KAPSABET HIGH SCHOOL

233/1 (*Kenya Certificate of Secondary Education*) **Paper 1**

INTERNAL MOCK EXAM

CHEMISTRY

(THEORY)

Dec. 2020– 2 Hours

MARKING SCHEME

Instructions to candidates

a) *Write your Name, Index, Admission number and stream in the spaces provided above.*
b) *Sign and write the examination date on the spaces provided above.*
c) *Answer all the questions in the spaces provided.*
d) *All workings **must** be clearly shown where necessary.*
e) *KNEC mathematical tables and non-programmable silent electronic calculators may be used.*
f) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
g) Candidates must answer the questions in English.

1. (i) $[Zn(NH_3)_4]^{2+}$√ 1 / Tetraamine zinc (II) ions
   (ii) $[Zn(OH)_4]^{2-}$√ 1 /Zincate ion
2. i. water//H_2O
   ii. $2Na_2O_2(aq) + 2H_2O(l) \longrightarrow 4NaOH(aq) + O_2(g)$
   iii. Carbon (IV) oxide formed from burning candle dissolved in the water to form a weak carbonic acid (pH less than 7).
3. Mass of hydrated salt = 305 -300 =3g
   Mass of anhydrous salt = 303.2 -300=3.2g
   Mass of water of crystallization= 5-3.2 =1.8g

$CuSO_4$:	H_2O	
3.2	1.8	
159.5	18	Formula: $CuSO_4.5H_2O$
0.02	0.1	
1	5	

4. a) i. Soapy
   ii. Soapless
   b) Is non-biodegradable thus environmental pollutant
5. a) ΔH_1 Atomization energy of Na
   ΔH_2 Ionization energy for Na
   ΔH_4 Lattice energy
   b) $\Delta H = \Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H_4$
   = 434 +371 + 483 + -781
   = 507 kJ/mole
6. Acid: H_3O^+ Reason: it donates a proton (H^+) to NH_3 to form NH_4^+
   Base: NH_3 Reason: accepts the donated H^+
7. (a)It is amphoteric√ 1
   (b) Lead ion√ 1 // Pb^{2+}
   (c) $Pb(OH)_2(aq) + 4OH^-(aq) \longrightarrow [Pb(OH)_4]^{2-}(aq)$√ 1

8. (i) from left right ⟶
   (ii) Syringe 1
   (iii) - Concentration increases
   - In electrolysis of dilute $MgCl_2$, Hydrogen and Oxygen are discharged (H_2O) //equivalent to discharge of water molecules

9. (i) $Na_2CO_{3(s)} + Cu(NO3)_{2\ (aq)} \longrightarrow CuCO_{3(s)} + 2NaNO_{3\ (aq)}$ ✔ 1

   (ii) Blue precipitate formed ✔ ½ which dissolve to give deep blue solution. ✔ ½

10. (i) G ✓1
    (ii) $G(s) + H^{2+}(aq) \longrightarrow G^{2+}(aq) + H(s)$ ✓1
    (iii) $E_{red} - E_{ox}$
    =+0.34 –(-0.44) ✓1
    = 0.78V✓1

11. (a)Volume of a fixed mass of an gas is directly proportional to its absolute temperature provided pressure is kept constant

(b) $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ √ ½

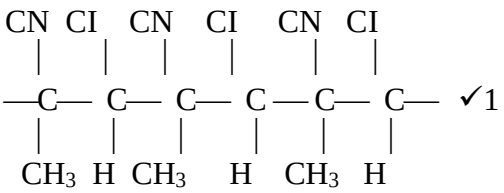
$\frac{98.31 \times 146}{291} = \frac{101.325 \times 133}{T_2}$ √ ½

$T_2 = \frac{101.325 \times 133 \times 291}{98.31 \times 146}$

$= \frac{3921581.475}{14353.26}$ √ ½

=273.2K √ ½

12. (a).



(b) Addition ✓1

c) -Cheaper ✓1

- Not easily attacked by chemicals
- Do not Grease
- Are lighter
- Dry faster.

13. molarity of NaOH = 8/40

=0.2M √ 1

Moles of NaOH = $\frac{0.2 \times 20}{1000}$

= 0.004moles √ 1

Moles of acid =0.002moles

RMM =0.118/0.002

=56 √ 1

14. Equation: $Cu^{2+}(aq) + \mathbf{2e} \longrightarrow Cu(s)$

1 mole (63.5g) Cu is discharged by 2 x96500 C

0.6g will be discharged by

$\frac{0.6 \times 2 \times 96500}{63.5}$

=1823.622 C

15. (i) Forward reaction is exothermic, thus increase in temperature shifts equilibrium to the left (backward reaction favoured) increasing the intensity of the red-brown colour of Br_2 gas.

(ii) The ratio of volumes of reactants to products is 1:1 therefore, decrease in pressure will have no effect on the equilibrium state of the reaction

16.

