WAKISSHA JOINT MOCK EXAMINATIONS SCORING GUIDE

Uganda Certificate of Education

Chemistry P525/1

July/August 2025

1(a)		
	Br Cl ₃ cı R T-shaped rej - T- shape	02:
	CLO ₄ Tetrahedral Accept C - O only one	
(b)	(i) Pale green solution turns brown / orange.	
	(ii) $8Fe_{(aq)}^{2+} + ClO_{4(aq)}^{-} + 8H_{(aq)}^{+} \rightarrow 8Fe_{(aq)}^{3+} + Cl_{(aq)}^{-} + 4H_2O_{(t)}$	The state of
		04 M
2(a)	(a) $CH_3CHO \xrightarrow{Ag_2O(NH_{Meat})} CH_3COOH$	
	Name Ethanoic acid	
	(b) OTCHS1-CrO2Cl2 CS2(1) 2. cold water OTCHO	
	Name Phenylmethanal / IUPAC only	
	(c) CH ₃ Br/FeBr ₃ COOH	1
	Name 3-methylbenzoic acid	
	(d) H2NCH2COOH NAND2 COOH HOCH3COOH	
	Name – 2- hydroxyethanoic acid	1
7		06 MA
3(a)	The intermolecular force between the molecules of different components in solution are equal to the magnitude of forces between pure component molecules (average cohesive forces)	01
(b)	Let the mole fraction of benzene in solution be x.	
	Partial V.P of benzene = Partial V.P of methylbenzene	
	(relevant formula)	03 🕏
	$Pb^{\theta}x = Pm^{\theta}(1-x)$	
	95.10 x = 28.4(1-x)	

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	x = 0.229959 (22.9959%)	
	mole fraction of methylbenzene = $1 - 0.2299 \approx 0.7700$	
0	Bouling point Vapour The boiling point of pure taluen The boling point of pure benzon The boling point of pure benzon	02 marks
- /2		06MARKS
4 (a)	$= B_a SO_{4(s)+aq \Rightarrow Ba_{(aq)}^{2+} + SO_{4(aq)}^{2-}} \text{rej BaSO}_{4(s)}$	01 marks
(ъ)	R.F.M of $SO_4^{2-} = 32.1 + 16 \times 4 = 96.1$ $ [SO_4^{2-}] = \frac{1.053 \times 10^{-3}}{96.1} $ $ = 1.095734 \times 10^{-5} \text{ moldm}^{-3} $ $ Ksp = [Ba^{2+}] [SO_4^{2-}] $	03 marks
	= (1.095734 x 10 ⁻⁵) ² =1:200632 x 10 ⁻¹⁰ mol ² dm ⁻⁶ units	1/2
(c)	(i) Solubility increases (ii) Lead (II) ions react with sulphate ions to form lead (ii) sulphate reducing the concentration of sulphate ions in the saturated solution. To restore the solubility product (equilibrium) more solid barium sulphate dissociates.	1 1 2
	1 2	06 MARKS
5(a)	 (i) Heat energy absorbed to break one mole of covalent bonds into its constituent free gaseous atoms. (ii) The atomic radius of chlorine is smaller than the atomic radius of iodine which is less electro negative. The hydrogen to chlorine bond is shorter, more polar and stronger than the hydrogen to iodine bond. Therefore, More heat is required to break the H-Cl bond than the H-I bond. 	01 mark

(b)	HCL does not react with sulphuric acid.	
	HI is oxidized to iodine by concentrated sulphuric acid which is reduced to sulphur dioxide and water.	1
	$2HI_{(g)} + H_2SO_{4(I)} \rightarrow SO_{2(g)} + I_{2(g)} + H_2O_{(I)}$	
6(0)		05
6(a)	CHECHO NOHECO (OF) - CHECH SCENTE /	
	NaHSQ3 coqs -> Nation+ HSQ3 coqs ~	
	CH3	02 -
(b)	OTNH2 CHOCCI OTNH- ECH3 or CH3 E-N-O	
	CH3 & CL CH3 &	021
		05 MAR
7(a)	Rate = $K[S_2O_3^2]$ [I]	01 mad
(b)	$K = \frac{Rate}{[S_2 O_8^{2-}][I^-]}$	1
	$=\frac{5.6\times10^{-4}}{0.05\times0.02}$	02 mari
	$= 0.56 \text{moldm}^3 \text{s}^{-1}$	
(c)	Iron(ii) ions (Fe ²⁺) acts as a catalyst.	
	It provides an alternative reaction path of lower activation energy. more $S_2O_8^{2-}$ and I^- ions have sufficient kinetic energy to overcome the activation energy, increasing the frequency of effective collisions.	02 mark
	12m 120	05 MAR

