



# PRINCE ACADEMY

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## SAMPLE PAPER- SET-2 (2024-25)

Time : 03 Hours

CLASS - XII CHEMISTRY (043)

M. M. : 70

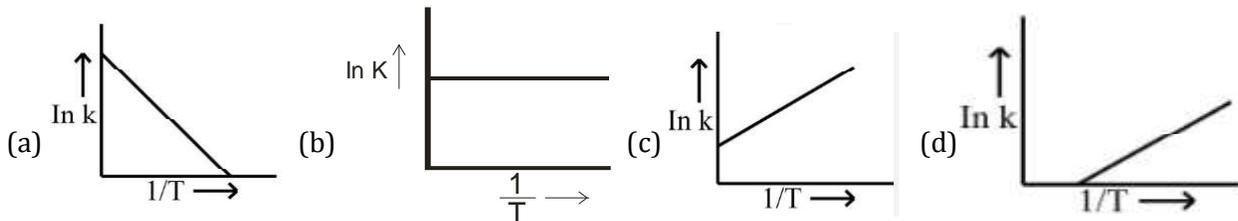
Read the following instructions carefully.

- There are 33 questions in this question paper with internal choice.
- SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
- SECTION B consists of 5 short answer questions carrying 2 marks each.
- SECTION C consists of 7 short answer questions carrying 3 marks each.
- SECTION D consists of 2 case-based questions carrying 4 marks each.
- SECTION E consists of 3 long answer questions carrying 5 marks each.
- All questions are compulsory.
- Use of log tables and calculators is not allowed.

### SECTION-A

The following are the multiple choice questions, each carry one mark

- In comparison to a 0.01 M Glucose solution, the depression in Freezing point of a 0.01 M  $MgCl_2$  solution is -  
(a) The same                      (b) about three times                      (c) about twice                      (d) none of these
- The cell constant of a conductivity cell -  
(a) Changes with change of electrolyte                      (b) Changes with change of concentration of electrolyte  
(c) Changes with temperature of electrolyte                      (d) Remains constant for a cell
- According to arrhenius equation  $K = Ae^{-E_a/RT}$ , which of the following options represents the graph of  $\ln k$  and  $\frac{1}{T}$ ?



- Gadolinium belongs to 4f series, Atomic no. 64. Which of the following is the correct electronic configuration of Gadolinium-  
(a)  $[Xe] 4f^7 5d^1 6s^2$                       (b)  $[Xe] 4f^6 5d^2 6s^2$                       (c)  $[Xe] 4f^8 6d^2$                       (d)  $[Xe] 4f^9 5s^1$

5. What kind of isomerism exists between  $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$  and  $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$ -

- (a) linkage isomerism (b) coordination isomerism  
(c) ionisation isomerism (d) solvate isomerism

6. IUPAC name of  $\text{CH}_3-\text{CH}(\text{OCH}_3)-\text{CH}_3$  is -



- (a) 1-methoxy-1-Methyl ethane (b) 2-Methoxy-2-Methyl ethane  
(c) 2-Methoxy propane (d) isopropyl methyl ether

7. Which of the following compound will react with sodium bicarbonate ?

- (a)  $\text{C}_6\text{H}_5\text{OH}$  (b)  $\text{CH}_3\text{COOH}$  (c)  $(\text{CH}_3)_3\text{COH}$  (d)  $\text{CH}_3-\text{CH}_2-\text{OH}$

8. The reagent which does not react with both, acetone and benzaldehyde-

- (a) Sodium hydrogen sulphite (b) Grignard reagent  
(c) Tollen's reagent (d) Fehling's solution

9. Which of the following compound do not undergo Aldol condensation

(a)  $\text{CH}_3-\text{CHO}$

(b)  $\text{CH}_3-\text{C}-\text{CH}_3$



10. Which of the following amine gives carbylamine reaction -

- (a)  $(\text{CH}_3)_3\text{N}$  (b)  $\text{CH}_3\text{NH}_2$  (c)  $(\text{CH}_3)_2\text{NH}$  (d) None of these

11. Which of the following amine evolve  $\text{N}_2$  gas with Nitrous acid at cold condition-



(b)  $\text{R}_2-\text{NH}$

(c)  $\text{R}-\text{NH}_2$

(d) Both a and b

12. Peptide bond present in -

- (a) Poly saccharides (b) Polypeptides (c) Polynucleotides (d) All of these

**For Questions number (13-16) , two statements are given - one labelled as Assertion (A) and the other labelled as Reason (R) . Select the correct answer to these questions from the codes (A), (B), (C) , and (D) as given below.**

**(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).**

**(B) Both Assertion (A) and Reason (R) are true, but Reason(R) is not the correct explanation of the Assertion(A).**

**(C) Assertion (A) is true, but Reason (R) is false.**

**(D) Assertion (A) is false, but Reason (R) is true.**

13. Assertion :- Electrolysis of  $\text{NaCl}$  solution gives chlorine at anode instead of  $\text{O}_2$ .

Reason :- Formation of oxygen at anode requires over voltage.