Test	Observation	Inference
Put less than half spatula end-full of the white solid in a test tube. Add about 5ml of distilled water and shake thoroughly.	White solid dissolves to form a colourless solution	-Soluble substance. -coloured ions absent; Cu^{2+}, Fe^{2+}, and Fe^{3+}
To a small portion of solution formed above, add 3 drops of lead (II) nitrate solution. Warm the mixture and allow it to cool	White precipitate on addition of lead (II) nitrate which dissolves on warming and reappears on cooling	Cl^- confirmed present

17. a) A number showing a charge a species has in a compound or valency of an element or ion bearing the charge.
    b) S +3(-2) = -2
    S – 6 =-2
    S= +4
    c) S^{+4} has electron pattern 2.82

18. (a) $N_{2(g)} + O_{2\,(g)} \longrightarrow 2NO\,(g)$√ 1
    (b) a lot of heat is required to break the triple bonds between the nitrogen atoms✓01
    (c) NO is readily oxidized to form nitrogen(IV)oxide which is responsible for acid rain✓01
19. a) C ; it is the most electronegative//it easily gain electrons// has smallest atomic radius
    b) Covalent bond. They react by sharing valence electrons
    c) E has smaller atomic radius than D. Across the period, nuclear force of attraction increases leading a stronger pull on the energy levels reducing overall size.
20.
    $2C_{(s)} + 2O_{2(g)} \longrightarrow 2CO_{2(g)}$ $\Delta H_C = 2(-394)kJmol^{-1} = -788$
    $3H_{2(g)} + 3O_{2(g)} \longrightarrow 3H_2O_{(l)}$ $\Delta H_C = 3(-286)kJmol^{-1} = -858$
    $2CO_{2(g)} + 3H_2O_{l)} \longrightarrow C_2H_{6(g)} + 5O_{2(g)}$ $\Delta H_c = +1300kJmol^{-1} = +1300$
    Overall: $2C(s) + 3H_2\,(g) \longrightarrow C_2H_6\,(g)$ $\Delta H_f = -346kJ/mole$

21. React lead (II) carbonate in excess √ ½with dilute nitric acid until effervescence stops, √ ½ filter √ ½out the unreacted carbonate. To the filtrate add dilute sulphuric acid√ ½ to precipitate out lead sulphate, filter the mixture to obtain residue√ ½,wash with distilled water and dry√ ½ between filter papers
22. a) i. Solid X: Iron silicate// $FeSiO_3$
    ii. Process W: Electrolysis
    b) $2CuFS_2(s) + 4O_2\,(g) \longrightarrow Cu_2S\,(s) + 2FeO(s) + 3SO_3(g)$
    c) Copper has very high thermal conductivity

23. a) Half life 48 ⟶ 24 ⟶ 12 ⟶ 6

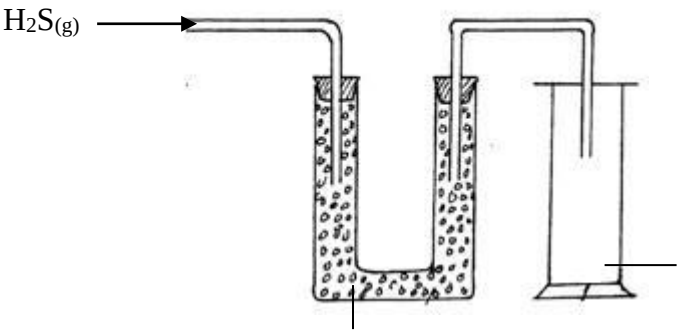
3 half lives 180 days

1 half life ?

$\frac{180 \times 1}{3}$ =60 days

b) $^{14}_{6}C \longrightarrow {}^{14}_{7}N + {}^{0}_{-1}e$

24. 24.

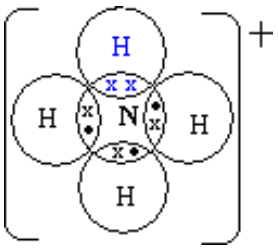


Dry Hydrogen Sulphide √ 1mark

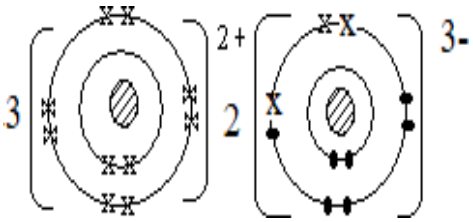
Anhydrous Calcium Chloride √ 1mark

Workability √ 1mark

25. Eletronic Structures



NH_4^+

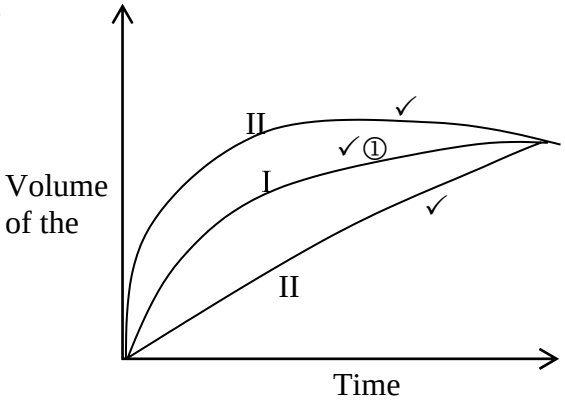


Mg_3N_2

26. i) The red brown iron(III) oxide turns to a grey solid (Fe)

ii) $Fe_2O_3(s) + 3CO(g) \longrightarrow 2Fe(s) + 3CO_2(g)$

27. 27.



28. (a). Sodium chloride saturated with Ammonia ✓ ½

b) Heating limestone/calcium carbonate ✓ ½

c) I. $NH_{3(aq)} + CO_{3(aq)} + H_2O_{(l)} \longrightarrow NH_4HCO_{3(aq)}$ ✓1

II. $NH_4HCO_{3(aq)} + NaCl_{(aq)} \longrightarrow NH_4Cl_{(aq)} + NaHCO_{3(s)}$ ✓1

29. a) Separation of salts in a mixture due to difference in their solubilities at different temperatures

b) Some crystals of the salt were deposited. The solublity of this salt decreased with increase in temperature

c) Mass deposited 36 -20 = 16g