1. Why is adsorption always exothermic?

2. Name the method that is used for refining of nickel.

3. Why does NO₂ dimerise?
1. Based on molecular forces what type of polymer is neoprene?

2. What are the products of hydrolysis of maltose?

3. Write the structure of 4-chloropentan-2-one.

4. Identify the chiral molecule in the following pair:

5. The conversion of primary aromatic amines into diazonium salts is known as ________

6. Write the name of monomers used for getting the following polymers:
   (i) Terylene
   (ii) Nylon-6, 6
10. Describe the role of the following:
   (i) \( \text{SiO}_2 \) in the extraction of copper from copper matte
   (ii) \( \text{NaCN} \) in froth floatation process

11. Complete the following equations:
   (i) \( \text{Ag} + \text{PCl}_5 \rightarrow \)
   (ii) \( \text{CaF}_2 + \text{H}_2\text{SO}_4 \rightarrow \)

12. Draw the structures of the following:
   (i) \( \text{XeF}_4 \)
   (ii) \( \text{HClO}_4 \)

13. (i) Write the type of magnetism observed when the magnetic moments are oppositely aligned and cancel out each other.
    (ii) Which stoichiometric defect does not change the density of the crystal?
14. Define the following terms:
(i) Fuel cell
(ii) Limiting molar conductivity ($\Lambda^0_m$)

15. Write the mechanism of the following reaction:

$$\text{CH}_3\text{CH}_2\text{OH } + \text{HBr} \rightarrow \text{CH}_3\text{CH}_2\text{Br} + \text{H}_2\text{O}$$

16. For a chemical reaction $R \rightarrow P$, the variation in the concentration ($R$) vs. time ($t$) plot is given as

(i) Predict the order of the reaction.
(ii) What is the slope of the curve?
17. An element with density 2.8 g cm\(^{-3}\) forms a f.c.c. unit cell with edge length 4 \(\times\) 10\(^{-8}\) cm. Calculate the molar mass of the element.

\(\text{(Given: } N_A = 6.022 \times 10^{23} \text{ mol}^{-1})\)

18. Write the equations involved in the following reactions:
   
   (i) Reimer–Tiemann reaction
   
   (ii) Williamson synthesis

19. Define the following terms:
   
   (i) Glycosidic linkage
   
   (ii) Invert sugar
   
   (iii) Oligosaccharides

20. Dr. Sathpaul emphasised the importance of agricultural practices and introduced a scheme called ‘Swasthya Karm’ to improve the health of farmers. This scheme was based on regular health check-ups and education. Dr. Sathpaul also advocated for a more inclusive approach to research and development, particularly for farmers. NHRC has taken steps to address these issues.
On the occasion of World Health Day, Dr. Satpal organized a ‘health camp’ for the poor farmers living in a nearby village. After check-up, he was shocked to see that most of the farmers suffered from cancer due to regular exposure to pesticides and many were diabetic. They distributed free medicines to them. Dr. Satpal immediately reported the matter to the National Human Rights Commission (NHRC). On the suggestions of NHRC, the government decided to provide medical care, financial assistance, setting up of super-speciality hospitals for treatment and prevention of the deadly disease in the affected villages all over India.

(i) Write the values shown by
(a) Dr. Satpal
(b) NHRC.

(ii) What type of analgesics are chiefly used for the relief of pains of terminal cancer?

(iii) Give an example of artificial sweetener that could have been recommended to diabetic patients.
21. Account for the following:

(i) Primary amines (R-NH₂) have higher boiling point than tertiary amines (R₃N).

(ii) Aniline does not undergo Friedel-Crafts reaction.

(iii) (CH₃)₂NH is more basic than (CH₃)₃N in an aqueous solution.

OR

Give the structures of A, B and C in the following reactions

(i) C₆H₅NO₂ \( \text{Sn} + \text{HCl} \) \( \text{NaNO₂} + \text{HCl} \) \( \text{H₂O} \) \( \text{C} \)

(ii) CH₃CN \( \text{H₂O}/\text{H}^+ \) \( \text{NH}_3 \) \( \text{Br}_2 + \text{KOH} \) \( \text{C} \)

\( \text{A} \) \( \text{B} \) \( \text{C} \) \( \Delta \) \( 273 \text{K} \)
22. (a) Draw the structures of major monohalo products in each of the following reactions:

(i) \( \text{CH}_2\text{OH} + \text{PCl}_5 \rightarrow \)

(ii) \( \text{CH}_2 - \text{CH} = \text{CH}_2 + \text{HBr} \rightarrow \)

(b) Which halogen compound in each of the following pairs will react faster in \( S_N2 \) reaction:

(i) \( \text{CH}_3\text{Br} \) or \( \text{CH}_3\text{I} \)

