VENKATESHWAR INTERNATIONAL SCHOOL

Sector – 10, Dwarka, New Delhi – 110075

HALF-YEARLY EXAMINATION (2023-24)

CLASS –XII

CHEMISTRY

Ayush Bhat XII Lovedale (12)

TIME: 3 hrs **Max. marks : 70**

General Instructions:

a) There are 33 questions in this question paper with internal choice .
b) Section A: Q. No 1 to 16 are objective type questions carrying 1 mark each.
c) Section B: Q. No. 17 to 21 are short answer questions and carry 2 marks each.
d) Section C: Q. No. 22 to 28 are short answer questions and carry 3 marks each.
e) Section D :Q. No. 29 and 30 are case based questions carrying 4 marks each.
f) Section E :Q. No. 31 to 33 are long answer questions carrying 5 marks each.
g) Use of calculator is not permitted.

SECTION A (OBJECTIVE TYPE)

Q1. If A-A interactions and B-B interactions are stronger than A-B interactions, then such a solution,

i. will form maximum boiling azeotrope
ii. will form minimum boiling azeotrope
iii. will show positive deviation
iv. will show negative deviation

Choose the correct option:

a. i & iii
b. i & iv
c. ii & iii
d. ii & iv

Q2. Elevation of boiling point is inversely proportional to

a. molal elevation constant
b. molar mass of solute
c. molality
d. mass of solute

Q3. A first-order reaction is 50% completed in 1.26×10^{14} s. How much time will it take for 100% completion?

a. 1.26×10^{14} s
b. 2.52×10^{14} s
c. 1.26×10^{28} s
d. Infinite

Q4. The activation energy of a reaction can be determined from the graph of

a. ln k vs 1/T
b. ln k vs T
c. ln R vs 1/T
d. ln R vs T

Q5. The compound that reacts fastest with Lucas reagent at room temperature is
a. Butanol
b. Butan-2-ol
c. 2-Methylpropanol
d. 2-Methylpropan-2-ol

Q6. Dehydrohalogenation of alkyl halides is governed by
a. Markovnikov Rule
b. Kharasch effect
c. Sytzeff rule
d. Peroxide effect

Q7. Chloroacetic acid is more acidic than acetic acid due to:
a. +R effect
b. +I effect
c. –R effect
d. –I effect

Q8. Which of the following is an ambident nucleophile ?
a. H_2O
b. NH_3
c. OH^-
d. CN^-

Q9. S_N1 mechanism is a stereospecific reaction, which undergoes:
a. Racemisation
b. Inversion
c. Retention
d. Diazotisation

Q10. Which of the alcohol will have the highest boiling point ?
a. Methanol
b. Butanol
c. Butan-2-ol
d. 2-Methyl-propan-2-ol

Q11. Phenol on treatment with conc. HNO_3 yields
a. Aspirin
b. Benzoquinone
c. Sulphanilic acid
d. Picric acid .

Q12. In a dry cell, the cathode is
a. Zn container
b. Graphite rod
c. MnO_2
d. NH_4Cl

In the questions(13-16), a statement of assertion is followed by a statement of reason. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
b) Assertion and reason both are correct statements but reason is not the correct explanation for assertion.
c) Assertion is correct statement but reason is wrong statement.
d) Assertion is wrong statement but reason is correct statement.

Q13. ASSERTION: Hydrolysis of an ester is a pseudo unimolecular reaction.
REASON : When one of the reactants is present in large excess, it is difficult to experimentally determine the order w.r.t this reactant.

Q14. ASSERTION: Freezing point of 1 m KCl will be higher than 1 m $CaCl_2$ solution.
REASON : Value of Van't Hoff factor of $CaCl_2$ is higher than that of KCl.

Q15. ASSERTION: Chlorobenzene on treatment with aq. KOH does not yield phenol .
REASON : Haloarenes preferably undergo electrophilic substitution .

Q16. ASSERTION: Phenols have higher pKa than carboxylic acids .
REASON : Phenoxide ion is more stable than carboxylate ion .

