



WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 4th Semester Examination, 2023

CEMACOR08T-CHEMISTRY (CC8)

PHYSICAL CHEMISTRY-III

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

Answer any three questions taking one from each unit

Unit-I

1. (a) Why is the vapour pressure of a solvent lowered when a non-volatile non-electrolyte solute is dissolved in it? Why is it necessary that the solute should be non-volatile? 3+1
- (b) Find the osmotic pressure of a 0.001 (M) solution of K_2SO_4 at $27^\circ C$. 3
- (c) Derive thermodynamically using chemical potential a relation between the depression of freezing point of a dilute solution with its molal concentration. Is elevation of freezing point possible? 4+2
- (d) What do you mean by an eutectic mixture? 1
2. (a) In the phase diagram of water, the slope of the solid/liquid curve is negative, while for carbon dioxide it is positive. Explain with suitable equation. 2+1
- (b) Account for the following fact: 3
An azeotrope has a fixed boiling point at a fixed pressure although it is not a chemical compound.
- (c) What is meant by upper critical solution temperature (UCST)? Draw a temperature-composition diagram for a system showing UCST and find the number of degree of freedom in its different regions. 1+2+3
- (d) State the principle of fractional distillation. 2

Unit-II

3. (a) State the Debye-Hückel limiting law. Graphically show the variation of $\log_{10} \gamma_{\pm}$ versus square root of ionic strength of 1-1, 2-1 and 2-2 electrolytes in aqueous solution, where, γ_{\pm} is the mean ionic activity coefficient. In which case is the limiting law applicable better? 1+3+2
- (b) Equal volumes of 0.01 (M) K_2SO_4 and 0.02 (M) $BaSO_4$ solutions are mixed. What will be the ionic strength of the resultant solution? 2

- (c) Specific conductance of pure water is $38.4 \times 10^{-9} \text{ ohm}^{-1} \text{ cm}^{-1}$ at 18°C . The equivalent conductance at infinite dilution of H^+ and OH^- are $315.2 \text{ ohm}^{-1} \text{ cm}^2 \text{ gm eqv}^{-1}$ and $173.8 \text{ ohm}^{-1} \text{ cm}^2 \text{ gm eqv}^{-1}$ respectively. Calculate the ionic product of water at 18°C . 3
- (d) Indicate with an example the essential characteristics to be considered in selecting the electrodes for a potentiometric titration. 3
4. (a) For the concentration cell $\text{Ag} | \text{AgCl(s)} | \text{HCl}(a_1) | \text{HCl}(a_2) | \text{AgCl(s)} | \text{Ag}$ 3+2
 (i) Write the various processes at the two electrodes and at the liquid junction
 (ii) Derive expression for ΔG of the cell.
- (b) The molar orientation polarization of chloroform decreases sharply with increasing temperature but that of carbon tetrachloride remains almost invariant with temperature. Explain with the help of an appropriate equation. 3
- (c) Why Debye equation for the dipole moment should be applicable to gases and vapours only? Find the C.G.S. unit of μ^2/kT , where μ is the permanent dipole moment of a molecule. 2+1
- (d) The cell corresponding to the reaction: 3

$$\text{Hg}_2\text{Cl}_2(\text{s}) + \text{H}_2(1 \text{ atm}) \rightarrow 2\text{Hg}(\text{l}) + 2\text{H}^+(a=1) + 2\text{Cl}^-(a=1)$$
 has the emf, $E_{298\text{K}}^0 = +0.27 \text{ (V)}$ and $\left(\frac{\partial E^0}{\partial T}\right)_P = -3.2 \times 10^{-4} \text{ (V K}^{-1}\text{)}$.
 Find the values of ΔH^0 and ΔS^0 of the reaction.

