SY-4025

Class No. : .....

Name : .....

SECOND YEAR HIGHER SECONDARY
SECOND TERMINAL EXAMINATION, DECEMBER-2025

Part – III

Time : 2 Hours

CHEMISTRY

Cool-off time : 15 Minutes

Maximum : 60 scores

General Instructions to Candidates :

- There is a 'Cool-off time' of 15 minutes in addition to the writing time.
- Use the 'Cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- Read the instructions carefully.
- Calculations, figures and graphs should be shown in the answer sheet itself.
- Malayalam version of the questions is also provided.
- Give equations wherever necessary.
- Electronic devices except non-programmable calculators are not allowed in the Examination Hall.

വിദ്യാർത്ഥികൾക്കുള്ള പൊതുനിർദ്ദേശങ്ങൾ :

- നിർദ്ദിഷ്ട സമയത്തിന് പുറമെ 15 മിനിറ്റ് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും.
- 'കൂൾ ഓഫ് ടൈം' ചോദ്യങ്ങൾ പരിചയപ്പെടാനും ഉത്തരങ്ങൾ ആസൂത്രണം ചെയ്യാനും ഉപയോഗിക്കുക.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- നിർദ്ദേശങ്ങൾ മുഴുവനും ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ, എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നല്കിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

Answer any 4 questions from 1 to 5. Each carries 1 score. **(4 × 1 = 4)**

1. The cell potential of mercury cell is nearly _____.

   (a) 1.50 V

   (b) 1.35 V

   (c) 1.91 V

   (d) 1.2 V

2. The rate of a chemical reaction doubles for every 10 °C rise in temperature. This is due to

   (a) increase in activation energy

   (b) increase in collision frequency

   (c) increase in number of effective collisions

   (d) decrease in activation energy

3. The compound $[Pt(NH_3)_2Cl_2]$ can exhibit

   (a) Ionization isomerism

   (b) Co-ordination isomerism

   (c) Linkage isomerism

   (d) Geometrical isomerism

4. Which of the following ions is colourless ?

   (a) Ti^{3+}

   (b) V^{3+}

   (c) Sc^{3+}

   (d) Cr^{3+}

5. **Assertion (A) :** Aldehydes are generally more reactive than ketones towards nucleophilic addition reactions.

Reason (R) : Ketones have +I effect of two alkyl groups and steric hindrance around the carbonyl carbon.

(a) Both (A) and (R) are true, and (R) is the correct explanation of (A).

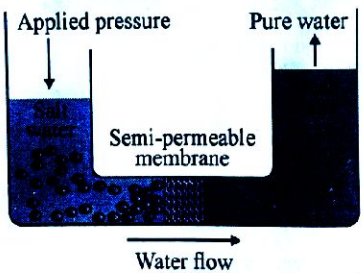
(b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

(c) (A) is true, (R) is false.

(d) (A) is false, (R) is true.

Answer any 8 questions from 6 to 15. Each carries 2 scores. **(8 × 2 = 16)**

6. State the principle behind this figure. Mention its one application.



7. Calculate the emf of the cell :

$Zn \mid Zn^{2+}(0.1M) \parallel Cu^{2+}(1M) \mid Cu$ (Given : $E^{\circ}_{cell} = 1.1$ V)

8. Draw a potential energy diagram showing effect of catalyst on activation energy.

9. Explain why the transition metals show variable oxidation states. Give one example.

10. What is lanthanoid contraction ? Mention any one of its consequences.

11. Explain the term *ambidentate ligand* with one example.

12. When 2-bromobutane is treated with alcoholic KOH, two alkenes are formed. Explain the formation of major and minor products with Saytzeff's rule.

13. Explain the reactions of phenol with dilute nitric acid and with bromine water.

14. $CH_2ClCOOH$ is a stronger acid than CH_3COOH. Why ?

