

Taxila Central College – Horana
General Certificate of Education (Ad. Level) Examination -2021,

Grade 13

3rd TERM TEST –NOVEMBER -2021

CHEMISTRY/02E

PAPER I

TIME :2 HOURS

Universal gas constant $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$

Avogadro constant $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$

Planck's constant $h = 6.626 \times 10^{-34} \text{ Js}$

Velocity of light $C = 3 \times 10^8 \text{ ms}^{-1}$

1. The scientists that introduced wave properties for small particles in definite condition is,

1. Albert Einstein.

2. Max Planck.

3. Niels Bohr

4. De Broglie.

5. Rutherford

2. Number of electrons in Sc^{3+} having azimuthal quantum number $l = 1$ and magnetic quantum number $m_l = -1$ respectively,

1. 2 and 6

2. 6 and 10

3. 6 and 2

4. 10 and 4

5. 12 and 4

3. Find group of M in the periodic table which M is an element in 3rd period and which makes polar covalent compound MCl_2 .

1. 2

2. 13

3. 14

4. 15

5. 16

4. Number of resonance structures that can be drawn for HN_3 is,

1. 2

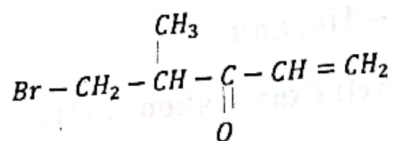
2. 3

3. 4

4. 5

5. 6

5. IUPAC name of the compound given below is,



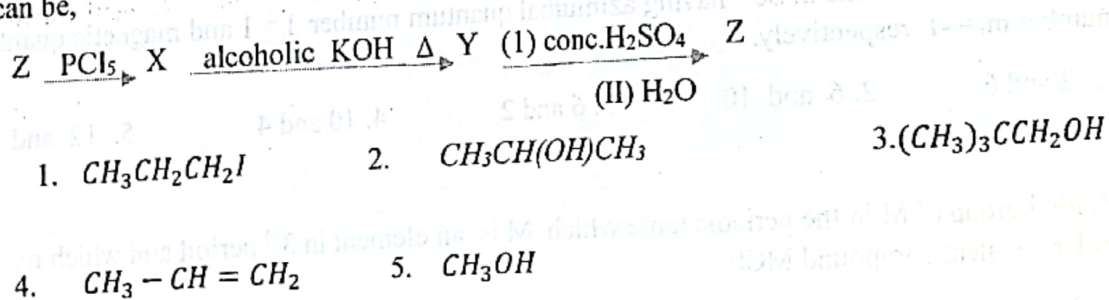
1. 1-bromo-2-methylpent-1-en-3-one
2. 5-bromo-4-methylpent-1-en-3-one
3. 1-bromo-2-methylpent-1-eneone
4. 5-bromo-4-methylpent-1-enol
5. 1-bromo-2-methylpentene-3-one

6. Molecules or ions having same shape is/ are,

- A) HF_2O^+ B) ClO_3^- C) OF_2 D) NO_3^- E) NF_3
1. A and B
 2. A and D
 3. A, B and E
 4. C and D
 5. B, C and D

7. Consider reaction chain given below.

Z can be,



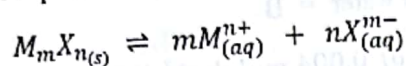
8. Nitrogen(IV) oxide is given by the complete reaction of 3mol of nitrogen(II) oxide with 2mol of O_2 . Volume of mixture is 0.8314 m^3 at 400K . Calculate pressure of the mixture of gas in Nm^{-2} if temperature remains constant.

1. 3000
2. 6000
3. 8000
4. 14000
5. 16000

9. Select correct ascending order of boiling point of the compound given.

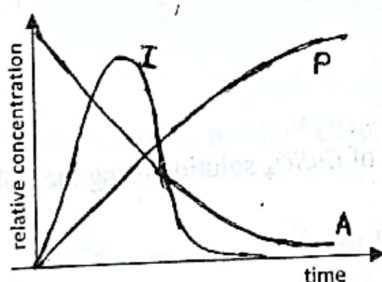
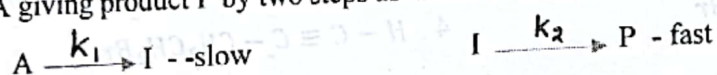
1. $C_2H_5OH < C_2H_6 < C_2H_5F < H_2O$
2. $C_2H_6 < C_2H_5F < H_2O < C_2H_5OH$
3. $C_2H_5F < C_2H_6 < C_2H_5OH < H_2O$
4. $C_2H_6 < C_2H_5F < C_2H_5OH < H_2O$
5. $C_2H_6 < C_2H_5OH < C_2H_5F < H_2O$

10. M_mX_n salt is in equilibrium with the solubility S in an aqueous solution. Correct relationship between K_{sp} of M_mX_n and S is,