SECTION B

Q. no. 17-21 are short answer type questions and carry 2 marks each.

Q17. Write the rate law for a first order reaction. Justify the statement that half life for a first order reaction is independent of the initial concentration of the reactant.

Q18. (i) Define specific rate of a reaction.
(ii) What is the significance of Arrhenius equation?

Q19. Justify, the following statements giving a suitable reason :
(a) o-nitrophenol is steam volatile but p-nitrophenol is not.
(b) Alcohols have higher boiling point than ethers of comparable molecular masses.

Q20 Complete the following reactions :
(i) $C_6H_5OC_2H_5 + HI \rightarrow$
(ii) $C_2H_5OH + NaOI \rightarrow$

OR

Write the reaction in the following cases :
(i) Anisole with HI
(ii) Phenol with dil. HNO_3

Q21. How will you distinguish between the following by a chemical test :
(i) Ethylamine and diethylamine
(ii) Methanamine and aniline

SECTION C

Q.no. 22-28 are short answer type II carrying 3 marks each.

Q22. A 10% solution (by mass) of sucrose in water has freezing point of 269.15 K. Calculate the freezing point of 10% glucose in water, if freezing point of pure water is 273.15 K.
(Given: Molar mass of sucrose=342 g/mol & Molar mass of glucose = 180 g/mol)

OR

An antifreeze solution is prepared from 222.6g of ethylene glycol and 200g of water. Calculate the molality of the solution. If the density of the solution is 1.072 g/ml, then what shall be the molarity of the solution?

Q23. The following data were obtained for the reaction:

A +2B ----> C

Experiment	[A]	[B]	Initial rate
1	0.2	0.3	4.2×10^{-2}
2	0.1	0.1	6×10^{-3}
3	0.4	0.3	1.68×10^{-1}
4	0.1	0.4	2.4×10^{-2}

(i) Find the order of reaction with respect to A and B.
(ii) Write the rate law and overall order of reaction.

Q24. Primary alkyl halide C_4H_9Br (A) is reacted with alcoholic KOH to give compound (B). B is reacted with HBr to give C which is an isomer of A. When A reacts with sodium metal in the presence of dry ether, it gives compound D C_8H_{18} which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of A and write all the reactions involved.

OR

Accomplish the following conversion :
(i) Propene to Iodopropane
(ii) Ethyl chloride to propanoic acid
(iii) Benzene to diphenyl

Q25. (i) Explain the mechanism of hydration of ethene to ethanol.
(ii) Write the structure of the compound whose IUPAC name is 2-methoxypropane.

Q26. Give reasons for the following:
(i) Grignard Reagent needs to be stored under anhydrous conditions.
(ii) Alkyl halides on treatment with $AgNO_2$ yield Nitro-alkanes.
(iii) Racemic mixtures are optically inactive.

Q27. (i) Write the IUPAC name of $CH_3CH=CHCH(OH)CHO$
(ii) Arrange the following in increasing order of their reactivity towards nucleophilic addition reaction :
(a) Butanone, propanal , ethanal ,propanone
(b) Benzaldehyde, p-nitrobenzaldehyde , acetophenone

Q28. Write the reaction of benzene diazonium chloride with :
(i) H_3PO_2
(ii) Aniline
(iii) Cu/HCl

SECTION D

Q29. Observe the given table carefully and answer the following questions:

Salt	Values of 'i'			'i' for complete dissociation of solute
	0.1m	0.01m	0.001m	
NaCl	1.87	1.94	1.97	2
KCl	1.85	1.94	1.98	2
$MgSO_4$	1.21	1.53	1.82	2
K_2SO_4	2.32	2.7	2.84	3

(i) What is Van't Hoff factor , (i) ?

(ii) What happens to the value of i of electrolytes on dilution and why?

(iii) A solution contains 5.85 g of NaCl per litre of solution .It has an osmotic pressure of 4.75 atm at 27^0C . Calculate the degree of dissociation of NaCl in this solution .(Given R= 0.0821 $LatmK^{-1}mol^{-1}$)

OR

1 g of a non-electrolyte solute dissolved in 50g of benzene lowered the freezing point by 0.40 K. Find the molar mass of solute.(K_f for benzene is 5.12 $KKgmol^{-1}$)?