15. How is acetyl chloride converted to acetaldehyde ? Name the reaction.

Answer any 8 questions from 16 to 26. Each carries 3 scores. **(8 × 3 = 24)**

16. (i) Sketch the diagram of H_2–O_2 fuel cell. **(1)**

(ii) Write the chemical equations for electrode reactions in it. **(1)**

(iii) Write any two advantages of fuel cell. **(1)**

17. The temperature dependence of the rate of a chemical reaction can be explained by Arrhenius equation.

(a) Give Arrhenius equation. (1)

(b) The rate of a chemical reaction doubles for an increase of 10 K in absolute temperature from 300 K. Calculate the activation energy (E_a).

[R = 8.314 J/K/mol and log 2 = 0.3010] (2)

18. (i) Write two Postulates of Werner's Coordination theory. (2)

(ii) Write the formula of pentaaminecarbonatocobalt (III) chloride. (1)

19. Draw the geometrical isomers of $[PtCl_2(en)_2]^{2+}$. Which among the isomer is optically active ? Give reason.

20. (i) Complete the reactions :

(a) $CH_3CH_2Br + AgCN \longrightarrow$ _____

(b) $CH_3CH_2Br \xrightarrow{NaI/Dry\ ether}$ _____ (2)

(ii) Why chloroform is kept in dark coloured bottles ? (1)

21. (i) Write difference between S_N1 and S_N2 reactions. (2)

(ii) How will you prepare chlorobenzene from benzene diazonium chloride ? (1)

22. (i) How will you prepare the following compounds using a Grignard reagent ?

(a) Primary alcohol

(b) Secondary alcohol (2)

(ii) Predict the products A and B :

$$3CH_3 - CH = CH_2 + (H - BH_2)_2 \longrightarrow A \xrightarrow{H_2O_2/OH^-} B$$ (1)

23. (i) What is cumene ? Explain the preparation of phenol from cumene. (2)

(ii) How methanol is prepared industrially ? (1)

24. (i) Phenols are more acidic than alcohols. Why ? (1)

(ii) How will you distinguish primary and secondary alcohols using Lucas test ? (2)

25. (i) Describe Gattermann Koch reaction. (1)

(ii) Distinguish between the following compounds :

(a) Propanal and propanone

(b) Phenol and benzoic acid (2)

26.

Sl. No.	Reactant	Reagent	Organic product	Name of reaction
1.	RCN	$SnCl_2/HCl$	_____	_____
2.	CH_3COOH	Cl_2/Red P	_____	_____
3.	CH_3CHO	_____	_____	Clemmensen reduction

Answer any 4 questions from 27 to 31. Each carries 4 scores. **(4 × 4 = 16)**

27. Analyse the picture and answer the following questions :

(i) Which law is related to this picture ? State the law and mention its one application. **(2)**

(ii) The vapour pressure of pure benzene at a certain temperature is 0.850 bar. A non-volatile, non-electrolyte solid weighing 0.5 g when added to 39 g of benzene (molar mass = 78 g mol^{-1}), vapour pressure of the solution, then is 0.845 bar. What is the molar mass of the solid substance ? **(2)**

28. (i) Identify the geometrical isomers of $[Co(NH_3)_3Cl_3]$ and give their structures. **(2)**

(ii) Diagrammatically represent the crystal field splitting of d-orbitals in a tetrahedral field. **(2)**

29. (i) Identify the products X and Y formed in the following reactions :

(a) $CH_3CH_2OH + PCl_5 \longrightarrow X + POCl_3 + HCl$

(b) $CH_3Br + AgF \longrightarrow Y + AgBr$ **(2)**

(ii) Write any two reasons for the less reactivity of aryl halides towards nucleophilic substitution reactions. **(2)**

30. (i) Name the product formed when phenol is treated with Zn dust. **(1)**

(ii) Explain the following reactions :

(a) Reimer-Tiemann reaction

(b) Williamson's synthesis **(3)**

31. (i) An organic compound A on reaction with CrO_2Cl_2 in CS_2 followed by acidification gives benzaldehyde as a product. Identify the compound A and also name the reaction. **(2)**

(ii) I am an aldehyde which does not have an α-hydrogen atom, react with Conc. NaOH to form two different products contain one carbon atom.

(a) Name the reaction.

(b) Identify two products. **(2)**