1. $S = \frac{K_{sp}}{m^m n^n}$
2. $S = \left[\frac{K_{sp}}{m^m n^n} \right]^{\frac{1}{(m+n)}}$
3. $S = K_{sp} \times m^m n^n$
4. $S = \left[\frac{m^m n^n}{K_{sp}} \right]^{\frac{1}{(m+n)}}$
5. $S = \sqrt{K_{sp} m^m n^n}$

11. A giving product P by two steps as follows. It can be represented as follows.



Incorrect statement regarding above reaction is,

1. Concentration of reactant A decreases by time.
2. Intermediate I increases to maximum within short periods of time and drops to the zero.
3. Concentration of product P increases to definite value.
4. Molecularity of the reaction is 2.
5. Rate equation is $R = -K_1[A]$

12. Descending order of bond angles of NF_3 , NH_3 , $NOCl$, NO_2^+ NF_3 is,

1. $NF_3 > NH_3 > NOCl > NO_2^+$
2. $NO_2^+ > NOCl > NH_3 > NF_3$
3. $NO_2^+ > NH_3 > NF_3 > NOCl$
4. $NO_2^+ > NOCl > NF_3 > NH_3$
5. $NF_3 > NOCl > NH_3 > NO_2^+$

13. Dissociation constant of weak acid HA at $25^\circ C$ is $1 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$. Solution P is 0.02 mol dm^{-3} of HA . 10 cm^3 solution P is mixed to get following B, C, D solutions

10 cm^3 of solution P + 10 cm^3 of water = B

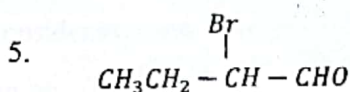
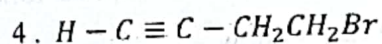
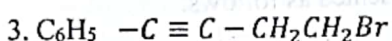
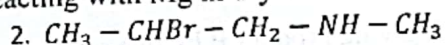
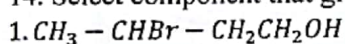
10 cm^3 of solution P + 10 cm^3 of $0.004 \text{ mol dm}^{-3} HCl$ = C

10 cm^3 of solution P + 10 cm^3 of $0.004 \text{ mol dm}^{-3} NaOH$ = D

Decreasing order of concentration ion A – in above B, C, D solutions at $25^\circ C$ is,

1. $B > C > D$
2. $B > D > C$
3. $D > B > C$
4. $D > C > B$
5. $C > D > B$

14. Select component that gives Grignard Reagent by reacting with Mg in dry ether



15. Select correct statement regarding electrolysis of $CuSO_4$ solution using inert electrodes is,

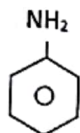
1. H_2 evolves at the anode
2. O_2 evolves at the cathode.
3. Cu deposits on Anode.
4. SO_4^{2-} and OH^- ions attracted towards cathode.
5. Blue colouration of solution increases gradually.

16. $A(g) \longrightarrow B(g) + C(g)$ is an elementary reaction. Pressure of the system at $t=0$ is P_1 , and pressure of the system at $t = t$ is P_2 . Rate of this reaction is,

1. $2P_1 - P_2$
2. $P_2 - P_1$
3. $P_1 - P_2$
4. $P_2 - 2P_1$
5. $2P + P_1$

17. Compound Y given by reaction of compound X when adding NaNO_2 and dil.HCl . Y reacts with acidified, KMnO_4 to give Z. Z gives orange precipitate with 2,4-DNP. X is,

1



2. $\text{C}_2\text{H}_5\text{CONH}_2$

3. $\text{C}_2\text{H}_5\text{CH}_2\text{CHNH}_2\text{CH}_3$

4. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$

5. $\text{CH}_3\text{CH}_2\text{COCH}_3$

18. A reaction is non spontaneous when increasing temperature however this reaction is spontaneous at room temperature and 1 atm pressure. Correct signs for this reaction at room temperature is,

	ΔG	ΔH	ΔS
1.	0	+	-
2.	-	-	-
3.	-	-	+
4.	+	+	+
5.	+	-	-

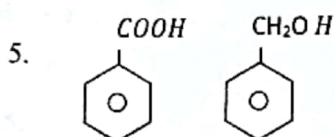
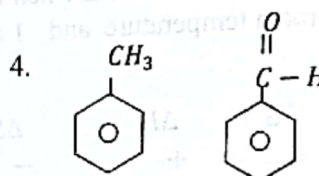
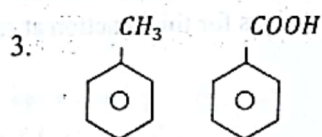
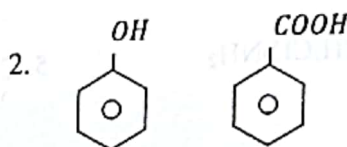
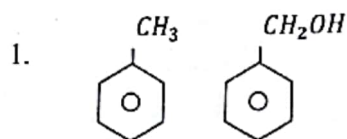
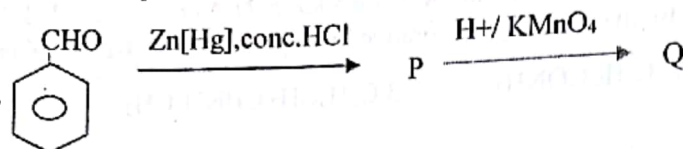
19. Dissociation constant of $\text{C}_1 \text{ mol dm}^{-3} \text{CH}_3\text{COOH}$ k_1 and dissociation constant of $\text{C}_2 \text{ mol dm}^{-3} \text{HCOOH}$ k_2 are mixed together. Correct expression for H^+ concentration of solution is,