Unit-III

5. (a) Hydrogen like wave function for $1s$ orbital is given by $\psi = b_0 e^{-r/a_0}$ (where r_0 is the Bohr radius). 4
 (i) Find out the normalization constant, b_0 .
 (ii) Specify the values of n , l and m for $1s$ electron.
 (iii) Determine the most probable value of r in this state and comment on the result.
- (b) For a rigid rotor $\psi_{J,M}(\theta, \phi) = \frac{1}{\sqrt{2\pi}} \theta(\theta) e^{iM\phi}$ and the operator for z -component of angular momentum in spherical coordinate is $\hat{L}_z = -i\hbar \frac{\partial}{\partial \phi}$. Show that the wave function is an eigenfunction of the operator and find the corresponding eigen value. 2+1
- (c) Write down the expression of \hat{H} for the H_2^+ molecular ion. 2
- (d) Write a short note on Born-Oppenheimer approximation. 3
6. (a) How is the concept of angular momentum relevant in quantum mechanics for our system of Interest? 3
- (b) Find the value of the commutator, $[\hat{L}^2, \hat{L}_z]$ and interpret the result. 3
- (c) Draw the radial function $R_{nl}(r)$ and the radial probability distribution function $r^2[R_{nl}]^2$ for the $2s$ orbital. Calculate the number of radial nodes. 2+1
- (d) Using the results $\hat{L}^2 Y_{l,m} = \lambda \hbar^2 Y_{l,m}$ and $\hat{L}_z Y_{l,m} = m \hbar Y_{l,m}$; find the maximum allowed limit for the value of m . (m and λ are pure integers). 3

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WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 4th Semester Examination, 2023

CEMACOR09T-CHEMISTRY (CC9)

INORGANIC CHEMISTRY-III

Time Allotted: 2 Hours

Full Marks: 40

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Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

Answer any three questions taking one from each unit

Unit-I

1. (a) Describe the principle and reactions related to the extraction of Aluminium by electrolytic reduction. 3
- (b) Out of C and CO, which is a better reducing agent for ZnO and why? 2
- (c) Write down the principle and importance of Zone refining process. 3
- (d) What are differences between ore and alloy? Give examples. 2

2. (a) What are cast and wrought iron? 2
- (b) Briefly discuss the van Arkel-de Boer process. Which metals are produced and refined by this process? 3
- (c) How are Gold and Silver extracted by Hydrometallurgy method? 3
- (d) The choice of flux depends upon the impurities present in the ore — Comment. 2

Unit-II

3. (a) Draw the structures of different oxyacids of sulphur and compare their acidic strength. 3
- (b) Give one example of graphitic compound. How is it prepared? 1+1
- (c) Draw the structure of borax. Why does borax form a glassy mass when heated? 1+1
- (d) How is XeF₄ prepared? Discuss its molecular shape using VSEPR theory. 1+2
- (e) What are pseudohalogens? Give examples. Why these are called pseudohalogens? 2
- (f) Aqueous solution of sodium perxenate is alkaline in nature. Explain. 2
- (g) How synthetic Zeolites can be used as water softener? 2
- (h) Why XeF₆ can not be handled in glass or quartz container? Give necessary reactions. 2
- (i) Aluminium chloride is better formulated as Al₂Cl₆ — Explain. 2

4. (a) How does Be differ from other alkaline earth metals? 2
- (b) Compare and Contrast the Chemistry of C, Si and Ge with respect to following points: 2+2+2
- (i) Oxidation states
- (ii) Hydrides
- (iii) Halides.
- (c) What are silicone resin and silicon rubber? Write their uses. 2+2
- (d) What are interhalogens? Classify different binary interhalogens and give examples of each type. Comment on their hydrolysis products and structures. 1+2+3
- (e) What happens when: (Give reaction) 2
- Silver nitrate solution is added to a solution of sodium thiosulphate.