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8(a)	(i) Carbon forms gaseous oxides. (accept first 2) Carbon tetrachloride does not undergo hydrolysis	01 mark
	Carbon does not complexes	
	(ii) For carbon tetrachloride, carbon lacks the vacant 3 - d orbitals that	
	can accept the lone pair of electrons from water, hence no	01 mark
	hydrolysis. (for complex hydrolysis) For gaseous oxides, carbon forms double bonds with each	or mark
	oxygen atom $(0 = c = 0)$. This leads to formation of <u>discrete</u>	
1	molecules which are joined together by weak vander waals	
	forces that are broken at room temperature, hence enabling the	
(h)	oxide of carbon to exist as a gas.	
(b)	Carbon does not react with dilute nitric acid	
	Tin reduces dilute nitric acid to ammonium nitrate and itself oxidized	
	to tin (II) nitrate.	02 marks
	$4Sn_{(s)} + 10H_{(aq)}^{+} + NO_{3(aq)}^{-} \rightarrow 4Sn_{(aq)}^{2+} + NH_{4(aq)}^{+} + 3H_{2}O_{(l)}$	
	$4Sn_{(s)} + 10HNO_{3(ag)} \rightarrow 4Sn(NO_3)_{2(ag)} + NH_4NO_{3(ag)} + 3H_2O_{(l)}$	* *
		05 MARKS
2()	- 149年	UD IIII III
9(a)	14 C-2 Cur-ou	
*	(i) H ₂ C=CH=CH ₂	1/2
		_
	(ii) LCH, C-CHCH \	
	(ii) - CH ₂ C= CH CH ₂	1/2
(b)	R.F.M of monomer = $5 \times 12 + 8 \times 1$	
	= 68	1/2
	R.F.M of polymer = 68 x 820	
		-
	= 55,760	
(c)	- Car tyres	
	Medical gloves, catheters and seals, brake pads	01 marks
	 Making wetsuits, cycling shorts, balloons, erasers, conveyor belts etc. 	
	beits etc.	3½ MARKS
	SECTION B (54 MARKS)	
10/->		11/
10(a)	(i) The isomers contain <u>free chloride ions</u> which <u>react with silver</u> nitrate to form sparingly soluble silver chloride.	11/2
	$Ag^{+}_{(\alpha q)} + Cl^{-}_{(\alpha q)} \rightarrow AgCl_{(s)}$ (for reacting forming)	
1		

Cr(H2O)63+ - green

Variable oxidation states *2, *3 and *6

Catalytic activity - Cr/ polymerization of H.D.P.

Paramagnetic - eg with unpaired electrons in 3d - subshell.

	NA APRIL DE MARCHET	09 MA
(d)	$2Fe_{(\alpha q)}^{3+} + Zn_{(s)} \rightarrow 2Fe_{(\alpha q)}^{2+} + Zn_{(\alpha q)}^{2+}$	11/
(c)	$E_{cell}^{\theta} = E_R^{\theta} - E_L^{\theta}$ $\Delta G = -nE_{cell}^{\theta} F$ = 1.36 - 0.77 = '2x0.59 x 96500 = 0.59 volts = '113.87KJ	Qi
(b)	Patinum Patinum Patinum Patinum Patinum Satter Im Chloridenians Subhatte bridge (1M KCL cay) To salt bridge or 03 fully correct.	03
11(a)	Atomization energy Ionisation energy Enthalpy of hydration	12-;
(c)	 (i) The green solution turns vellow (ii) Hydrogen peroxide oxidizes chromium (III) ions in alkaline medium to chromate (VI) ions and itself reduced to water. 2Cr²⁺_(oq) +3H₂O_{2(oq)} +100H_(oq) →2CrO²⁻_{4(oq)} +8H₂O_(f) 	09 M.
(b)	(ii) X - Hexa aqua chromium (III) chloride (iii) [Cr(H ₂ O) ₄ Cl ₂] Cl ⁻ 2H ₂ O (iii) the Chi2 (Cl ⁻) ₂ H ₂ O Octoberhal Accept dative bonds without arrows.	