- | | | |
|--|------------------------------------|-------------------------------|
| 1. $k_1 C_1 + k_2 C_2$ | 2. $k_1 C_1 - k_2 C_2$ | 3. $\sqrt{k_1 C_1 + k_2 C_2}$ |
| 4. $\frac{k_1}{k_2} = \frac{C_1}{C_2}$ | 5. $\sqrt{k_1 C_1 \times k_2 C_2}$ | |

20 Correct descending order of ionic radius of given species S^{2-} , Cl^- , K^+ , Ca^{2+} is,

- | | |
|--|--|
| 1. $\text{S}^{2-} > \text{Cl}^- > \text{K}^+ > \text{Ca}^{2+}$ | 2. $\text{Cl}^- > \text{S}^{2-} > \text{K}^+ > \text{Ca}^{2+}$ |
| 3. $\text{S}^{2-} > \text{Cl}^- > \text{Ca}^{2+} > \text{K}^+$ | 4. $\text{Ca}^{2+} > \text{K}^+ > \text{S}^{2-} > \text{Cl}^-$ |
| 5. $\text{K}^+ > \text{Ca}^{2+} > \text{Cl}^- > \text{S}^{2-}$ | |

21. Consider sequence of reaction given below and P and Q respectively is,



22. Calculate number of moles of MnO_4^- needed to react with 1 mol of H_2O_2 in acidic medium when H_2O_2 react with MnO_4^- in an acidic medium to give O_2 , Mn^{2+} , and H_2O .

1. 0.4 mol 2. 0.8 3. 2.0 4. 2.5 5. 5.0

23. Volume of 0.1 mol dm^{-3} NaOH needed to react with 25 cm^3 0.1 mol dm^{-3} HA to become $[\text{HA}] = [\text{A}^-]$

1. 12.50 cm^3 2. 25.00 cm^3 3. 37.50 cm^3
4. 6.25 cm^3 5. 50.00 cm^3

24. Calculate the concentration of Cu^{2+} ion when it is saturated with copper hydroxide solution at $\text{pH} = 10$ at 298K.

$$K_{sp}(\text{Cu}(\text{OH})_2) = 2.2 \times 10^{-20} \text{ mol}^3 \text{ dm}^{-9}$$

1. $2.2 \times 10^{-16} \text{ mol dm}^{-3}$
2. $2.2 \times 10^{-12} \text{ mol dm}^{-3}$
3. $22 \times 10^{-16} \text{ mol dm}^{-3}$
4. $(4.4) \times 10^{-20} \text{ mol dm}^{-3}$
5. $44 \times 10^{-18} \text{ mol dm}^{-3}$

25. Standard electrode potential of electrochemical cell $\text{Cu}_{(s)} | \text{Cu}_{(aq)}^{2+} || \text{Ag}_{(aq)}^+ | \text{Ag}_{(s)}$ is 0.46 V. calculate electrode potential of the cathode.

$$E^\circ_{\text{Cu}_{(aq)}^{2+}/\text{Cu}_{(s)}} = +0.34 \text{ V}$$

1. +0.42 V
2. +0.12 V
3. +0.80 V
4. -0.42 V
5. -0.80 V

26. 75 cm^3 of aqueous solution of E is mixed with 50 cm^3 CHCl_3 and allowed to reach equilibrium at room temperature. 75% of E extracted to the organic layer at equilibrium. Calculate distribution coefficients K_D between CHCl_3 and water.

1. 0.25
2. 0.9
3. 4.5
4. 9.0
5. 45

27. K_c value of reaction $\text{A(g)} \rightleftharpoons \text{B(g)} + \text{C(g)}$ is 2×10^{-3} , after t. time composition of each in mixture $[\text{A(g)}] = [\text{B(g)}] = [\text{C(g)}] = 3 \times 10^{-4} \text{ mol dm}^{-3}$. Correct statement regarding this reaction is,

1. Reaction occurs towards forward direction due to $Q_c < K_c$
2. Reaction is in equilibrium due to $Q_c = K_c$
3. Reaction occurs back world reaction do to $Q_c < K_c$
4. Reaction tend to backward reaction due to $Q_c > K_c$
5. Reaction tend to forward reaction due to $Q_c > K_c$

28. Select reaction that is not involved in Born Haber cycle of formation of $\text{MgCl}_{2(s)}$.

1. $\text{Mg}_{(s)} \rightarrow \text{Mg}_{(g)}^+ + e$
2. $\text{Mg}_{(g)} \rightarrow \text{Mg}_{(g)}^+ + e$
3. $\text{Cl}_{2(g)} \rightarrow 2\text{Cl}_{(g)}$
4. $e + \text{Cl}_{(g)} \rightarrow \text{Cl}_{(g)}^-$
5. $\text{Mg}_{(g)}^{2+} + 2\text{Cl}_{(g)}^- \rightarrow \text{MgCl}_{2(s)}$

29. Correct statement regarding polymer is,

1. Teflon is thermosetting polymer.
2. Polystyrene is condensation polymer.
3. Nylon -6,6- is thermosetting polymer.
4. Bakelite form due to addition polymerization of phenol and formaldehyde.
5. Elasticity of natural rubber is due to cis- polyisoprene chains.