14. Assertion : All collision of reactant molecules lead to product formation.

Reason :- Only those collisions in which molecules have correct orientation and sufficient kinetic energy lead to compound formation.

15. Assertion :- d-block elements also called transition element.  
Reason :- d-block elements have fully filled (n-1)d orbital
16. Assertion :- Linkage isomerism arises in coordination compounds containing ambidentate ligand.  
Reason :- Ambidentate ligand has two different donor atoms and use both at a time.

### SECTION-B

**Section B carry 5 question - 2 marks each with internal choice.**

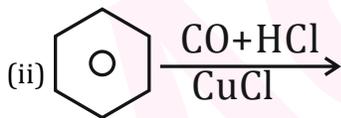
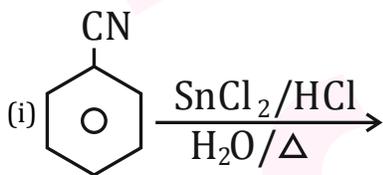
The following questions, Q.No 17 - 21 are short answer type and carry 2 marks each.

17. (i) Name the element of 3d series which shows maximum oxidation state and why ?  
(ii) Name an important alloy which contains some of the lanthanoid metals.
18. (i) In a coordination entity, the electronic configuration of central metal ion is  $t_2g^3 e_g^1$ .  
Is the coordination compound a high spin or low spin complex ?  
(ii) Define chelate effect.
19. An organic compound A with the molecular formula  $C_4H_9Br$  undergoes hydrolysis to form  $C_4H_9OH$ . Give the structure of A and write the mechanism of the reaction.

OR

Among the isomeric alkanes of molecular formula  $C_5H_{12}$ , identify the one that on photochemical chlorination yields-

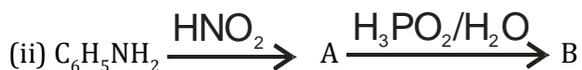
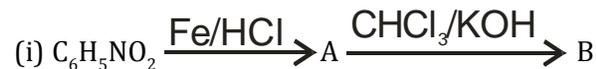
- (a) A single monochloride  
(b) Three isomeric monochlorides
20. Complete the following reactions-



OR

Convert following-

- (i) propanone into propene  
(ii) Ethanol to 3-hydroxy butanal
21. Identify A and B in the following equations-



## SECTION-C

**Contain 7 question with 3 marks each with internal choice.**

22. The half-life for radioactive decay of  $^{14}\text{C}$  is 5730 years. An archaeological artifact containing wood had only 80% of the  $^{14}\text{C}$  found in a living tree. Estimate the age of the sample.

[ $\log 2 = 0.30$ ,  $\log 3 = 0.47$ ,  $\log 4 = 0.60$ ,  $\log 5 = 0.69$ ]

23. (i) What is the order of Radio-decay reaction ?  
(ii) Write integrate rate expression for above order.  
(iii) Write the unit of rate constant for above reaction.

OR

For a reaction-



The proposed mechanism is given as below-

- (i)  $\text{H}_2\text{O}_2 + \text{I}^- \xrightarrow{\text{slow}} \text{H}_2\text{O} + \text{IO}^-$   
(ii)  $\text{H}_2\text{O}_2 + \text{IO}^- \xrightarrow{\text{fast}} \text{H}_2\text{O} + \text{I}^- + \text{O}_2$   
(a) Write rate law for the reaction.  
(b) Write overall order of reaction.  
(c) Out of step (i) and (ii), which one is rate determining step ?
24. Account for the following -  
(i) Actinoids shows large number of Oxidation states.  
(ii) The enthalpies of atomisation of transition metals are high.  
(iii) Transition metals form interstitial compounds.
25. The hexaaquamanganese (II) ion contains five unpaired electrons while hexacyanidomanganate(II) ion contains only one unpaired electron- Explain using crystal field theory.

OR

Answer the following-

- (i) Out of  $\text{NH}_3$  and  $\text{CO}$ , which ligand forms a more stable complex with a transition metal and why ?  
(ii) Draw one of the geometrical isomer of the complex  $[\text{Pt}(\text{en})_2\text{Cl}_2]^{2+}$ , Which is optically inactive.  
(iii)  $\text{FeSO}_4$  solution mixed with  $(\text{NH}_4)_2\text{SO}_4$  solution in 1 : 1 gives the test of  $\text{Fe}^{2+}$  ion but  $\text{CuSO}_4$  solution mixed with aqueous ammonia in 1 : 4 does not give the test of  $\text{Cu}^{2+}$  ion, why ?
26. Give equations of the following reactions -  
(i) Bromine in  $\text{CS}_2$  with phenol.  
(ii) Treatment of isopropyl alcohol with  $\text{Cu}$  at 573 K.  
(iii) Kolbe's reaction.
27. (i) How- OH group activates the benzene ring towards electrophilic substitution reactions ?  
(ii) The usual halogenation of phenol takes place even in absence of catalyst  $\text{Fe III}$  or  $\text{FeBr}_3$ .  
(iii) Give reason for the higher boiling point of ethanol in comparison to methoxymethane ?
28. Account for the followings-  
(i) Ethylamine is soluble in water.  
(ii) Aliphatic amines are more basic than Aromatic amines.  
(iii) Aromatic primary amines cannot be prepared by Gabriel phthalimide synthesis.