12 (a)	снзснзсоон to (Снзснз)20.	
	(NH) CO HEAT (N	04
(b)	reagent / condition Och H20/H PCH2 OCH H20/H Warm	02
0	CH3 CH3 to CH3 E-CODH Heat MADGINT Heat Habit CH3 CCH3 CH3 CH3 C-CN CH3 CCH3 20°C	03
		09 MARKS
13(a)	(i) $Kp = P NH_3 \times Pco_2$ (ii) $PNH_3 = \frac{2}{3} \times 1.20 = 0.8 \text{ atm}$ $Pco_2 = \frac{1}{3} \times 1.20 = 0.4 \text{ atm or } Pco_2 = 1.2 - 0.8 = 0.4 \text{ atm}$ $Kp = 0.8^2 \times 0.4$	1/ ₂
	$= 0.256 \text{ atm}^3$	
(b)	(i) Kp value increases The dissociation of ammonium carbamate is endothermic hence increasing temperature favours the forward reaction and increases the partial pressures of the gaseous products.	11/2
	(ii) Equilibrium position shifts from the left to right	
	Neon is an inert gas which decreases the partial pressures of	11/2
	ammonia and carbon dioxide.	
	ammonia and carbon dioxide. To restore the Kp value, more ammonium-carbamate dissociates.	

	carbonate. The reaction decreases the concentration of carbon dioxide at equilibrium. More solid ammonium carbamate	T
	dissociates to restore the equilibrium.	
-		10
14(a)	Reagent	100
	Fehling's solution and heat reject other reagents	
	Observation	
	CH ₃ CHO – reddish brown precipitate	
	OCH3-NO observable abange	
(b)	Reagent	
	Ammoniacal silver nitrate solution	
	Observations	
	HOCH2COOH - No observable change	
	HCOOH - silver mirror deposit	
(c)	Reagent	
	Hot concentrated sodium hydroxide solution/ dilute / acidified silver nitrate nitric acid followed by silver nitrate solution.	
	Observations	
	CH, CHCH, - white precipitate	,
	CH, CHCH, - Yellow precipitate	
15(a)	(i) $Cl_{2(g)} + 2I_{(ag)}^- \rightarrow 2Cl_{(ag)}^- + I_{2(ag)}$	09 M
(-)	(ii) Starch indicator	13
(b)	(ii) Staren indicator	<u></u>
(b)	Moles of $S_2O_1^{2-}$ ions = $\frac{23.8 \times 0.10}{1000}$	1
	= 2.38 x 10 ⁻³	
	$I_{2,n_{\ell}} + 2S_2O_{2,n_{\ell}}^2 \rightarrow S_4O_{\ell,n_{\ell}}^2 + 2I_{(n_{\ell})}^2$	
	Moles of $I_z = \frac{1}{2} \times 2.3 \times 10^{-3}$	

	$= 1.19 \times 10^{-3}$	
	Moles of I ₂ in 500cm ³ of solution $=\frac{500}{25.0}$ x 1.19 x 10 ⁻³	
	= 0.0238	05
	$MnO_2: Cl_2 = 1:1$ and $I_2: Cl_2 = 1:1$	
	:: Moles of MnO ₂ in pyrolusite = 0.0238	
	Mass of pure $MnO_2 = 0.0238 \times (54.9 + 16 \times 2)$	
	= 2.06822g	
	% of MnO ₂ = $\frac{2.06822}{2.40}$ x 100	
	= 86.176%	
c)	(i) MnO ₄ ²⁻ or Manganate (VI) ions	1/2
	(ii) $3MnO_{4(aq)}^{2-} + 4H_{(aq)}^{+} \rightarrow 2MnO_{4(aq)}^{-} + MnO_{2(z)} + 2H_{2}O_{(l)}$	1/2
		09 MARKS
16.(a)	(i) The depression in freezing point of 1000g of solvent caused by dissolving one mole of non-volatile solute	. 01
	(ii) 200g of benzene dissolved 4.6g of solute.	
	1000g of benzene dissolved $\left(\frac{1000 \times 4.6}{200}\right)$ g of solute.	
	= 23g	
	1 400 1 1 1 1 1 1 10	
	1.28k is the depression caused by 23g	
	5.12k is the depression caused by $\frac{23g}{1.28}$	03
		03
	5.12k is the depression caused by $\left(\frac{5.12 \times 23}{1.28}\right)$	03
	5.12k is the depression caused by $\left(\frac{5.12 \times 23}{1.28}\right)$ = 92 Molar mass = 92g/mol. (iii) Observed molar mass is twice the theoretical value (R.F.M of HCOOH = 46)	03
	5.12k is the depression caused by $\left(\frac{5.12 \times 23}{1.28}\right)$ = 92 Molar mass = 92g/mol. (iii) Observed molar mass is twice the theoretical value (R.F.M of	03