30. Reaction $A + B \longrightarrow C$ is zeroth order with respect to B and first order with respect to A. Select the correct statement regarding that time taken to reduce concentration of B exactly half is,

1. It depends on initial concentration of B and does not depend on initial concentration of A.
2. It depends on initial concentration A and does not depend on the initial concentration of B
3. It depends on initial concentrations of both A and B.
4. It does not depend on initial concentration of both A and B.
5. Only concentration of A depends on the reaction rate.

• For each of the questions 31 to 40, one or more responses out of the four responses (a), (b), (c) and (d) given is/are correct. Select the correct response/responses in accordance with the instructions given on your answer sheet,

Mark (1) If only (a) and (b) are correct.

(2) If only (b) and (c) are correct.

(3) If only (c) and (d) are correct.

(4) If only (d) and (a) are correct.

(5) If any other number or combination of responses is correct.

Summary of above Instructions,

1	2	3	4	5
Only (a) and (b) are correct	Only (b) and (c) are correct	Only (c) and (d) are correct	Only (a) and (d) are correct	Any other number or combination of responses is correct

31. Select correct statement or statements regarding chemistry of ammonia.

- a. It acts as both acid and a base.
- b. It can act as both oxidizing agent and reducing agent.
- c. It reacts sodium to make Na_3N .
- d. Makes hydrogen bonds with water.

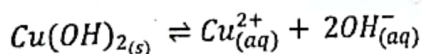
32. Correct statement regarding alkynes is/are,

- a. All alkynes react with sodium and evolve ammonia.
- b. Alkynes with terminal hydrogen are less acidic than that of alcohols and water.
- c. Make acetylides with Ag^+ and Cu^{2+} ions to make insoluble metal acetylides.
- d. All carbon atoms in alkynes are sp hybridized.

33. Correct statement regarding the endothermic reaction which occurs spontaneously at constant temperature and pressure is /are,

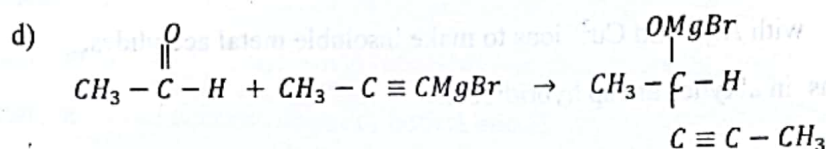
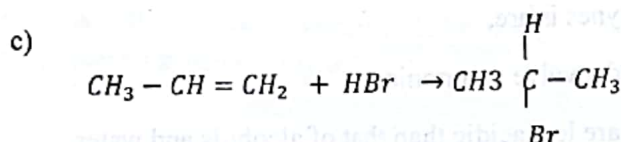
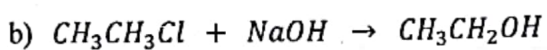
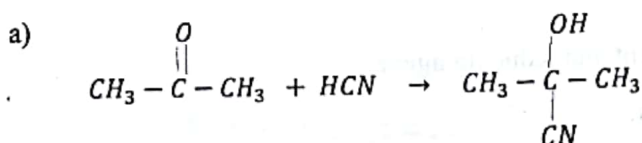
- a. Entropy change is positive.
- b. Entropy change is negative.
- c. The value of ΔH is greater than $T\Delta S$.
- d. The value of ΔH is less than $T\Delta S$.

34. Correct statement regarding given equilibrium system is,

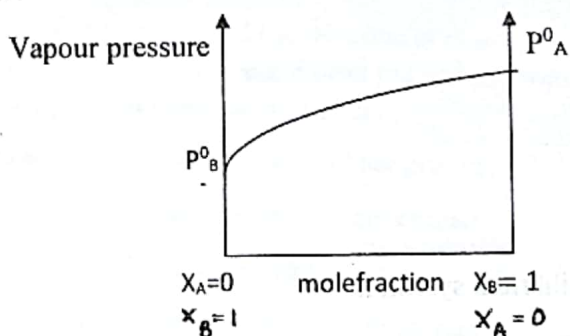


- a. Increasing pH value increases the solubility of $\text{Cu}(\text{OH})_{2(s)}$.
- b. Decreasing the pH value equilibrium tends towards left.
- c. The solubility of $\text{Cu}(\text{OH})_{2(s)}$ increases by adding dilute ammonia solution drop by drop.
- d. Increasing temperature, increases the solubility.