Unit-III

5. (a) Mention IUPAC nomenclature of $[\text{Co}(\text{NO}_2)_2(\text{NH}_3)_4]\text{Cl}$ and draw all the possible isomers. 1+2
- (b) Explain why chelate affect is called an entropy effect. 2
- (c) How will you distinguish between, $1\frac{1}{2}+1\frac{1}{2}$
- (i) $[\text{Cr}(\text{OH}_2)_6]\text{Cl}_3$ and $[\text{Cr}(\text{OH}_2)_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$
- (ii) *cis*- $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ and *trans*- $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
- (d) Tetrahedral complexes do not show geometrical isomerism while square planar complexes do show this kind of isomerism. Comment. 2
6. (a) Predict the order (first/second/third) of the following innermetallic complexes with proper explanation: 1+2
- (i) $\text{Na}[\text{Co}(\text{acac})_3]$ and (ii) $[\text{Co}(\text{gly})_3]$
- (b) With suitable example explain the facial and meridional isomerism. 2
- (c) Draw the possible geometrical isomers of $[\text{Co}(\text{en})(\text{NH}_3)_2\text{BrCl}]^+$ and hence predict which of them would be optically active. 3
- (d) Write the formula of the following compounds: 2
- (i) Ammonium pentafluoroaquanickelate(IV)
- (ii) Potassium tetrafluoroargentate(I)

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WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 4th Semester Examination, 2023

CEMACOR10T-CHEMISTRY (CC10)

ORGANIC CHEMISTRY-IV

Time Allotted: 2 Hours

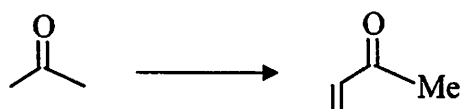
Full Marks: 40

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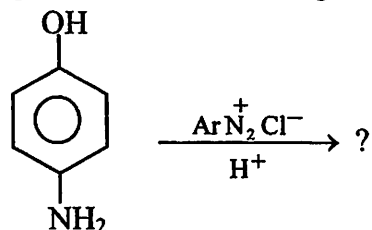
Answer any *four* questions taking *one* from each unit

Unit-I

1. (a) Although *N,N*-dimethylaniline couples with benzenediazonium chloride, its 2,6-dimethyl derivative does not. Explain. 2
- (b) Predict the product with suitable mechanistic course when *p*-bromonitrobenzene is treated with potassium cyanide in aqueous ethanol medium. 2
- (c) How can you chemically distinguish between *o*-phenylene diamine and *m*-phenylene diamine? 2
2. (a) How can you chemically distinguish between the isomers 4-nitro toluene and PhCH_2NO_2 ? 2
- (b) Carry out the following conversion using Mannich reaction in one of the steps: 2

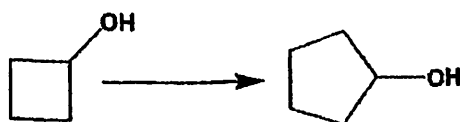


- (c) Predict the product in the following reaction 2



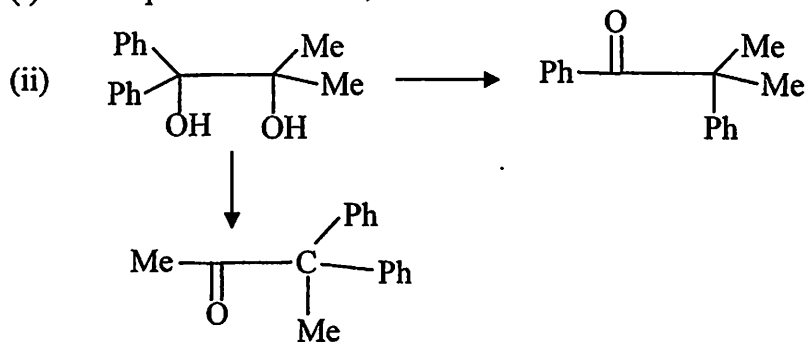
Unit-II

3. (a) Carry out the following conversion and suggest plausible mechanism of the ring expansion step: 2