Enthalpy o	= 2			5.25KJr	nol ⁻¹					9 MARK	
	= 2				100 (20)						
	,			= 215.25KJ							
1 mole evolved $\left(\frac{3.444}{0.016}\right)$ KJ											
										04	
= 0.016											
$Moles of CuSO_4 = \frac{50 \times 0.32}{1000}$											
= 3.444J											
= 50 x 4.2 x 16.4											
Heat evolved = mc ΔTmax											
= 50g										92	
Mass of solution = 50 x 1.0											
$\Delta T = (16.40 \pm 0.20)^{0} C$ from graph.								+			
At 6 correct ΔT values.											
					120	130	100			03	
	0.0		1775-5-5-5							01	
AT (00)	Inn	74	11.4	12 0	14 0	140	14.6	142		01	
Heat change that occurs when one mole of a less electropositive metal is displaced from its aqueous solution by a more reactive (electropositive) metal.									Gi		
								sitive me	tal	O) MA	
The same of		.0(,)			-				-	09 MA	
		.O∞ ←	HCOC	OH+0	н						
Methanoic acid and excess hydroxide ions hence the solution is								s			
							rm we	<u>ak</u>			
			•				-				
Reject dissociate											
	(ii) Method method or Ho Sodius Method alkali HCO Time(s) AT (°C) Time(s) (Graph at At 6 correduction of Sodius Mass of sodius Method alkali HCO Time(s) (Graph at At 6 correduction of Sodius Moles of Control of Contr	(ii) Methanoic a methanoate Or HCOOH Sodium methanoic a alkaline HCOO + Hat Heat change that is displaced from (electropositive) AT (°C) 0.0 Time(s) 0 (Graph at the bat At 6 correct AT and	(ii) Methanoic acid reamethanoate Or HCOOH + NaO Sodium methanoate Methanoic acid and alkaline HCOO + H ₂ O ₍₁₎ = Heat change that occurs is displaced from its aqui (electropositive) metal. ΔT (°C) 0.0 7.4 Time(s) 0 30 (Graph at the back) At 6 correct ΔT values. ΔTmax = (16.40 ± 0.20) Mass of solution = 50 x = 50g Heat evolved = mc ΔTm = 50 x 4.2 x = 3.444J Moles of CuSO ₄ = 50 x 0.000 = 0.016	(ii) Methanoic acid reacts with methanoate Or HCOOH + NaOH → H Sodium methanoate under Methanoic acid and excess alkaline HCOO + H ₂ O ₍₁₎ ≒ HCOO Heat change that occurs when a sis displaced from its aqueous so (electropositive) metal. \[\Delta T (\text{°C}) 0.0 7.4 11.4 \] Time(s) 0 30 60 (Graph at the back) At 6 correct \(\Delta T \) values. \[\Delta T \text{max} = (16.40 ± 0.20) \text{°C} \) from Mass of solution = 50 x 1.0 \[= 50g Heat evolved = \text{mc} \Delta T \text{max} \] \[= 50 \text{ x 4.2 x 16.4} \] \[= 3.444 \text{ J} Moles of CuSO ₄ = \frac{50 \text{ x 0.32}}{1000} \] \[= 0.016 0.016 \text{ moles evolved 3.444 K J}	(ii) Methanoic acid reacts with sodiumethanoate Or HCOOH + NaOH → HCOON Sodium methanoate undergoes by Methanoic acid and excess hydrogalkaline HCOO + H ₂ O ₍₁₎ ≒ HCOOH + O Heat change that occurs when one mois displaced from its aqueous solution (electropositive) metal. \[\Delta T (\text{OC}) 0.0 7.4 11.4 13.8 \\ \Time(s) 0 30 60 90 \\ (Graph at the back) At 6 correct \Delta T values. \[\Delta Tmax = (16.40 ± 0.20)\text{OC} \text{ from graph} \] Mass of solution = 50 x 1.0 = 50g Heat evolved = mc \Delta Tmax = 50 x 4.2 x 16.4 = 3.444J Moles of CuSO ₄ = \frac{50 x 0.32}{1000} = 0.016 0.016 moles evolved 3.444KJ	(hydroxonium) ions into solution. (ii) Methanoic acid reacts with sodium hydmethanoate Or HCOOH + NaOH → HCOONa(aq) + Sodium methanoate undergoes hydrolys Methanoic acid and excess hydroxide io alkaline HCOO + H ₂ O(1) ⇒ HCOOH + OH Heat change that occurs when one mole of a is displaced from its aqueous solution by a m (electropositive) metal. ΔT (°C) 0.0 7.4 11.4 13.8 14.8 Time(s) 0 30 60 90 120 (Graph at the back) At 