Reg. No.

Name : .

SY-25

SECOND YEAR HIGHER SECONDARY EXAMINATION, MARCH 2020

Part – III

CHEMISTRY

Maximum : 60 Scores

Time : 2 Hours

Cool-off time : 15 Minutes

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 7 questions from 1-9. Each carries 1 score. **(7 × 1 = 7)**

1. Which of the following lattices has the highest packing efficiency (assuming that atoms are touching each other) ?

   (a) Simple cubic

   (b) Body centred cubic

   (c) Face centred cubic

2. The limiting molar conductivity of weak electrolytes can be calculated by using the law

   (a) Faraday's law (b) Kohlrausch law

   (c) Henry's law (d) Raoult's law

3. Bredig's arc method is used to prepare which of the following sol ?

   (a) Silver sol (b) Gelatine sol

   (c) CdS sol (d) As_2S_3 sol

4. The product obtained by the reaction of calcium phosphide with water is

   (a) Phosphoric acid (b) Phosphine

   (c) Phosphorous acid (d) Phosphorus trichloride

5. Among the following which is more acidic ?

   (a) HCOOH (b) CH_3CH_2COOH

   (c) CH_3COOH (d) $CH_3CH_2CH_2COOH$

6. In the presence of light, chloroform is slowly oxidised by air to an extremely poisonous gas called _____.

7. Benzene diazonium chloride when treated with Cu_2Cl_2 and HCl, the product formed is chlorobenzene. This reaction is known as _____.

8. The monomer unit of natural rubber is _____.

9. Name a substance which can be used as an antiseptic and disinfectant at different concentrations.

Answer any 10 questions from 10-22. Each carries 2 scores. **(10 × 2 = 20)**

10. Classify each of the following as being either a p-type or n-type semiconductor : **(2 × 1 = 2)**

    (a) Ge doped with B

    (b) Si doped with As

11. Schottky defect and Frenkel defect are two types of stoichiometric point defects shown by ionic solids. Give two points of difference between Schottky defect and Frenkel defect.

12. Complete the table by giving the value of Van't Hoff factor 'i' for complete dissociation of solute. **(4 × ½ = 2)**

Salt	Vant Holf factor 'i' for complete dissociation of solute
$NaCl$	.....
$Al(NO_3)_3$	.....
K_2SO_4	.....
$Al_2(SO_4)_3$	.....

13. For a reaction $A + B \rightarrow C + D$, the rate equation is, Rate $= K [A]^{3/2} [B]^{1/2}$. Give the overall order and molecularity of reaction.

14. Give the general method used for the concentration of following ores : **(2 × 1 = 2)**

(a) Bauxite ore

(b) Zinc sulphide ore

15. Semiconductors of very high purity can be obtained by zone refining. Explain the principle behind zone refining. **2**

16. The composition of bleaching powder is $Ca(OCl)_2 \cdot CaCl_2 \cdot Ca(OH)_2 \cdot 2H_2O$ Give one method for the preparation of bleaching powder. **2**

17. (a) In d-block elements the radii of elements of third transition series are similar to those of the elements of second transition series. Give reason.

(b) Outer electronic configuration of Cu^{2+} ion is $3d^9$. Calculate its spin only magnetic moment. **(2 × 1 = 2)**

18. Assign the primary valence and secondary valence of the central metal in $[Ni(CO)_4]$

19. Aryl halides are less reactive towards nucleophilic substitution reactions. Write any two reasons for the less reactivity of aryl halides.

20. Ethanol and methoxymethane are functional isomers. But ethanol has higher boiling point than methoxymethane. Give reason.

21. Give a chemical test to distinguish between propanal and propanone.

22. Analgesics and antibiotics are drugs having different therapeutic actions. Define each class of drugs.

Answer any 7 questions from 23-31. Each carries 3 scores. **(7 × 3 = 21)**

23. For ethanol-acetone mixture solute-solvent interaction is weaker than solute-solute and solvent-solvent interaction.

(a) Does this solution obey Raoult's law ? **1**

(b) Give the vapour pressure-mole fraction graph for this solution. **2**

24. 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 (Ea) ?

