



INDIAN SCHOOL AL WADI AL KABIR

First Rehearsal Examination 2022-23

SUB: Chemistry (043)

Date: 08/12/2022

Time Allowed :3 hours

Class: XII

SET 1

Maximum Marks: 70

General Instructions:

Read the following instructions carefully.

- a) There are 35 questions in this question paper with internal choice.
- b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
- d) SECTION C consists of 5 short answer questions carrying 3 marks each.
- e) SECTION D consists of 2 case- based questions carrying 4 marks each.
- f) SECTION E consists of 3 long answer questions carrying 5 marks each.
- g) All questions are compulsory.
- h) Use of log tables and calculators is not allowed.

SECTION A

The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. Which one is the best colligative property for determination of molecular mass of a polymer?
 - (A) osmotic pressure
 - (B) elevation in boiling point
 - (C) depression in freezing point
 - (D) relative lowering of vapour pressure

2. Radioactive decay is an example of:
- (A) zero order reaction
 - (B) second order reaction
 - (C) first order reaction
 - (D) third order reaction
3. Values of Henry's law constant for some gases in water are given below.

Gas	Temperature	K_H/kbar
Argon	298 K	40.3
Formaldehyde	298 K	1.83×10^{-5}
Methane	298 K	0.413
Vinyl chloride	298 K	0.611

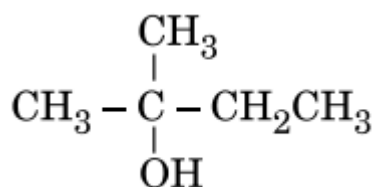
Identify the least soluble gas at 298 K.

- (A) Methane
 - (B) Argon
 - (C) Formaldehyde
 - (D) Vinyl chloride
4. Which of the following would decrease with increase in concentration?
- (i) Conductivity of strong electrolytes
 - (ii) Conductivity of weak electrolytes
 - (iii) Molar conductivity of strong electrolytes
 - (iv) Molar conductivity of weak electrolytes
- (A) (i) and (ii)
 - (B) (ii) and (iv)
 - (C) (iii) and (iv)
 - (D) (i) and (iii)
5. For a reaction, $A + B \rightarrow \text{Product}$; the rate law is given by,
- $$\text{Rate} = k [A]^x [B]$$
- Rate increases by 8 times, when concentrations of both A and B are doubled. What is the order of reaction with respect to A?
- (A) 1
 - (B) 0
 - (C) 3
 - (D) 2

6. The oxidation state of Cobalt in $K_3[Co(C_2O_4)_3]$ is:
- (A) -2
 - (B) +1
 - (C) +2
 - (D) +3
7. Which of the following metallic ions have same magnetic moment?
- (i) Co^{2+} (ii) Cr^{2+} (iii) Mn^{2+} (iv) Cr^{3+}
- (A) i, iv
 - (B) ii, iv
 - (C) i, ii
 - (D) ii, iii
8. Which of the following statement is correct towards S_N1 reactions?
- (A) Aryl halides are more reactive than benzyl halides
 - (B) Allyl halides are less reactive than alkyl halides
 - (C) Aryl halides are more reactive than alkyl halides
 - (D) Benzyl halides are more reactive than vinyl and aryl halides
9. The conversion of an alkyl halide into an alkene by alcoholic KOH is classified as
- (A) a substitution reaction
 - (B) a dehydrohalogenation reaction
 - (C) an addition reaction
 - (D) a dehydration reaction
10. Name a transition element which does not exhibit variable oxidation states.
- (A) Zinc
 - (B) Scandium
 - (C) Copper
 - (D) Manganese
11. $[Co(NH_3)_5(NO_2)]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2$ are examples of
- (A) Coordination isomers
 - (B) Ionisation isomers
 - (C) Linkage isomers
 - (D) Solvate isomers

12. An α -helix is a structural feature of
- (A) Sucrose
 (B) Nucleotides
 (C) Polypeptides
 (D) Starch
13. When Phenol is manufactured from cumene, the useful by-product formed is
- (A) Acetone
 (B) Acetic acid
 (C) Acetaldehyde
 (D) Ethanol

14.



The correct IUPAC name of this compound is:

- (A) 2,2-Dimethylpropanol
 (B) 2-Methylbutan-2-ol
 (C) 3-Methylbutan-3-ol
 (D) tert-butyl alcohol
15. Given below are two statements labelled as Assertion (A) and Reason (R).
 Assertion (A): Hydrolysis of an ester follows first order kinetics.
 Reason (R): Concentrations of both ester and water remain nearly constant during the course of the reaction.
- (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 correct explanation for assertion.
 (C) Assertion is correct statement but reason is wrong statement.
 (D) Assertion is wrong statement but reason is correct statement.
16. Given below are two statements labelled as Assertion (A) and Reason (R).
 Assertion (A): The solubility of a solid in a liquid always increases with increase in temperature.
 Reason (R): The dissolution process of solid in liquid can either be endothermic or be exothermic.

- (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 correct explanation for assertion.
- (C) Assertion is correct statement but reason is wrong statement.
- (D) Assertion is wrong statement but reason is correct statement.