6 correct ΔT values. ΔTmax = (16.40 ± 0.20)°C from graph. Mass of solution = 50 x 1.0 = 50g Heat evolved = mc ΔTmax = 50 x 4.2 x 16.4 = 3.444J Moles of CuSO ₄ = 50 x 0.32/1000 = 0.016 0.016 moles evolved 3.444KJ	Give (ii) Methanoic acid reacts with sodium hydroxide methanoate Or HCOOH + NaOH → HCOONa(aq) + H ₂ O(t) Sodium methanoate undergoes hydrolysis to for Methanoic acid and excess hydroxide ions hence alkaline HCOO + H ₂ O(t) ≒ HCOOH + OH Heat change that occurs when one mole of a less elective is displaced from its aqueous solution by a more react (electropositive) metal. \[\text{\text{AT}} (\text{\text{\text{0C}}}) = \text{\text{0.0}} \text{\text{7}} \text{11.4} \text{13.8} \text{14.8} \text{14.8} \\ \text{\text{Time}(s)} = \text{0} \text{30} \text{60} \text{90} \text{150} \\ \text{\text{Graph at the back}} \\ \text{AT max} = (16.40 ± 0.20)\text{\text{0C}} \text{ from graph.} \\ \text{Mass of solution} = 50 \times 1.0 \\ \text{= 50g} \\ \text{Heat evolved} = \text{mc} \text{\text{\text{CTmax}}} \\ \text{= 50 x 4.2 x 16.4} \\ \text{= 3.444J} \\ \text{Moles of CuSO4} = \frac{50 \times 0.32}{1000} \\ \text{= 0.016} \\ 0.016 \text{ moles evolved 3.444KJ} \\ \text{1 mole evolved} \left(\frac{3.444}{0.016} \right) \text{KJ}	(ii) Methanoic acid reacts with sodium hydroxide to form methanoate Or HCOOH + NaOH → HCOONa(ac) + H2O(0) Sodium methanoate undergoes hydrolysis to form we Methanoic acid and excess hydroxide ions hence the salkaline HCOO + H2O(0) ≒ HCOOH + OH Heat change that occurs when one mole of a less electroposis displaced from its aqueous solution by a more reactive (electropositive) metal. ΔT (°C) 0.0 7.4 11.4 13.8 14.8 14.8 14.6 Time(s) 0 30 60 90 120 150 180 (Graph at the back) At 6 correct ΔT values. ΔTmax = (16.40 ± 0.20)°C from graph. Mass of solution = 50 x 1.0 = 50g Heat evolved = mc ΔTmax = 50 x 4.2 x 16.4 = 3.444J Moles of CuSO ₄ = 50 x 0.32 1000 = 0.016 0.016 moles evolved (3.444KJ) I mole evolved (3.444KJ) I mole evolved (3.444KJ)	Reject dissord Give ½ for equation of Methanoic acid reacts with sodium hydroxide to form sodium methanoate Or HCOOH + NaOH → HCOONa(aa) + H2O(b) Sodium methanoate undergoes hydrolysis to form weak Methanoic acid and excess hydroxide ions hence the solution is alkaline HCOO + H2O(b) ≒ HCOOH + OH Heat change that occurs when one mole of a less electropositive metis displaced from its aqueous solution by a more reactive (electropositive) metal. ΔT (°C) 0.0 7.4 11.4 13.8 14.8 14.8 14.6 14.2 Time(s) 0 30 60 90 120 150 180 210 (Graph at the back) At 6 correct ΔT values. ΔTmax = (16.40 ± 0.20)°C from graph. Mass of solution = 50 x 1.0 = 50g Heat evolved = mc ΔTmax = 50 x 4.2 x 16.4 = 3.444J Moles of CuSO4 = 50 x 0.32 1000 = 0.016 0.016 moles evolved 3.444KJ	Reject dissociate Give ½ for equation only. (ii) Methanoic acid reacts with sodium hydroxide to form sodium methanoate Or HCOOH + NaOH → HCOONa(aq) + H₂O(n) Sodium methanoate undergoes hydrolysis to form weak Methanoic acid and excess hydroxide ions hence the solution is alkaline HCOO + H₂O(n) ← HCOOH + OH Heat change that occurs when one mole of a less electropositive metal is displaced from its aqueous solution by a more reactive (electropositive) metal. ΔT (°C) 0.0 7.4 11.4 13.8 14.8 14.8 14.6 14.2 Time(s) 0 30 60 90 120 150 180 210 (Graph at the back) At 6 correct ΔT values. ΔTmax = (16.40 ± 0.20)°C from graph. Mass of solution = 50 x 1.0	

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