



(Kenya Certificate of Secondary Education)



INTERNAL MOCK EXAM
CHEMISTRY
(THEORY)
Dec. 2020– 2 Hours

MARKING SCHEME

Instructions to candidates

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

- $[\text{Zn}(\text{NH}_3)_4]^{2+}$ ✓ 1 / Tetraamine zinc (II) ions
 - $[\text{Zn}(\text{OH})_4]^{2-}$ ✓ 1 / Zincate ion
- water// H_2O
 - $2\text{Na}_2\text{O}_2(\text{aq}) + 2\text{H}_2\text{O}(\text{l}) \longrightarrow 4\text{NaOH}(\text{aq}) + \text{O}_2(\text{g})$
 - Carbon (IV) oxide formed from burning candle dissolved in the water to form a weak carbonic acid (pH less than 7).
- | | | | |
|----------------------------------|---|--------------------|--|
| 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	
<u>3.2</u>		<u>1.8</u>	
159.5		18	Formula: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
0.02		0.1	
1		5	
- Soapy
 - Soapless
 - Is non-biodegradable thus environmental pollutant
- ΔH_1 Atomization energy of Na
 - ΔH_2 Ionization energy for Na
 - ΔH_4 Lattice energy
 - $\Delta H = \Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H_4$
 $= 434 + 371 + 483 + -781$
 $= 507 \text{ kJ/mole}$
- Acid: H_3O^+ Reason: it donates a proton (H^+) to NH_3 to form NH_4^+
 Base: NH_3 Reason: accepts the donated H^+
- It is amphoteric ✓ 1
 - Lead ion ✓ 1 // Pb^{2+}
 - $\text{Pb}(\text{OH})_2(\text{aq}) + 4\text{OH}^-(\text{aq}) \longrightarrow [\text{Pb}(\text{OH})_4]^{2-}(\text{aq})$ ✓ 1
- from left right \longrightarrow
 - Syringe 1
 - Concentration increases
- In electrolysis of dilute MgCl_2 , Hydrogen and Oxygen are discharged (H_2 O)
//equivalent to discharge of water molecules
- $\text{Na}_2\text{CO}_3(\text{s}) + \text{Cu}(\text{NO}_3)_2(\text{aq}) \longrightarrow \text{CuCO}_3(\text{s}) + 2\text{NaNO}_3(\text{aq})$ ✓ 1
 - Blue precipitate formed ✓ ½ which dissolve to give deep blue solution. ✓ ½
- G ✓ 1
 - $\text{G}(\text{s}) + \text{H}^{2+}(\text{aq}) \longrightarrow \text{G}^{2+}(\text{aq}) + \text{H}(\text{s})$ ✓ 1
 - $E_{\text{red}} - E_{\text{ox}}$

$$\begin{aligned} &= +0.34 - (-0.44) \checkmark 1 \\ &= 0.78V \checkmark 1 \end{aligned}$$

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

$$(b) \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

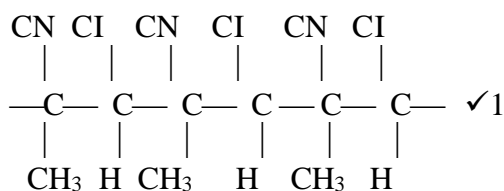
$$\frac{98.31 \times 146}{291} = \frac{101.325 \times 133}{T_2}$$

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

$$= \frac{3921581.475}{14353.26}$$

$$= 273.2K$$

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

$$= 0.2M \checkmark 1$$

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

$$= 0.004 \text{ moles} \checkmark 1$$

$$\text{Moles of acid} = 0.002 \text{ moles}$$

$$\text{RMM} = 0.118 / 0.002$$

$$= 56 \checkmark 1$$

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

1 mole (63.5g) Cu is discharged by 2 x 96500 C

0.6g will be discharged by

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

$$= 1823.622 \text{ C}$$

$$= 1823.622 \text{ C}$$

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 Br₂ 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

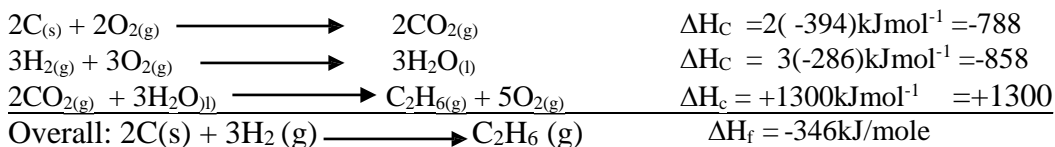
(c) NO is readily oxidized to form nitrogen(IV)oxide which is responsible for acid rain ✓ 01

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.

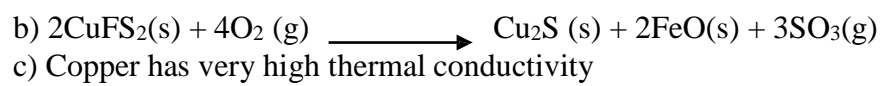
20.