17. Given below are two statements labelled as Assertion (A) and Reason (R).

Assertion (A): Finkelstein reaction takes place in presence of dry acetone.

Reason (R): NaX formed during the reaction is precipitated in dry acetone and it facilitates the forward reaction.

- (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 correct explanation for assertion.
- (C) Assertion is correct statement but reason is wrong statement.
- (D) Assertion is wrong statement but reason is correct statement.

18. Given below are two statements labelled as Assertion (A) and Reason (R).

Assertion (A): Lysine is an essential amino acid.

Reason (R): Lysine can be synthesised in the body.

- (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 correct explanation for assertion.
- (C) Assertion is correct statement but reason is wrong statement.
- (D) Assertion is wrong statement but reason is correct statement.

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19. Account for the following:

- a) Highest fluoride of Mn is MnF_4 whereas the highest oxide is Mn_2O_7 .
- b) Generally, there is an increase in density of elements from titanium to copper in the first series of transition elements.

20. A first order reaction is 50% complete in 25 minutes. Calculate the time for 80% completion of the reaction.

(Given: $\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 5 = 0.6990$)

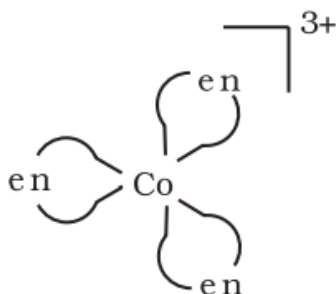
21. Give reasons for the following:
- Protonation of phenol is difficult whereas ethanol easily undergoes protonation.
 - Anisole on reaction with HI gives phenol and CH_3I as main products and not Iodobenzene and methanol.
22. What happens when: (Write chemical equations)
- Phenol is oxidised with $\text{Na}_2\text{Cr}_2\text{O}_7 / \text{H}^+$
 - Phenol is treated with bromine water

OR

- Name the reagents used in the following reactions:
 - Oxidation of a primary alcohol to aldehyde.
 - Phenol to 2,4,6-Trinitrophenol.
 - Write structure of 1-Phenylpropan-2-ol
23. When fruits and vegetables that have dried up are placed in water, they swell and return to original form. Why? Would temperature increase accelerate the process?
24. a) Write the formula of Tetraammineaquachloridocobalt(III) chloride.
b) Identify the coordination number and oxidation state of chromium in the complex $[\text{Cr}(\text{H}_2\text{O})_2(\text{en})_2]\text{Cl}_3$

OR

- Draw the Geometrical isomers of $[\text{CoCl}_2(\text{en})_2]$
- Dextro rotatory isomer of $[\text{Co}(\text{en})_3]^{3+}$ is given below. Draw its optical isomer (laevo).



25. a) Among the isomeric alkanes of molecular formula C_6H_{14} , identify the one that on photochemical chlorination yields two isomeric monochlorides.

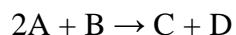
b) Arrange the following in the order of increasing boiling points.

1-Chloropropane, Isopropyl chloride, 1-Chlorobutane.

SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26. The following results have been obtained during the kinetic studies of the reaction:

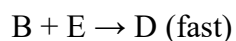
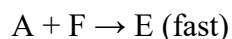
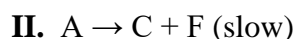
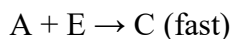
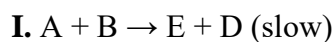


Experiment number	[A] molL ⁻¹	[B] molL ⁻¹	Initial rate molL ⁻¹ s ⁻¹
1.	0.02	0.6	3×10^{-3}
2.	0.08	0.6	1.2×10^{-2}
3.	0.02	1.2	3×10^{-3}

a) Find the order of reaction with respect to A and B.

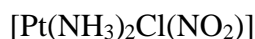
b) Write the rate law and overall order of reaction.

c) Which of the following possible reaction mechanisms is consistent with the rate law?



27. a) Give one chemical test as an evidence to show that $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Cl}$ are ionisation isomers.

b) Write the IUPAC name of the following coordination compound:



c) Write the electronic configuration of Mn(II) on the basis of crystal field theory when it forms an octahedral complex in the presence of:

(i) strong field ligand

(ii) weak field ligand. (Atomic no. of Mn = 25)

OR

Using Valence bond theory, identify the following in relation to the complex:



- a) type of hybridization
 - b) magnetic property
 - c) type of complex – inner orbital or outer orbital complex
28. a) What type of a battery is the Lead storage battery? Write the anode and cathode reactions and the overall reaction occurring in a Lead storage battery when current is drawn from it.
- b) Unlike dry cell, the mercury cell has a constant potential throughout its usual life. Why?
29. a) Which compound in each of the following pairs will react faster in $\text{S}_{\text{N}}2$ reaction?
- i) CH_3Br or CH_3Cl ii) $(\text{CH}_3)_3\text{CCl}$ or $\text{CH}_3\text{CH}_2\text{Cl}$
- b) Write the equation for the preparation of 1-Iodobutane from But-1-ene
30. Give reasons for **any 3** of the following observations:
- a) Chlorobenzene can't be formed by treating Phenol with SOCl_2 at room temperature.
 - b) p-dihalobenzene has higher melting point than ortho and meta-isomers.
 - c) It is necessary to avoid even traces of moisture from a Grignard reagent.
 - d) Electrophilic substitution reactions in haloarenes occur slowly.