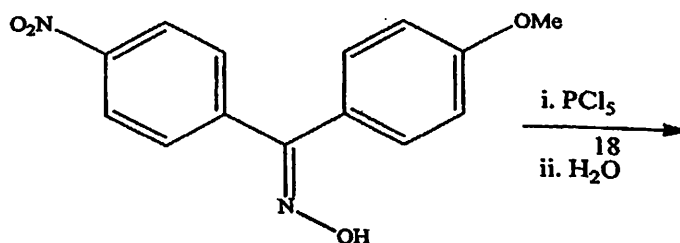


- (b) Two isomeric α -halo ketones A and B on treatment with NaOMe (separately) gave the same product $\text{PhCH}_2\text{CH}_2\text{CO}_2\text{Me}$. Identify A and B. 2
- (c) Show how each of the following conversions could be accomplished by using a sequence of reactions involving a rearrangement reaction: 2+2

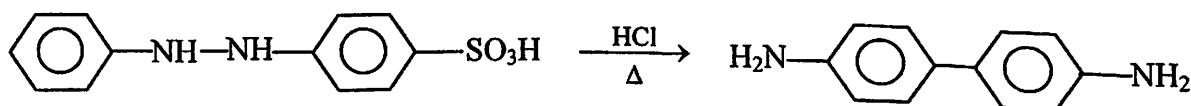
(i) Benzophenone \longrightarrow Aniline



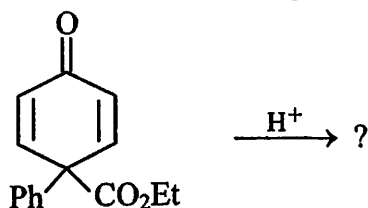
4. (a) In the Hofmann degradation of benzamide, small amounts of PhNHCONHPh and PhNHCONHCOPh are sometimes obtained along with aniline. Explain. 2
- (b) Identify the product of the following reaction and suggest plausible mechanism for its formation. 2



(c) Suggest a mechanism of the following reaction 2

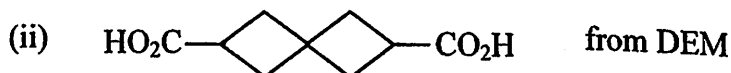
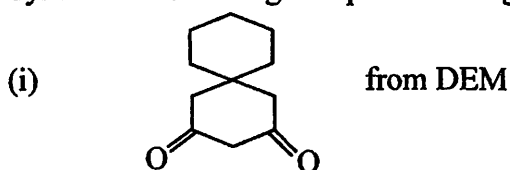


(d) Find out the product in the following reaction 2



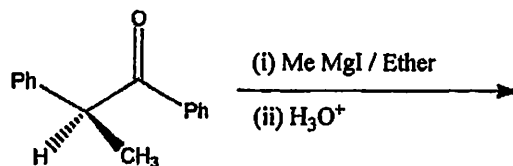
Unit-III

5. (a) Explain with suitable examples: (i) synthon ; (ii) illogical electrophile. 2+2
- (b) Synthesize following compounds using retrosynthetic analysis: 2+2

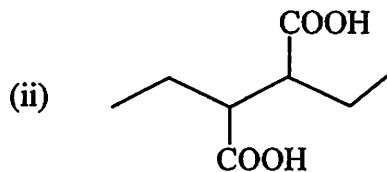
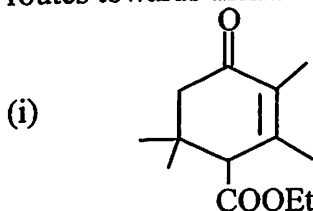


DEM = Diethyl malonate

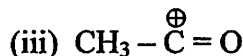
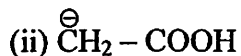
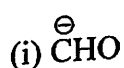
- (c) Use Felkin-Anh model to explain the formation of major product in the following reaction: 2