35. Select the nucleophilic addition reactions / reaction,



37. Select correct statement regarding vapor pressure, composition curve given for nonideal A,B mixture



- Attraction forces A-A and B-B are stronger than A-B.
- Attraction forces of A-A and B-B are ^{weaker} stronger than A-B.
- Heat evolves when mixing A and B liquids.
- Heat absorbs when mixing A and B liquids.

37. Select correct statement / statements regarding compounds of group 16 elements in periodic table

- a. H_2O_2 has both oxidizing and reducing abilities.
- b. Rhombic sulfur is the most stable allotrope of sulfur.
- c. No reduction of SO_4^{2-} ion to either S or S^{2-}
- d. $\text{S}_2\text{O}_3^{2-}$ is reducing agent.

38. Select statement that can be applicable for all Co, Ni, Zn

- a. Transition metals.
- b. They make colored complexes with aqueous ammonia.
- c. Stable ion of them are divalent cation
- d. Hydroxides of them are coloured

Following paragraph is for question number 39 and 40

A and B liquids make ideal solution when they mixed. Their saturated vapor pressure P_A^0 and P_B^0 respectively. Equimolar a mixture of A and B are added to the rigid container allowed to attain equilibrium. The mole fractions of A and B in liquid phase is X_A and X_B and vapour phase Y_A and Y_B respectively. Pressures of A and B at equilibrium are P_A and P_B respectively. The boiling points of A and B at the equilibrium are T_A and T_B .

39. Correct statement regarding A and B.

- a) $X_A > 0.5 > X_B$
- b) $Y_A < 0.5 < Y_B$
- c) $Y_A > 0.5 > Y_B$
- d) $X_A > 0.5 > Y_B$

40. Correct statement regarding properties of A and B.

- a) $T_A > T_B$
- b) $T_B > T_A$
- c) $P_A + P_B > P_A^0$
- d) $P_A^0 X_A + P_B^0 (1 - X_A) < P_B^0$

In question numbers 41 to 50, two statements are given in respect of each question. From the table given below, select the response out of the responses (1), (2), (3), (4) and (5) that best fits the two statements and mark appropriately on your answer sheet.

Response	1 st Statement	2 nd Statement
1	True	True 1 st statement is explained correctly
2	True	True 1 st statement is not explained correctly
3	True	False
4	False	True
5	False	False

	First statement	Second statement
41.	F ₂ is more reactive from the halogens.	Bond energy of F ₂ is the minimum from halogens.
42.	Always Methyl orange used as indicator in titration between HCl and NH ₃ (aq)	pH of the equilibrium point of titration between HCl and NH ₃ (aq) is less than 7 because of hydrolysis of NH ₄ ⁺ ion.
43.	It is not suitable to heat higher temperatures during extraction of essential oils.	Most of the essential oils get decomposed or get polymerized due to heat.
44.	Compressibility factor becomes zero when pressure of any gas decreases.	Intermolecular forces become strong when decreasing pressure.
45.	Those are not mirror images of each other are diastereomers.	Asymmetric carbon atoms bonded to four asymmetric groups.
46.	Benzene undergoes electrophilic substitution reactions	Benzene ring is stable due to delocalized π electron cloud.
47.	NH ₄ OH reacts with aqueous CO ₂ to give NH ₄ HCO ₃ is an exothermic reaction.	Ammonium hydroxide is basic gas and carbon dioxide is acidic gas.
48.	Tertiary alkyl halides undergo nucleophilic substitution reactions.	Tertiary carbocation is more stable than primary carbocation.
49.	The slowest step of the multi-step reaction determines the rate of the reaction.	Molecularity of any reaction is same as stoichiometry of the reaction.
50.	All HFC, CFC, HCFC are greenhouse gases.	Any gas that absorbs IR rays are greenhouse gas.

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3rd TERM TEST –NOVEMBER -2021- CHEMISTRY

PAPER 11

TIME:2HOURS

PART B- Answer only two questions

5) Gas A achieves an equilibrium $a A_{(g)} \rightleftharpoons b B_{(g)}$ above $100^{\circ}C$ temperature by partial decomposition.

Equilibrium point of above equilibrium shifts towards right by increasing temperature of this system from 400 K to 500K.

i. Mention sign of the ΔH of above reaction and explain it by giving reasons.

ii. 2mol of A allows to get reacted at 400K. Then total number of moles increases by 40% than initial when 40% of A reacted. Calculate "a / b" ratio.

iii. Using calculation done in (ii) decide sign of the ΔS and explain your answer.

iv. Calculate Q_p if total pressure of above mixture is 2.1 kPa at 400K.

v. State whether the system achieved equilibrium or not if $K_p = 5 \times 10^3 Pa$

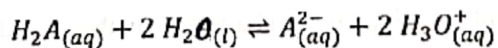
vi. Deduce the reaction as spontaneous or not by considering sign of the ΔG relevant to above (iv)th question.

vii. 2 mol gaseous A inserted to the system at 400K and allows to achieve equilibrium. The system achieved equilibrium after five minutes then 2 mol of B available in the system. Draw graph between concentration A and B with time.

viii. Solid catalyst is added to above system at 400K and then allows to achieve equilibrium. Draw the graph between concentration of A and B with time in same graph (use dash lines).