(ii) \( (\text{CH}_3)_3\text{C} - \text{Cl} \) or \( \text{CH}_3 - \text{Cl} \)

23. (a) \( \text{Mg} (s) + \text{Cu}^{2+} \) (जलिय) \( \rightarrow \) \( \text{Mg}^{2+} \) (जलिय) + \( \text{Cu} (s) \)

\[ \Delta r G^0 \text{ निर्देशित कीजिए।} \]

दिया गया है: \( E^0_{\text{塞}} = +2.71 \text{ V}, \) \( 1 \text{ F} = 96500 \text{ C मोल}^{-1} \)

(b) अपोलो (Apollo) अंतरिक्ष प्रोग्राम के लिए विद्युत शक्ति उपलब्ध कराने के लिए प्रयुक्त सेल के प्रकार का नाम लिखिए।
(a) Calculate $\Delta G^0$ for the reaction

$$\text{Mg} (s) + \text{Cu}^{2+} (aq) \rightarrow \text{Mg}^{2+} (aq) + \text{Cu} (s)$$

Given: $E_{\text{cell}}^0 = +2.71 \text{ V}$, $1 \text{ F} = 96500 \text{ C mol}^{-1}$

(b) Name the type of cell which was used in Apollo space programme for providing electrical power.

24. स्थिर आयतन अवस्था में $\text{SO}_2\text{Cl}_2$ के प्रथम कोटि के तापीय विघटन के दौरान मिमतिक्षित आंकड़े प्राप्त हुए:

$$\text{SO}_2\text{Cl}_2 (\text{गैस}) \rightarrow \text{SO}_2 (\text{गैस}) + \text{Cl}_2 (\text{गैस})$$

| प्रयोग | समय/s$^{-1}$ | सकल दब/बायुगम्ण
<table>
<thead>
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<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0.4</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
<td>0.7</td>
</tr>
</tbody>
</table>

चेतन नियतांक परिकलित कीजिए।

(दिया गया है : $\log 4 = 0.6021$, $\log 2 = 0.3010$)

The following data were obtained during the first order thermal decomposition of $\text{SO}_2\text{Cl}_2$ at a constant volume

$$\text{SO}_2\text{Cl}_2 (g) \rightarrow \text{SO}_2 (g) + \text{Cl}_2 (g)$$

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Time/s$^{-1}$</th>
<th>Total pressure/atm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0.4</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Calculate the rate constant.

(Given: $\log 4 = 0.6021$, $\log 2 = 0.3010$)

25. इमलशन्स क्या होते हैं? इनके विभिन्न प्रकार क्या हैं? प्रत्येक प्रकार का एक उदाहरण दीजिए।

What are emulsions? What are their different types? Give one example of each type.
26. Give reasons for the following:

(i) \((\text{CH}_3)_3 \text{P} = \text{O}\) exists but \((\text{CH}_3)_3 \text{N} = \text{O}\) does not.

(ii) Oxygen has less electron gain enthalpy with negative sign than sulphur.

(iii) \(\text{H}_3\text{PO}_2\) is a stronger reducing agent than \(\text{H}_3\text{PO}_3\).

27. (i) Write the IUPAC name of the complex \([\text{Cr(NH}_3]_4 \text{Cl}_2]\text{Cl}\).

(ii) What type of isomerism is exhibited by the complex \([\text{Co(en)}_3]^{3+}\)?

\((\text{en} = \text{ethane-1,2-diamine})\)

(iii) Why is \([\text{NiCl}_4]^{2-}\) paramagnetic but \([\text{Ni(CO)}_4]\) is diamagnetic?

(At. nos. : Cr = 24, Co = 27, Ni = 28)

28. (a) Nirm abhikarokon se \(\text{CH}_3\text{CHO}\) ki abhikriya karna par banne utpado ko likhien:

(i) HCN

(ii) \(\text{H}_2\text{N} - \text{OH}\)

(iii) latu NaOH ki upasthitim me \(\text{CH}_3\text{CHO}\).
(b) निम्न वैज्ञानिक युग्मों में अंतर दिखाने के लिए सरल रासायनिक समीकरण लिखिएः

(i) बैन-जोइक अम्ल और फीनॉल
(ii) प्रोपेनल और प्रोपेनोन

अथवा

(а) निम्न के कारण लिखिएः

(i) CH₃COOH की तुलना में Cl – CH₂COOH अधिक प्रभाव अम्ल है।
(ii) कार्बोसिलिक अम्ल कार्बोनिल समूह की अभिक्रियाएं नहीं देते।

(б) निम्न नाम धारित अभिक्रियाओं के लिए रासायनिक समीकरण लिखिएः

(i) रोजनमुख अपचयन
(ii) कैनिज़ारो अभिक्रिया

(в) CH₃CH₂ – CO – CH₂ – CH₃ और CH₃CH₂ – CH₂ – CO – CH₃ में से कौन आयोडोफोम परीक्षण देता है?