6. (a) Analyse the following molecules retrosynthetically and suggest plausible synthetic routes towards them: 2+2

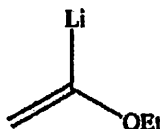


- (b) Write down the synthetic equivalents of the following: (any two) 2



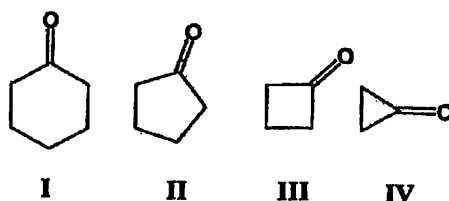
- (c) Synthesis of large rings is kinetically favourable but thermodynamically unfavourable — Justify or contradict with reasons. 2

- (d) Which synthon does the following compound represent when it reacts with benzaldehyde and the product is hydrolysed by acid? 2



Unit-IV

7. (a) Consider the following cyclic ketones. Suggest the correct increasing order of $\text{C} = \text{O}$ stretching frequency with proper explanation. 3



- (b) The position of UV absorption maxima of aniline and benzene is different in aqueous medium but they give identical absorption maxima in acidic solution. Explain this observation. 2

- (c) A compound having molecular formula $\text{C}_8\text{H}_{10}\text{O}$ shows the following spectroscopic data: 4

IR: 1170, 2950, 3080 cm^{-1}

$^1\text{H-NMR}$: δ 2.2 (3H, s), 3.5 (3H, s), 7.3 (2H, d, $J = 8$ Hz), 7.6 (2H, d, $J = 8$ Hz)

Find out the structure of the compound and explain the spectroscopic data as far as practicable.

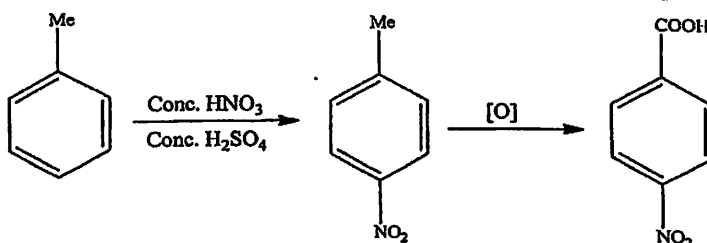
- (d) How would you distinguish 1,1-dichloroethane and 1,2-dichloroethane using NMR spectroscopy? 2

(e) How can you distinguish between the members in each of the following pairs of compounds by the spectroscopic technique mentioned within parenthesis? $1\frac{1}{2}+1\frac{1}{2}$

(i) *p*-Cresol and anisole (by UV spectroscopy)

(ii) *cis*-stilbene and *trans*-stilbene (by $^1\text{H-NMR}$ spectroscopy)

(f) How can you monitor the progress of the following reaction using IR spectroscopy? 2



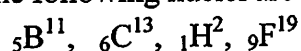
8. (a) A compound having molecular formula $\text{C}_{10}\text{H}_{12}\text{O}_2$ shows the following IR and $^1\text{H-NMR}$ data. 4

IR: $3050, 2950, 1730\text{ cm}^{-1}$

$^1\text{H-NMR}$: δ 1.3 (6H, d), 5.2 (1H, septet), 7.2 (3H, m), 8.0 (2H, m)

Find out the structure of the compound and explain the spectroscopic data as far as practicable.

(b) Which of the following nuclei are NMR active? 2



(c) Distinguish the following pairs of compounds on the basis of IR spectroscopic data (any two): 2+2

(i) Acetone and hexamethyl acetone

(ii) Salicylic acid and *p*-hydroxy benzoic acid

(iii) Phenyl acetate and methyl benzoate

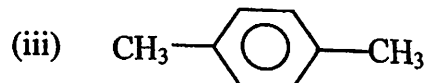
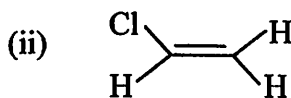
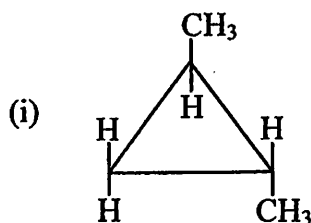
(d) Define the following terms in connection with UV spectroscopy with suitable example (any two): 2+2

(i) Auxochrome

(ii) Blue shift

(iii) Chromophore.

