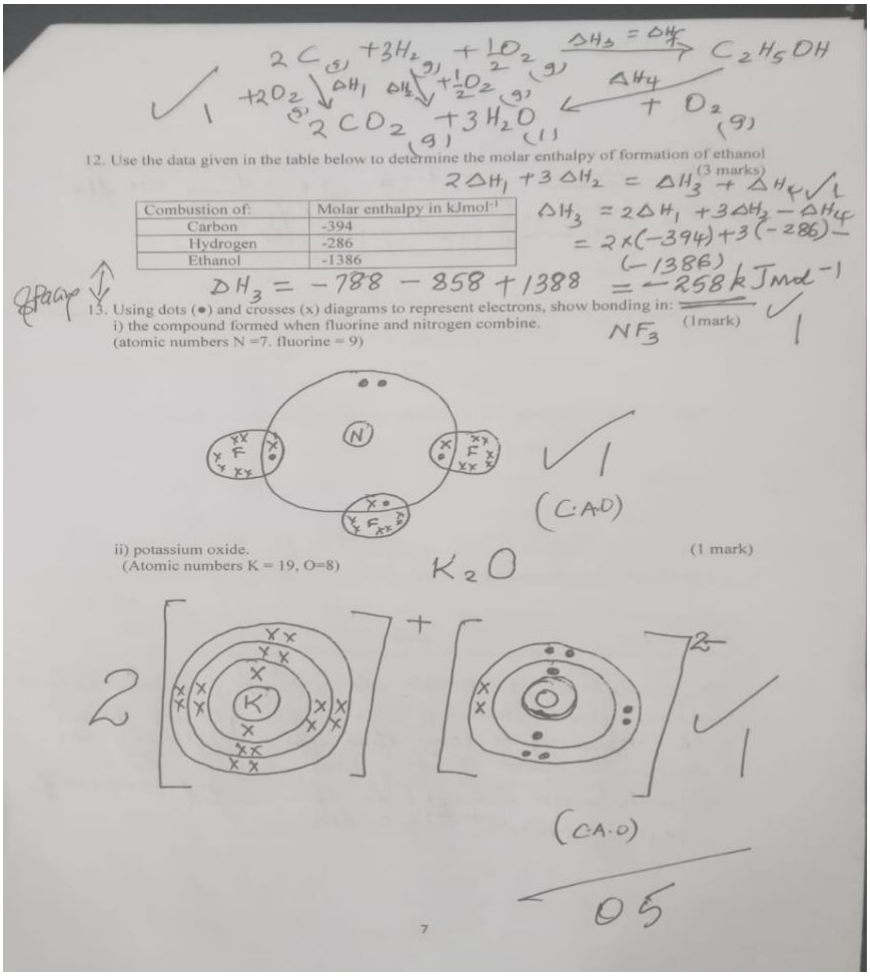
   Enthalpy change = 2252-2328

   = -76kJmol^{-1} wrong/no units and/or sign missing penalize ½

   b)



9. a) Thermal dissociation // heating
   b) Filtration
   c) -Remove water hardness / softening hard water
      -Glass making
      - Paper industry
      -Sodium silicate for making dertegents

10. a) Water containing Ca^{2+} or Mg^{2+} ion is made to pass through a column with sodium complex where ion exchange will take place, Ca^{2+} or Mg^{2+} ions remain in the column and soft water passes out (with sodiumions).
    b) Flushing/ washing with brine (concentrated sodium chloride
    c) -Wastes soap
    -Stains white clothes
    - Formation/decomposition fur (boiler's scales) in boilers, kettles and water pipes which reduces efficiency and may make hot water pipes to burst.
11. a) Using downward delivery // upward displacement of air to collect the gas
    b) Crystals of copper (II) sulphate
12.
13. 

14. a) The brown coating formed on the surface of iron metal/object when exposed to the elements of air (oxygen and moisture) // Hydrated iron (III) oxide.
    b) Brown coating formed on the iron nail in set- up X while the nail in set-up Y remained shiny grey// no brown coating formed on the nail in set-up Y (wwte)
15. The mixture changes to **<u>orange //Brown colour intensifies.</u>** The OH- ions from sodium hydroxide react with hydrogen ions thereby **reducing the concentration of H+ ions**, hence the **equilibrium shifts to the left** // favouring the backward reaction.

16. a) Name: Pipe-Clay triangle
Use: supporting crucibles during heating
b) Name: Pair of **<u>Tongs</u>**
Use: Safely holding **hot or corrosive solids**

17. a) NaOCl (aq) +Dye $\longrightarrow$ NaCl (aq) + [Dye+ O]
b) Oxidation
c) Chlorine water contains **HCl which is corrosive to the skin** while NaOCl in ***<u>JIK</u>*** **decomposes to form harmless** / neutral sodium chloride

18. a) Number of half-lives $=\frac{160}{40} = 4$

112g $\longleftarrow$ 56g $\longleftarrow$ 28g $\longleftarrow$ 14g $\longleftarrow$ 7g

OR

$N = NO\ (½)^{T/t}$

$7 = NO\ (½)^{160/40}$

$7 = NO(½)^4$; $7 = \frac{NO}{16}$

NO = 16x7

NO= 112g

b) Causes - Cancer

- Genetic mutation

Can be used as weapons of mass destruction

19. – Heat the recycled copper in air to form copper (II) oxide

- Add excess copper (II) oxide to dilute sulphuric (VI) acid in a beaker and stir

- Filter to remove unreacted copper (II) oxide.

- Heat the filtrate to saturation

- Allow the saturated solution to cool to form crystals

- Decant/pour out the mother liquor and dry the crystals between filter papers.

20. a) $(COOH)_{2\,(aq)} \longrightarrow CO_{2\,(g)} + CO\ (g) + H_2O\ (l)$
b) Bubble the gaseous mixture into concentrated sodium hydroxide or potassium hydroxide solution in order to absorb carbon (IV) oxide leaving behind carbon (II) oxide.
c) Colourless
Odourless

21. a) Atoms of an element with the same atomic number but different mass numbers.
    b) $\frac{36K}{k+4} + \frac{40x4}{k+4}$=37.25

    36k+160 = 37.25 (K+4)

    36+ 160 = 37.25K + 149

    36K-37.25K =149-160

    -1.25K= -11
    K= $\frac{-11}{-1.25}$

    K= 8.8

22. a) Substance that show definite colour when in acid and a different definite colour in a base
    b) -Give inconsistent results
    - Composition changes colour with time since the indicator has impurities // are impure

23. a) Mass of Metal M;
    16.41-10.2 = 6.21g
    Mass of Oxygen 7.17- 6.21 =0.96g

b) Element	M	O
Mass	6.21	0.96
RAM	207	16
No of moles	$\frac{6,21}{207}$ =0.03	$\frac{0.96}{16}$ =0.06 ½
Mole ratio	$\frac{0.03}{0.03}$ = 1	$\frac{0.06}{0.03}$ = 2 ½
No of atoms	1	2

    Empirical formula = **MO_2**

24. a) N
    b) K M N
    c) Silver, Mercury or Gold (any one)
25. a) Source of heat is missing
    b) Grey beads of lead metal
    Pb^{2+} (l) + $2e^-$ ⟶ Pb (s)

26. $E^e = E_{red} - E_{ox}$
    = -0.44 – (-1.66)
    = + 1.22 volts
    Not advisable, e.m.f is positive hence a reaction will take place

27. a) I. E
    II. D
    b) Are non- biodegradable hence cause pollution
28. a) Water gas, both CO and H_2 whereas in producer gas it is only CO that burns while N_2 does not
    b) **DDT**