(a) Write the products formed when CH₃CHO reacts with the following reagents:

(i) HCN
(ii) H₂N – OH
(iii) CH₃CHO in the presence of dilute NaOH

(b) Give simple chemical tests to distinguish between the following pairs of compounds:

(i) Benzoic acid and Phenol
(ii) Propanal and Propanone

(a) Account for the following:

(i) Cl – CH₂COOH is a stronger acid than CH₃COOH.
(ii) Carboxylic acids do not give reactions of carbonyl group.
(b) Write the chemical equations to illustrate the following name reactions:

(i) Rosenmund reduction

(ii) Cannizzaro’s reaction

(c) Out of \( \text{CH}_3\text{CH}_2 - \text{CO} - \text{CH}_2 - \text{CH}_3 \) and \( \text{CH}_3\text{CH}_2 - \text{CH}_2 - \text{CO} - \text{CH}_3 \), which gives iodoform test?

29. (a) निम्न पदों की परिभाषा दीजिए:

(i) भोलता

(ii) भोलल उत्तरतन स्थिरांक \( (K_b) \)

(b) एक जलीय विलयन में प्रति लिटर विलयन में 15 g यूरिया (भोलर द्रव्यमान = 60 g मोल\(^{-1}\)) चुलित है। इस विलयन का परामर्श ढाब जल में ग्ल्युकोज (भोलर द्रव्यमान = 180 g मोल\(^{-1}\)) के एक विलयन के समान (समपरामर्शी) है। एक लिटर विलयन में उपस्थित ग्ल्युकोज का द्रव्यमान परिकलित कीजिए।

अथवा

(a) एथेनॉल और एसिटोन का मिश्रण किस प्रकार का विचलन दिखाता है? कारण दीजिए।

(b) जल में ग्ल्युकोज (भोलर द्रव्यमान = 180 g मोल\(^{-1}\)) के एक विलयन पर लेबल लगा है, 10% (द्रव्यमान अनुसार)। इस विलयन की मोलता और मोलरता क्या होंगे? (विलयन का घनत्व = 1.2 g mL\(^{-1}\))
(a) Define the following terms:

(i) Molarity
(ii) Molal elevation constant ($K_b$)

A solution containing 15 g urea (molar mass = 60 g mol$^{-1}$) per litre of solution in water has the same osmotic pressure (isotonic) as a solution of glucose (molar mass = 180 g mol$^{-1}$) in water. Calculate the mass of glucose present in one litre of its solution.

(a) What type of deviation is shown by a mixture of ethanol and acetone? Give reason.

(b) A solution of glucose (molar mass = 180 g mol$^{-1}$) in water is labelled as 10% (by mass). What would be the molality and molarity of the solution?

(Density of solution = 1.2 g mL$^{-1}$)

30. (a) निम्न समीकरणों को पूरा कीजिए :

(i) $\text{Cr}_2\text{O}_7^{2-} + 2\text{OH}^- \rightarrow$

(ii) $\text{MnO}_4^- + 4\text{H}^+ + 3\text{e}^- \rightarrow$

(b) निम्न के कारण लिखिए :

(i) Zn को संक्रमण तत्त्व नहीं माना जाता ।

(ii) संक्रमण धातु बहुत से संकर बनते हैं ।

(iii) $\text{Mn}^{3+}/\text{Mn}^{2+}$ युग, $\text{Cr}^{3+}/\text{Cr}^{2+}$ युग से कहीं अधिक $E^0$ मान रखता है ।

अथवा

2, 3
(i) Complete the following equations:

(i) \( \text{Cr}_2\text{O}_7^{2-} + 2\text{OH}^- \rightarrow \)  

(ii) \( \text{MnO}_4^- + 4\text{H}^+ + 3\text{e}^- \rightarrow \)  

(b) Account for the following:

(i) Zn is not considered as a transition element.

(ii) Transition metals form a large number of complexes.

(iii) The \( E^0 \) value for the \( \text{Mn}^{3+}/\text{Mn}^{2+} \) couple is much more positive than that for \( \text{Cr}^{3+}/\text{Cr}^{2+} \) couple.

OR

(i) With reference to structural variability and chemical reactivity, write the differences between lanthanoids and actinoids.

(ii) Name a member of the lanthanoid series which is well known to exhibit +4 oxidation state.

(iii) Complete the following equation:

\( \text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \rightarrow \)  

(iv) Out of \( \text{Mn}^{3+} \) and \( \text{Cr}^{3+} \), which is more paramagnetic and why?

(Atomic nos.: Mn = 25, Cr = 24)