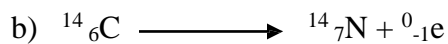
21. React lead (II) carbonate in excess $\sqrt{1/2}$ with dilute nitric acid until effervescence stops, $\sqrt{1/2}$ filter $\sqrt{1/2}$ out the unreacted carbonate. To the filtrate add dilute sulphuric acid $\sqrt{1/2}$ to precipitate out lead sulphate, filter the mixture to obtain residue $\sqrt{1/2}$, wash with distilled water and dry $\sqrt{1/2}$ between filter papers

22. a) i. Solid X: Iron silicate// FeSiO₃

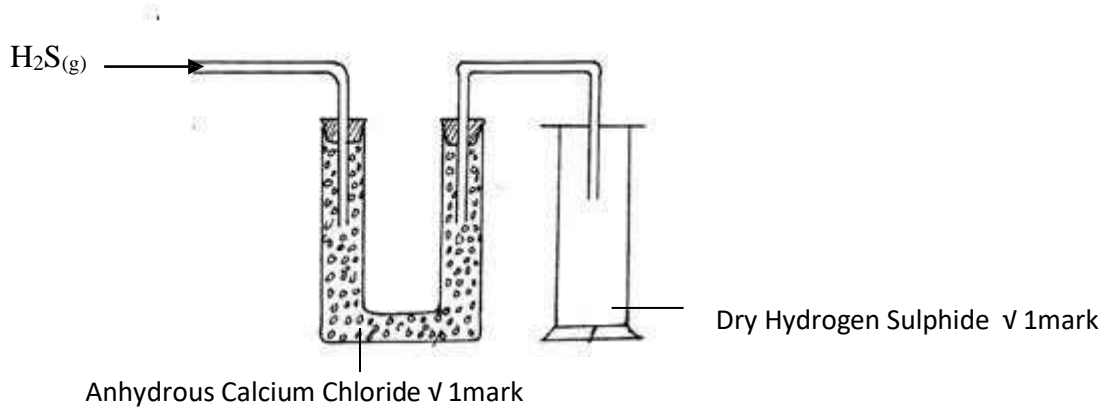
ii. Process W: Electrolysis



23. a) Half life 48 —————> 24 —————> 12 —————> 6
 3 half lives 180 days
 1 half life ?
 $\frac{180 \times 1}{3}$ =60 days



24. 24.

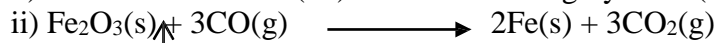


Workability ✓ 1mark

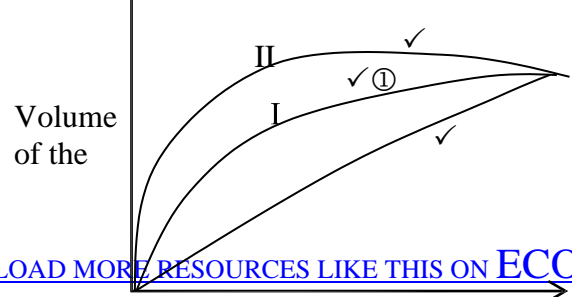
25. Eletronic Structures



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



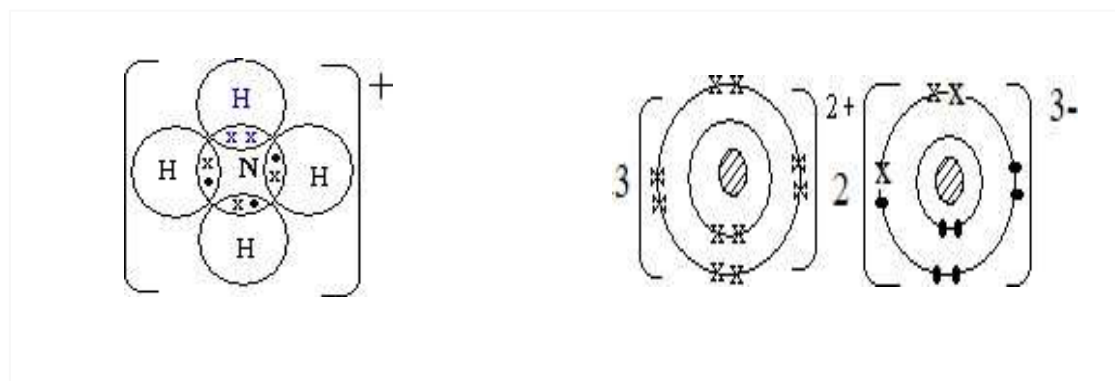
27. 27.



II

Time

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28. (a). Sodium chloride saturated with Ammonia ✓ ½
b) Heating limestone/calcium carbonate ✓ ½
c) I. $\text{NH}_3(\text{aq}) + \text{CO}_3(\text{aq}) + \text{H}_2\text{O}(\text{l}) \longrightarrow \text{NH}_4\text{HCO}_3(\text{aq})$ ✓ 1
II. $\text{NH}_4\text{HCO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \longrightarrow \text{NH}_4\text{Cl}(\text{aq}) + \text{NaHCO}_3(\text{s})$ ✓ 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 solubility of this salt decreased with increase in temperature
c) Mass deposited $36 - 20 = 16\text{g}$