(e) Find out the number of signal(s) in NMR spectroscopy (any two): 1+1



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WEST BENGAL STATE UNIVERSITY
B.Sc. Honours/Programme 4th Semester Examination, 2023

CEMHGEC04T/CEMGCOR04T-CHEMISTRY (GE4/DSC4)

Time Allotted: 2 Hours

Full Marks: 40

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and adhere to the word limit as practicable.*

*প্রাঙ্গিক সীমার মধ্যস্থ সংখ্যাটি পূর্ণমান নির্দেশ করে।
পরীক্ষার্থীরা নিজের ভাষায় যথা সম্ভব শব্দসীমার মধ্যে
উত্তর করিবে।*

All symbols are of usual significance.

SECTION-A / বিভাগ-ক

Answer any four questions taking one from each unit
প্রত্যেক ইউনিট থেকে একটি করে নিয়ে মোট চারটি প্রশ্নের উত্তর দাও

Unit-I / একক-১

1. (a) State Raoult's Law. State the nature of a solution if the vapour pressure of it is either higher or lower than that predicted by Raoult's Law. 1+1
রাউল্টের সূত্রটি লেখো। দ্রবণের বাষ্প চাপ রাউল্টের সূত্রানুযায়ী যা হওয়ার তার চেয়ে বেশি বা কম হলে দ্রবণের প্রকৃতি কেমন হবে ?
- (b) Define Van't Hoff factor. 1
ভ্যান্ট হফ ফ্যাক্টরের সংজ্ঞা দাও।
- (c) What is azeotropic mixture? Give an example of a low boiling azeotropic mixture. 1+1
অ্যাজিওট্রপিক মিশ্রণ বলতে কি বোঝায় ? একটি সর্বনিম্ন স্ফুটনাঙ্কের অ্যাজিওট্রপিক মিশ্রণের উদাহরণ দাও।
2. (a) What is critical solution temperature? Explain with an example. 1+1
সংকট দ্রবণ উষ্ণতা কাকে বলে ? একটি উদাহরণসহ বোঝাও।
- (b) State Nernst Distribution Law with mathematical representation. When partially miscible phenol-water liquid pair forms two conjugate layers at a definite temperature, then does addition of small amount of phenol or water to it at the same temperature change the composition of the layers? 2+1
গাণিতিক রূপসহ নার্নস্টের বণ্টন সূত্রটি লেখো। একটি নির্দিষ্ট তাপমাত্রায় যদি আংশিক মিশ্রিত ফেনল-জল তরলজোড়া দুটি সংহত স্তর তৈরী করে, তাহলে ঐ তাপমাত্রায় মিশ্রণে খুব সামান্য পরিমাণ ফেনল বা জল যোগ করলে তরল স্তর দুটির গঠনের কি পরিবর্তন হবে ?

Unit-II / একক-২

3. (a) Draw a labelled P-T diagram of water system and describe it. 3
বিভিন্ন অংশের নামসহ জলের P বনাম T দশাচিত্র অঙ্কন করো ও বর্ণনা করো।
- (b) Why ice liquefies to water but solid CO₂ converts into gas directly? 2
বরফ গলে তরল জলে পরিণত হয়, কিন্তু কঠিন CO₂ সরাসরি গ্যাসে পরিণত হয় কেন ?