Q30. Read the passage given below and answer the following questions :

Michael Faraday was the first scientist who described the quantitative aspects of electrolysis. The laws given by him find extensive use in industry. Many of the articles that we use in the kitchen or bathroom are electroplated with nickel or chromium. We need to know how much time and how much current will be required to electroplate an article with a particular thickness of Cr or Ni. Faraday's first law states that the amount of chemical reaction which occurs at any electrode during electrolysis by a current is proportional to the quantity of electricity passed through the electrolyte (solution and melt).
Faraday's second law states that the amounts of different substances liberated by the same quantity of electricity passing through the electrolytic solution are proportional to their chemical equivalent weights which is equal to the atomic mass of the metal divided by the number of electrons required to reduce the cation.

In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices:

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
b) Assertion and reason both are correct statements but reason is not the correct explanation for assertion.
c) Assertion is correct statement but reason is wrong statement.
d) Assertion is wrong statement but reason is correct statement.

(i) ASSERTION : The value of one Faraday is 96500 Coulomb.
REASON : The quantity of electricity required to reduce 2.4 g of Mg^{2+} ions is 48250 C.

(ii) ASSERTION : The article to be electroplated with nickel is made as cathode .
REASON : In electrolytic cell reduction occurs at cathode .

(iii) ASSERTION : When 1F is passed through 1M NaCl or 1M KCl same mass of the metal will be produced .
REASON : Amount of metal produced does not depend on the molarity of the solution.

(iv) ASSERTION : Aqueous NaCl on electrolysis will produce H_2 at cathode .
REASON : Hydrogen has higher reduction potential than Na.

SECTION E

Q.no. 31 to 33 are long answer type carrying 5 marks each .

Q31. (i) Write the reaction of
(a) Acetaldehyde with HCN
(b) Benzaldehyde with conc. NaOH
(c) Propanone with NH_2NH_2

(ii) Give a chemical test to distinguish between the following:
(a) Formaldehyde and acetaldehyde .
(b) Butanal and Butanone .

OR

(i) Give reasons for the following ?
(a) Benzaldehyde doesn't undergo Aldol condensation .
(b) Carbonyl compounds undergo nucleophillc addition reactions .

(ii) Illustrate the following reaction with a suitable example
(a) Rosenmund reduction
(b) Wolff-Kishner reduction
(c) HVZ reaction

Q32. (i) How would you account for the following?
(a) Ammonolysis of alkyl halides is not considered a good method of preparation of amines .
(b) Primary amines are soluble in water while tertiary amines are not .
(c) Aniline on nitration gives a significant amount of meta derivative .

(ii) Give a chemical equation for the following :
(a) Hoffmann Bromamide reaction
(b) Gabriel phthalimide synthesis .

OR

(i) An aromatic compound A of molecular formula C_7H_7ON when treated with Br_2 and KOH gives another compound B . B on treatment with nitrous acid followed by treatment with ethanol gives a compound C . Identify A,B,and C and write the reactions involved .

(ii) Illustrate the following reaction with a suitable example
(a) Carbylamine reaction
(b) Ammonolysis of alkyl halides

Q33. (i) If solutions of two electrolytes A and B are diluted, then the molar conductivity of B increases 1.5 times while that of a A increases 25 times . Comment on the nature of A and B . Justify your answer giving suitable answer..

(ii) Represent the cell in which the following reaction takes place . If the value of E^0 for the cell is 1.26 V . Calculate the E_{cell} .

$2Al(s) + 3Cd^{2+}(0.1M) \rightarrow 3Cd(s) + 2Al^{3+}(0.01M)$

OR

(i) Why mercury cell gives a constant voltage throughout its life span . Mention its any two uses .

(ii) Three electrolytic cells A,B,C containing solutions of $ZnSO_4$, $AgNO_3$ and $CuSO_4$ respectively are connected in series .A steady current of 1.5 amperes was passed through them until 1.45 g of silver deposited at the cathode of cell B .How long did the current flow ? What mass of copper and zinc were deposited ?(Zn =65.3u ; Cu= 63.5 u ; Ag =108 u)

97