SECTION D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks. Read the passage carefully and answer the questions that follow.

31. Solutions are homogeneous mixtures of two or more than two components. By homogenous mixture we mean that its composition and properties are uniform throughout the mixture. Generally, the component that is present in the largest quantity is known as solvent. Solvent determines the physical state in which solution exists. One or more components present in the solution other than solvent are called solutes. Liquid-liquid solutions can be classified into ideal and non-ideal solutions on the basis of Raoult's law.

Nithya is investigating the nature of 6 different liquids A, B, C, D, E and F. Her experimental results are given below.

Exp. No.	Liquids mixed	Volume of the resulting solution
1	10 ml A and 10 ml B	20.4 ml
2	10 ml C and 10 ml D	19.2 ml
3	10 ml E and 10 ml F	20.0 ml

Answer the following questions:

- a) In Nithya's experiment, identify the liquids that form an ideal solution.

- b) Which two liquids when mixed together form a solution that shows positive deviation from Raoult's law?
- c) Is the formation of solution in experiment 2 endothermic or exothermic? Explain.

OR

- c) The vapour pressure of pure liquids X and Y are 350 mm Hg and 500 mm Hg respectively, at 370 K. Find out the composition of the liquid mixture if total vapour pressure is 400 mm Hg.

- 32.** The nucleic acids, deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) are the molecules responsible for carrying the genetic information of a cell. As proteins are polymers of amino acids, nucleic acids are long chain "polymers" of nucleotide building blocks. Each nucleotide is made up of a nucleoside along with phosphoric acid. Each nucleoside is made up of a simple aldopentose sugar and a heterocyclic amine base. Base refers to the ability of the nitrogen lone pair to accept a proton.

Answer the following questions:

- a) Name the linkage present between nucleotides.
- b) The two strands in DNA are complementary to each other. Why?
- c) Name the four bases present in DNA and RNA.

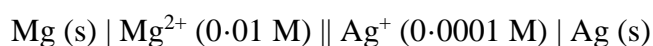
OR

- c) Write any two points of differences between DNA and RNA.

SECTION E

The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

- 33.** a) Calculate emf for the following cell at 298 K:



$$[\text{Given : } E^0_{\text{Mg}^{2+}/\text{Mg}} = -2.37 \text{ V; } E^0_{\text{Ag}^+/\text{Ag}} = +0.80 \text{ V}]$$

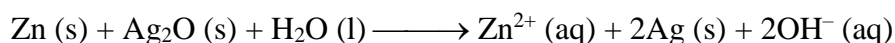
- b) Define fuel cell.
- c) On the basis of E^0 values, O_2 gas should be liberated at anode but it is Cl_2 gas which is liberated in the electrolysis of aqueous NaCl. Why?

OR

- a) The conductivity of 0.001 mol L^{-1} solution of CH_3COOH is $4.95 \times 10^{-5} \text{ S cm}^{-1}$. Calculate its molar conductivity and degree of dissociation (α).

$$[\text{Given : } \lambda^0_{\text{H}^+} = 349.6 \text{ S cm}^2 \text{ mol}^{-1} \text{ and } \lambda^0_{\text{CH}_3\text{COO}^-} = 40.9 \text{ S cm}^2 \text{ mol}^{-1}]$$

b) Following reaction takes place in the cell:



Calculate $\Delta_r G^\theta$ of the reaction.

$$[\text{Given : } E^\theta_{(\text{Zn}^{2+} / \text{Zn})} = -0.76 \text{ V, } E^\theta_{(\text{Ag}^+ / \text{Ag})} = 0.80 \text{ V, } 1 \text{ F} = 96,500 \text{ C mol}^{-1}]$$

34. a) Explain the mechanism of acid catalysed hydration of an alkene forming an alcohol.
b) An organic compound (A) having molecular formula $\text{C}_6\text{H}_6\text{O}$ gives a characteristic colour with aq. FeCl_3 solution. When (A) is treated with CO_2 and NaOH at 400 K under pressure, (B) is obtained. The compound (B) on acidification gives compound (C) which reacts with acetyl chloride to form (D) which is a popular pain killer. Write the structures of A, B, C and D.

OR

- a) Explain the mechanism of dehydration of Ethanol to give Ethene.
b) Write the reaction involved in the following:
i) Nitration of Anisole
ii) Williamson synthesis
35. a) Account for the following:
i) The highest oxidation state of a metal is exhibited in its oxides or fluorides only.
ii) Transition elements form interstitial compounds.
iii) Actinoid contraction is greater than lanthanoid contraction.
- b) Complete the following equation:
$$5\text{NO}_2^- + 2\text{MnO}_4^- + 6\text{H}^+ \rightarrow$$
- c) Write a balanced chemical equation for the decomposition of KMnO_4 at 513 K.