4. (a) What is eutectic temperature? Draw the phase diagram of a simple eutectic system and identify the different regions. 1+2
ইউটেকটিক তাপমাত্রা কি? একটি সাধারণ ইউটেকটিক সিস্টেমের দশাচিত্র অঙ্কন করে বিভিন্ন অঞ্চল চিহ্নিত করো।
- (b) Explain with example: Congruent melting point. 2
উদাহরণসহ কনগ্রুয়েন্ট গলনাঙ্ক ব্যাখ্যা করো।

Unit-III / একক-৩

5. (a) State Kohlrausch's Law. At 25°C equivalent conductance of NaCl, HCl and CH₃COONa at infinite dilution are 126.45, 426.16 and 91 ohm⁻¹ cm² mol⁻¹ respectively. What is the equivalent conductance of acetic acid at infinite dilution? 1+2
কোলরাশের সূত্রটি বর্ণনা করো। 25°C উষ্ণতায় NaCl, HCl এবং CH₃COONa-এর তুল্যাঙ্ক পরিবাহিতার মান যথাক্রমে 126.45, 426.16 এবং 91 ohm⁻¹ cm² mol⁻¹ হলে অ্যাসেটিক অ্যাসিডের অসীম লঘুতার দ্রবণে তুল্যাঙ্ক পরিবাহিতার মান কত?
- (b) Compare specific conductance and equivalent conductance of a solution and mention their unit also. 2
কোন দ্রবণের আপেক্ষিক পরিবাহিতা এবং তুল্যাঙ্ক পরিবাহিতার তুলনা করো এবং এদের একক উল্লেখ করো।
6. (a) Draw and explain the conductometric titration curve for HCl vs NaOH. 1+1
HCl বনাম NaOH-এর পরিবাহিতা অনুপান পদ্ধতিতে প্রশমন প্রক্রিয়ার রেখাচিত্র অঙ্কন করো ও ব্যাখ্যা করো।
- (b) What are transport number and ionic mobility? 2
পরিবাহনাঙ্ক ও আয়নীয় সচলতা কাকে বলে?
- (c) How does equivalent conductance of a solution of an electrolyte vary with temperature? 1
তড়িৎবিশ্লেষ্য পদার্থের দ্রবণের তুল্যাঙ্ক পরিবাহিতা দ্রবণের উষ্ণতার সঙ্গে কিভাবে পরিবর্তিত হয়?

Unit-IV / একক-৪

7. (a) Derive the Nernst equation of the following reaction taking place in voltaic cell: 2
 $aA + bB = cC + dD$
ভোল্টীয় কোষে সংঘটিত নিম্নলিখিত বিক্রিয়ার জন্য Nernst-এর সমীকরণটি উপপাদন করো।
 $aA + bB = cC + dD$
- (b) Standard reduction potential of Cu⁺²/Cu and Ag⁺/Ag electrodes are 0.337 and 0.799 volt respectively. Construct a cell with the electrodes and find its standard e.m.f. 3
Cu⁺²/Cu এবং Ag⁺/Ag তড়িৎদ্বার দুটির প্রমাণ বিজারণ বিভব যথাক্রমে 0.337 এবং 0.799 volt। তড়িৎদ্বার দুটির সাহায্যে একটি কোষ গঠন করো ও কোষটির প্রমাণ e.m.f নির্ণয় করো।

8. (a) Define pH. Find the pH of 0.1 (N) HCl. 2
pH-এর সংজ্ঞা দাও। 0.1 (N) HCl-এর pH নির্ণয় করো।
- (b) What do you understand by electrochemical series? Why does AgNO₃ solution turn blue when a copper wire is dipped in it? 3
তড়িৎ রাসায়নিক শ্রেণী কি? AgNO₃ দ্রবণে একটি তামার তারকে নিমজ্জিত করলে দ্রবণের বর্ণ নীল হয় কেন?