## SECTION-D

Following questions are case based question. each question carry 4 marks with internal choice.

29. The substitution reaction of alkyl halide mainly occur by  $SN^1$  or  $SN^2$  reaction mechanism. The rate of  $SN^1$  reaction are governed by the stability of carbocation whereas for  $SN^2$  reaction steric factor is the deciding factor. If the starting material is a chiral compound, we may end up with an inverted product or racemic mixture depending upon the type of mechanism followed by alkyl halide.

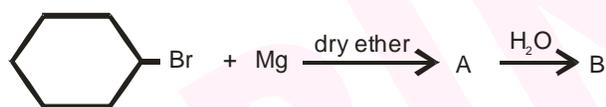
(i) What is stereocenter or chiral center ?

(ii) Name the instrument used for measuring the angle by which the PPL is rotated.

(iii) Arrange the following compounds in the order of reactivity towards  $SN^1$  reaction-

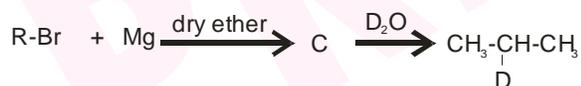


(iv) Identify A, B in the following reaction-



OR

(iv) Identify R and C in the following reaction-



30. Carbohydrates are the hydrates of carbon having general formula  $C_x(H_2O)_y$ . Carbohydrates may be defined as the optically active polyhydroxy aldehyde or ketone.

Proteins are the most abundant biomolecules of the living system. Chief source of proteins are Milk, Cheese, pulses etc- They occur in every part of the body and form fundamental basis of structure and functions of life.

(i) What are the hydrolysis product of milk sugar ?

(ii) What are anomers ?

(iii) Which type of linkage present in protein ?

(iv) When RNA is hydrolysed, there is no relationship among the quantities of different bases obtained, why?

OR

(iv) The two strands in DNA are not identical but are complementary. Explain.

## SECTION-E

This section carry three question of five marks each.

31. (i) Out of 1 M Glucose and 1 M NaCl solution, which one has higher boiling point and why ?  
(ii) What happens when the external pressure applied becomes more than the osmotic pressure of the solution ?  
(iii) What is the effect of temperature on the solubility of gas in water ?  
(iv) A solution of Glucose in water is labelled as 10% by weight. What would be the molality of the solution ?

[ $M_2 = 180 \text{ gm/mol}$ ]

OR

(iv) Boiling point of water at 750 mm Hg is 99.63 °C. How much sucrose is to be added to 500 gm. of water such that it boils at 100 °C. (Given  $K_b = 0.52 \text{ K Kg Mol}^{-1}$ ,  $M_2 = 342 \text{ gm Mol}^{-1}$ )

32. Account for following Questions-

(i) How much charge in coulomb required to obtained one mole of aluminium from molten  $\text{Al}_2\text{O}_3$  ?

(ii) Define conductivity. What is the effect of dilution on conductivity ?

(iii) Why alternating current is used instead of direct current for the measurement of electrolytic conductance?

(iv) Calculate  $\lambda_m^\circ$  for  $\text{CaCl}_2$  and  $\text{MgSO}_4$  using following data -

$$\lambda_{\text{Ca}^{2+}}^\circ = 119 \text{ Scm}^2 \text{ mol}^{-1}$$

$$\lambda_{\text{Mg}^{2+}}^\circ = 106 \text{ Scm}^2 \text{ Mol}^{-1}$$

$$\lambda_{\text{Cl}^{-}}^\circ = 76.3 \text{ Scm}^2 \text{ Mol}^{-1}$$

$$\lambda_{\text{SO}_4^{2-}}^\circ = 160 \text{ Scm}^2 \text{ Mol}^{-1}$$

OR

(iv) Represent the cell in which following reaction takes place-



Calculate  $E_{\text{cell}}$  if  $E^\circ_{\text{cell}} = + 3.17 \text{ V}$ .

[given  $\log 10 = 1$ ,  $\log 13 = 1.1139$ ]

33. (i) Write reaction involve in cannizzaro.

(ii) Arrange the following in decreasing order of their acidic strength.



(iii) Write chemical equation of HVZ reaction.

(iv) Give reason-

(a) Carboxylic acids do not give reactions of carbonyl group.

(b) Why dry HCl gas used in the reaction of acetal and ketal formation ?

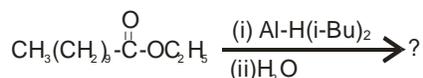
OR

(i) An Alkene with molecular formula  $\text{C}_5\text{H}_{10}$  on ozonolysis gives a mixture of two compounds B and C. Compound B gives fehling test and also react with iodine and NaOH solution. Compound C does not give fehling solution test but forms iodoform. Identify the compound A, B and C.

(ii) Give reason-

(a) Propanone is less reactive than ethanal towards addition of HCN.

(b) Complete the reaction -



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