[$R = 8.314\ JK^{-1}mol^{-1}$, $\log 2 = 0.3010$] **2**

25. The existence of charge on colloidal particles is confirmed by electrophoresis experiment.

(a) What is meant by electrophoresis ? **1**

(b) In the coagulation of a negative sol, the coagulating power is in the order

$Al^{3+} > Ba^{2+} > Na^{+}$. Name and state the rule behind this. **2**

26. Give the steps involved in the preparation of potassium dichromate ($K_2Cr_2O_7$) from chromite ore.

27. Cis isomer of $[Pt(NH_3)_2Cl_2]$ is used to inhibit the growth of tumours.

(a) Give the IUPAC name of $[Pt(NH_3)_2Cl_2]$. **1**

(b) Give the structure of cis and trans isomers of $[Pt(NH_3)_2Cl_2]$. **(2 × 1 = 2)**

28. (a) Which is the major product obtained when 2-bromopentane is heated with alcoholic solution of potassium hydroxide ? **1**

(b) Name and state the rule that governs the formation of major product. **2**

29. Complete the following table : **(3 × 1 = 3)**

Sl. No.	Reactant	Reagent	Product	Name of Reaction
1.	$CH_3CH_2NH_2$	$CHCl_3/KOH_{alc}$	.....	Carbylamine reaction
2.	CH_3CONH_2	$Br_2/NaOH$	CH_3NH_2	.....
3.	.....	$NaNO_2 + HCl$ 273 K	$C_6H_5\overset{\oplus}{N}_2\overset{\ominus}{Cl}$	Diazotisation

30. (a) Vulcanisation is carried out to improve the physical properties of rubber. Explain the process of vulcanisation of rubber. **1**

(b) Classify the following into addition and condensation polymers :

PVC, nylon 66, teflon, terylene **(4 × ½ = 2)**

31. (a) Differentiate between globular and fibrous proteins. **2**

(b) The deficiency of which vitamin causes night-blindness. **1**

Answer any 3 questions from 32-35. Each carries 4 scores. **(3 × 4 = 12)**

32. Daniell cell converts the chemical energy liberated during the redox reaction to electrical energy.

$$Zn_{(s)} + Cu^{2+}_{(aq)} \longrightarrow Zn^{2+}_{(aq)} + Cu_{(s)};\ E^0_{cell} = 1.1\ V$$

(a) Identify the anode and cathode in Daniell cell. **1**

(b) Calculate the standard Gibbs energy ($\Delta_r G°$) for the reaction. **2**

(c) Give the Nernst equation of above cell reaction. **1**

33. Account for the following :

(a) N_2 is less reactive at room temperature. **1**

(b) PCl_3 fumes in moisture. **1**

(c) Cl_2 is a powerful bleaching agent. **1**

(d) H_3PO_3 is dibasic. **1**

34. (a) A mixture of anhydrous $ZnCl_2$ and conc. HCl is an important reagent used to distinguish primary, secondary and tertiary alcohols. How the above reagent is used to distinguish the three types of alcohols ? **3**

(b) Predict the product formed in the reaction : $CH_3 - CH_2 - OH \xrightarrow[443\ K]{Conc \cdot H_2SO_4} ?$ **1**

35. Explain the following reactions :

(a) Rosenmund reduction **2**

(b) Cannizzaro reaction. **2**

HSE March 2020
Chemistry Answer Key

1. (c) Face Centred cubic
2. (b) Kohlrausch law
3. (a) Silver Sol
4. (b) Phosphine
5. (a) HCOOH
6. Phosgene
7. Sandmeyer reaction
8. Isoprene
9. Phenol
10. (a) p-type (b) n-type

11.

Schottky	Frenkel
• Density decreases • Cation and anion have almost same size.	• Density no change • Size of cation is very smaller than anion

12. NaCl - 2
$Al(NO_3)_3$ - 4
K_2SO_4 - 3
$Al_2(SO_4)_3$ - 5

13. • Order = $\frac{3}{2}+\frac{1}{2}=2$
• Molecularity = 2

14. • Bauxite - Leaching
• Zinc Sulphide - Froth Floation

15. Principle of Zone refining - Impurities are more soluble in the melt than the solid state of the metal.

16. $Ca(OH)_2 + Cl_2 \longrightarrow Ca(OCl)_2 + CaCl_2 + H_2O$

17. a) Lanthanoid Contraction
b) $3d^9$ ↑↓ ↑↓ ↑↓ ↑↓ ↑ $\therefore n=1$ $\mu = \sqrt{n(n+2)} = \sqrt{1(1+2)} = \sqrt{3}$

18. • Primary Valence - Oxidation State = Zero
• Secondary valence - Coordination number = 4

19. Aryl halide
• Carbon has sp^2 hybridisation
• Due to Resonance there is Partial double bond between Carbon and halogen.