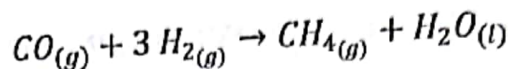
b) K_{a1} and K_{a2} of dibasic acid H_2A are $3.2 \times 10^{-6} \text{ mol dm}^{-3}$ and $1 \times 10^{-7} \text{ mol dm}^{-3}$ respectively at $25^{\circ}C$.

i. Calculate K_c of the reaction given at $25^{\circ}C$.



ii. Calculate pH value of $0.1 \text{ mol dm}^{-3} H_2A$ solution.

C) Consider reaction occurs at 25°C.



	Standard enthalpy of formation (KJmol ⁻¹)	Standard entropy (J mol ⁻¹ k ⁻¹)
CH _{4(g)}	-751	186
H ₂ O _(l)	-286	70
CO _(g)	-111	198
H _{2(g)}	0	131
CO _{2(g)}	-393	214

- Deduce whether the reaction is spontaneous by doing calculation at 25°C.
- Explain reasons for your answer.
- Calculate the temperature if the reaction is not spontaneous.

06)i. Write down Rault's law

ii. A and B are two immiscible binary ideal solution. Saturated vapour pressures of A and B are P_A⁰ and P_B⁰. Partial pressures of A and B are P_A and P_B. Mole fractions of A and B in liquid phase X_A and X_B respectively. Mole fractions of A and B in vapour phase is Y_A and Y_B respectively. Build relationship for Y_A and Y_B with other terms.

iii. Saturated vapour pressures of A and B at 25°C are 45KPa and 60KPa. 2mol A and 3mol of B mixed to get ideal binary solution. Calculate mole fraction of A and B in vapour phase.

iv. Draw temperature -composition phase diagram for above system.

v. Mark following points on diagram you have drawn above. Indicate points as given.

A) Composition of liquid X₁ when 2 mol of A and 3 mol of B in liquid phase.

B) Boiling point T₁ of liquid at composition X₁.

C) Composition of vapour Y_1 when boiling the liquid at T_1 which is in equilibrium with its liquid.

D) Composition X_2 when condensing the gas with composition Y_1 .

c. Dilute AgNO_3 solution is added dropwise to the 25cm^3 mixture of 0.1mol dm^{-3} KCl and 0.01mol dm^{-3} K_2CrO_4 solution.

i. Which compound get precipitated first, show it by doing calculation.

ii. Calculate the ion concentration got precipitated initially when 2nd salt get precipitated.

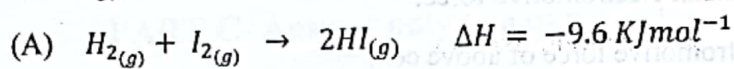
iii. Calculate the mass of 1st salt got precipitated when 2nd salt started to precipitate.

$$K_{sp}(\text{AgCl}) = 1.6 \times 10^{-10} \text{ mol}^2 \text{ dm}^{-6}$$

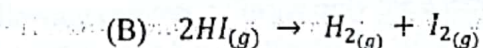
$$K_{sp}(\text{Ag}_2\text{CrO}_4) = 9.0 \times 10^{-12} \text{ mol}^3 \text{ dm}^{-9}$$

$$(\text{Ag}=108, \text{Cl}=35.5, \text{Cr}=52, \text{O}=16)$$

c) Activation energy of following reaction is $+173.2\text{kJ mol}^{-1}$

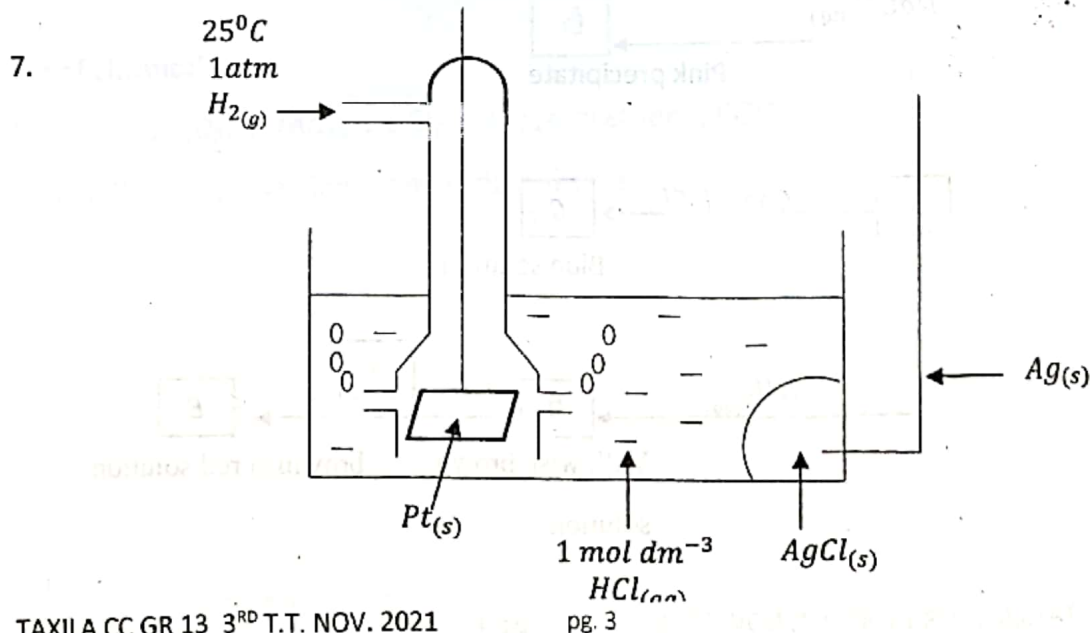
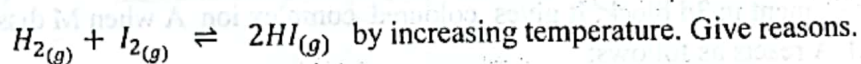