SECTION-B / বিভাগ-খ

Answer any two questions taking one from each unit

প্রত্যেক ইউনিট থেকে একটি করে নিয়ে মোট দুটি প্রশ্নের উত্তর দাও

Unit-I / একক-১

9. (a) Mention the principle and reactions for gravimetric estimation of SO₄²⁻. 3
তৌলিক বিশ্লেষণের মাধ্যমে দ্রবণে উপস্থিত SO₄²⁻ আয়নের পরিমাণ কিভাবে নির্ণয় করবে তার নীতি ও বিক্রিয়া উল্লেখ করো।
- (b) What is a redox indicator? Which redox indicator can be used for the estimation of Fe⁺² by K₂Cr₂O₇? Draw its oxidized and reduced form mentioning the colours. 3
জারণ-বিজারণ নির্দেশক কি? আয়তন মাত্রিক পদ্ধতিতে K₂Cr₂O₇ দ্বারা Fe⁺² এর পরিমাণ নির্ণয় করতে কোন জারণ-বিজারণ নির্দেশক ব্যবহার করা যায়? এর জারিত ও বিজারিত রূপ চিত্রায়িত করো ও বিভিন্ন রূপের বর্ণগুলি লেখো।
- (c) Define R_f value. Why thin layer chromatography is superior to paper chromatography? 2+2
R_f-এর সংজ্ঞা লেখো। পেপার ক্রোমাটোগ্রাফির তুলনায় পাতলাস্তর ক্রোমাটোগ্রাফি সুবিধাজনক কেন?
- 10.(a) Define co-precipitation and post precipitation in the extract of gravimetric analysis. 2
কো-অধঃক্ষেপণ ও পোস্ট-অধঃক্ষেপণ বলতে তৌলিক পদ্ধতিতে কি বোঝো?
- (b) What is common ion effect? 2
সম আয়ন প্রভাব বলতে কি বোঝো?
- (c) What do you mean by primary and secondary standard substances in titrimetric analysis? Write two examples for each. 1+1+2
অনুমাণ পদ্ধতিতে ব্যবহৃত মুখ্য ও গৌণ প্রমাণ পদার্থ বলতে কি বোঝো? প্রত্যেকটির ক্ষেত্রে দুটি করে উদাহরণ দাও।
- (d) In gravimetric analysis Ni⁺² is precipitated using which reagent? Give its structure. 1+1
তৌলিক বিশ্লেষণে Ni⁺² আয়নের অধঃক্ষেপের জন্য কোন বিকারক ব্যবহার করা হয়? এর গঠন লেখো।

Unit-II / একক-২

- 11.(a) Name the layer of atmosphere where depletion of ozone occurs. How does ozone depletion occur? Discuss the harmful effects of it. 1+2+1
বায়ুমণ্ডলের কোন স্তরে ওজোনস্তরের ক্ষয় ঘটে? ওজোন স্তরের ক্ষয় কিভাবে হয়? এর ক্ষতিকারক দিকগুলি লেখো।

- (b) Define Hard Water. Why it is called so? 3
ক্ষর জলের সংজ্ঞা দাও। কেন উহার নাম এরকম ?
- (c) What do you mean by B.O.D and C.O.D of water? 3
জলের B.O.D ও C.O.D বলতে কি বোঝো ?
- 12.(a) Write short notes on: (any *two*) 2×2 = 4
(i) Bhopal Gas Tragedy (ii) Photochemical Smog (iii) Green House effect
টীকা লেখোঃ (যে-কোনো দুটি)
(i) ভোপাল গ্যাস দুর্ঘটনা (ii) আলোক রাসায়নিক ধোঁয়াশা (iii) গ্রীন হাউস প্রভাব
- (b) What is soil pollution? What are the control measures of soil pollution? 1+2
মৃত্তিকা দূষণ কী ? মৃত্তিকা দূষণ কিভাবে রোধ করা যায় ?
- (c) Discuss how water resources get polluted due to industrial effluents and agricultural runoff. 3
শিল্প ও কৃষিজ বর্জ্য দ্বারা জল কিভাবে দূষিত হয় ?

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