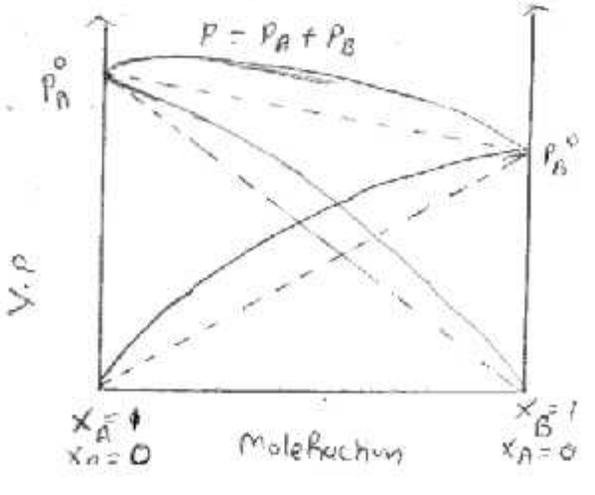
20. In Ethanol hydrogen bond formation takes place. But in Methox methane no hydrogen bond.

21. Tollen's test - Propanal produces silver mirror with TR

22. • Analgesics - Reduce pain
• Antibiotics - Kills / Inhibit the growth of microorganisms.

23. a) No.
b) Positive deviation.

24. a) $K = Ae^{\frac{-E_a}{RT}}$
b) $\log\left(\frac{K_2}{K_1}\right) = \frac{E_a}{2.303 \times R}\left[\frac{T_2-T_1}{T_1 \times T_2}\right]$



$$\log \frac{2k_1}{k_1} = \frac{E_a}{2.303 \times 8.314}\left[\frac{310-300}{310\times 300}\right] \Rightarrow \log 2 = \frac{E_a}{19.147}\left[\frac{10}{93000}\right]$$

$E_a = 53598.19\ J$

25. a) Electrophoresis - Movement of colloidal particles under applied electric potential.

b) Hardy - Schulze rule.

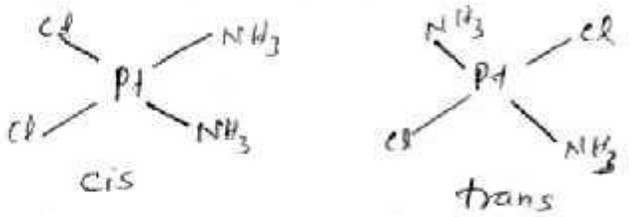
26. • $FeCr_2O_4 + Na_2CO_3 + O_2 \longrightarrow Na_2CrO_4 + Fe_2O_3 + CO_2$

• $Na_2CrO_4 + H^+ \longrightarrow Na_2Cr_2O_7 + Na^+ + H_2O$

• $Na_2Cr_2O_7 + KCl \longrightarrow K_2Cr_2O_7 + NaCl$

27. a) Diaminedichloridoplatinum (II)

b)



28. a) $CH_3-CH_2-CH_2-\underset{Br}{CH}-CH_3 \xrightarrow[\Delta]{Alc.\ KOH} CH_3-CH_2-CH=CH-CH_3$ (Pent-2-ene)

b) Saytzeve rule

29. a) CH_3-CH_2-NC b) Hoffmann Bromamide degradation c) $C_6H_5NH_2$ (aniline)

30. a) Heating of rubber with Sulphur.

b) • Addition - PVC, Teflon • Condensation - Nylon 6,6, terylene.

31. a) • Globular protein - Coiling of polypeptide chain giving spherical shape

• Fibrous protein - Polypeptide chains run parallel and giving thread like structure.

b) Vitamin - A

32. a) Anode - Zn, Cathode - Cu

b) $\Delta G^\circ = -nF E^\circ_{cell}$

$= -2 \times 96500 \times 1.1$

$= -212300\ J$

c) $E_{cell} = E^\circ_{cell} - \frac{0.059}{n}\log\frac{[Zn^{2+}]}{[Cu^{2+}]}$

33. a) N_2 has triple bond between them.

b) PCl_3 react with moisture giving fumes of HCl

c) Cl_2 produces Nascent oxygen with water.

$Cl_2 + H_2O \longrightarrow HCl + O$ (Nascent oxy

34. Lucas test - • 3° Alcohols produce turbidity immediately.

• 2° Alcohols produce turbidity after 5 minutes

• 1° Alcohols produce do not produce turbidity.

b) $CH_3-\overset{O}{\overset{\|}{C}}-Cl + 4H_2 \longrightarrow CH_3-CH_2-OH \xrightarrow[443\ K]{H_2SO_4} CH_2=CH_2 + H_2O$

35. a) Rosenmund reduction - $CH_3-\overset{O}{\overset{\|}{C}}-Cl + H_2 \xrightarrow{Pd\text{-}BaSO_4} CH_3-\overset{O}{\overset{\|}{C}}-H$

b) Cannizzaro reaction - $2H-\overset{O}{\overset{\|}{C}}-H + Conc.\ NaOH \longrightarrow H-\overset{O}{\overset{\|}{C}}-ONa + CH_3-OH$.

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