i. Calculate activation energy of following reaction (B)



ii. How does reaction rates of reactions A and B affect when increasing temperature.

iii. Deduce the direction of equilibrium point of reaction



An electrochemical cell is made as above

$$E^\ominus_{H^+_{(aq)}/H_{2(g)}} = 0.00V$$

$$E^\ominus_{AgCl(s)/Ag(s)} = +0.22V$$

i. Write balanced chemical equations for the following when current flows through the cell.

A. Anode reaction

B. Cathode reaction

C. Cell reaction

ii. Write IUPAC notation of the electrochemical cell.

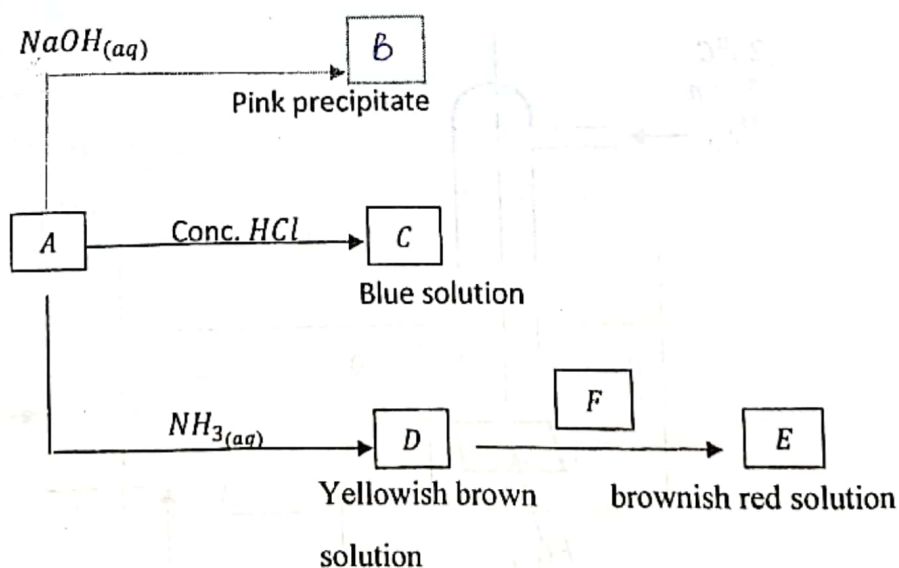
iii. What do you mean electromotive force.

iv. Calculate electromotive force of above cell.

v. Indicate the direction of electron flows in above cell while current flows.

b. 50cm^3 of aqueous CuSO_4 solution is electrolysed by using Pt electrodes. 9.65s needed to deposit all Cu^{2+} ions as Cu on cathode by passing 10^{-2}A current. Calculate Cu^{2+} ions concentration in the solution.

c. M is element in 3d block. It gives coloured complex ion A when M dissolves in dil. HCl. A reacts as follows:

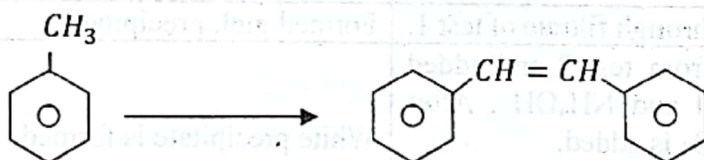


Hint : F is compound with two elements which belongs to initial periods of the periodic table.

- Identify element M. Give oxidation state of M in complex ion A.
- Write electron configuration of M in complex ion A.
- Write chemical formulae of A, B, C, D, E, and F.
- Write IUPAC names of A, C, D, and E.
- Write colour of A.
- Write balanced chemical equation that D, F react to give E.
- What would be the observation by passing H_2S through alkaline solution containing A at room temperature. . What is the chemical compound that gives the observation you mentioned.

PART C- Answer only two questions

8. a) Do the following conversion using only the chemicals given in the list – (The conversion, must not exceed 7 steps)

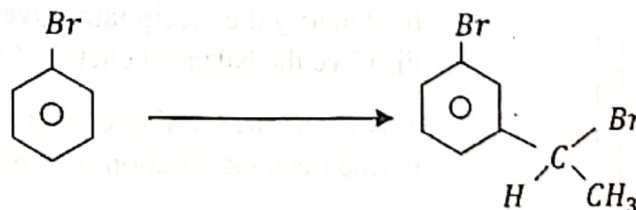


List of chemicals

Anhydrous Al_2O_3 , $LiAlH_4$, PCl_5 , Mg , dry ether, PCC , $H^+/KMnO_4$, H^+/H_2O

- b) Do following conversion not more than 6 steps

I.



c) Write reaction mechanism for the reaction of benzene with $\text{CH}_3\text{CH}_2\text{Cl}$ in the presence of anhydrous AlCl_3 .

Write electrophile, Lewis acid and base in this reaction.

9. a) When metal A is heated with non-metal B, white colour solid C is obtained. C dissolves in water and produce a gas D. When flame test is carried out after the addition of HCl to C, it gives green colour flame. When gas D reacts with another gas E, element B and substance F are obtained, here F is liquid at room temperature which converts BiCl_3 to white solid G. The product H is obtained in the reaction between C i. Identify A, B, C, D, E, F, and G

ii. What are the possible products obtained in the reaction between element B and NaOH . Give the balanced chemical equations for the formation of those products.

b). The coloured aqueous solution Q contains, three metal ions as, their chlorides. The test performed with solution Q together with their observation are given below.

Test	Observation
1. Added equal volumes of NH_4Cl and NH_4OH to the part of the solution Q.	A green color precipitate is formed. Adding excess KOH solution to the precipitate dark green solution is formed.
2. Passed H_2S gas through filtrate of test 1.	Formed pink precipitate.
3. Heated filtrate from test 2 and added excess NH_4Cl and NH_4OH . After that $(\text{NH}_4)_2\text{CO}_3$ is added. Flame test is done for the formed precipitate.	White precipitate is formed. Crimson red flame is given.
4. 8-hydroxy quinoline is added for the filtrate from test 3.	Yellow green complex is given

i. Identify the metal ions in solution Q.

ii. Identify the precipitates given by above tests 1, 2, and 3.

iii. Give the balanced chemical for the reaction of the dark green colored formed in test 1

c) An aqueous solution contains $\text{Cr}_2\text{O}_7^{2-}$ and PO_4^{3-} ions. A quantitative analysis has done to find the concentration of these ions as follows.

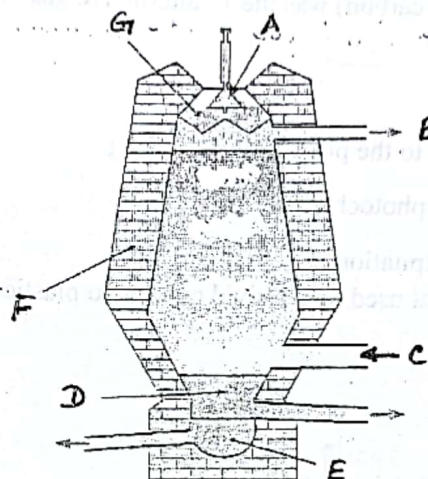
1) Mass of the precipitate which has obtained when excess BaCl_2 solution added to 100cm^3 of the given solution is 1.855g.

II) 60 cm³ of 0.05 mol dm⁻³ Na₂C₂O₄ has spent another 100 cm³ of the solution is reacted with Na₂C₂O₄ solution which is acidified with dil. H₂SO₄.

Calculate the concentration of each Cr₂O₇²⁻ and PO₄³⁻ ion in the solution.

(Ba=137, Cr=52, O=16, P=31)

10 a) Blast furnace is used to extract iron using raw material. following is a diagram of a blast furnace



- i. Name parts A, B, C, D, E, F and G.
 - ii. Write raw materials used for iron extraction.
 - iii. Indicate the direction of
 - I. Mass flow
 - II. Compress air flow inside the blast furnace.
 - iv. What are the two reducing agents used during the process and indicate the main reducing agent from them.
 - v. What are the factors that decided the rate of burning reaction.
 - vi. Write balanced chemical equations to show extraction of Fe using
 - I. Haematite
 - II. Magnetite
- b) Write monomer, repeating unit and polymer of following polymers
- i. Teflon

ii. PET (Polyethelene tetraphthalate)

~~iii. Bakelite~~

c.) Write main chemical species available in following essential oils.

i. Citronella oil

ii. Clove oil

iii. Lemon grass oil

d) i. HCFC (Hydrochlorofluoro carbon) was the 1st alternative gas used for CFCs. Write two structures of them (HCFC)

ii. Write I. Green house gases

II. Pollutants contribute to the photochemical smog.

iii. Write two adverse effect of photochemical smog.

iv. What are the ways of precipitation of water on earth.

v. Write Leaded pigments that used to get vivid colours to plastic.

