Class XII | Session 2026-27
Subject - Chemistry
Sample Question Paper - Set 3

General Instructions:

Read the following instructions carefully.

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

Section A

1. Which of the following alcohols will yield the corresponding alkyl chloride on reaction with concentrated HCl at room temperature? **[1]**

a) $CH_3CH_2-\underset{\underset{CH_3}{|}}{C}-CH_2OH$

b) $CH_3CH_2-\underset{\underset{CH_3}{|}}{\overset{CH_3}{\overset{|}{C}}}-OH$

c) $CH_3CH_2-\underset{\underset{CH_3}{|}}{C}-OH$

d) $CH_3CH_2—CH_2—OH$

2. Progesterone is responsible for **[1]**

a) development of secondary male characteristics.

b) development of secondary female characteristics.

c) controlling menstrual cycle.

d) preparing the uterus for implantation of fertilised egg.

3. Alcoholic compounds react: **[1]**

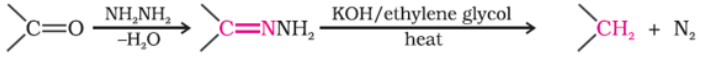
a) both as nucleophiles and electrophiles.

b) None of these

c) only as electrophiles.

d) only as nucleophiles.

4. The following reaction is: **[1]**



a) Wolff – Kishner reduction

b) catalytic hydrogenation

c) Clemens reduction

d) catalytic ionisation

5. The following experimental rate data were obtained for a reaction carried out at 25°C: **[1]**

$A_{(g)} + B_{(g)} \rightarrow C_{(g)} + D_{(g)}$

Initial $[A_{(g)}]$/mol dm^{-3}	**Initial $[B_{(g)}]$/mol dm^{-3}**	**Initial rate/mol $dm^{-3}s^{-1}$**
3.0×10^{-2}	2.0×10^{-2}	1.89×10^{-4}
3.0×10^{-2}	4.0×10^{-2}	1.89×10^{-4}
6.0×10^{-2}	4.0×10^{-2}	7.56×10^{-4}

What are the orders with respect to $A_{(g)}$ and $B_{(g)}$?

a) Order with respect to $A_{(g)}$ - Zero
Order with respect to $B_{(g)}$ - Second

b) Order with respect to $A_{(g)}$ - First
Order with respect to $B_{(g)}$ - Zero

c) Order with respect to $A_{(g)}$ - Second
Order with respect to $B_{(g)}$ - First

d) Order with respect to $A_{(g)}$ - Second
Order with respect to $B_{(g)}$ - Zero

6. Match the item given in Column I with expression given in Column II. **[1]**

Column I	Column II
(a) Osmotic Pressure	(i) $p = K_H . \chi_B$
(b) Relative lowering of vapour pressure	(ii) $\frac{\triangle P}{P^o_A} = \chi_B$
(c) Henry Law	(iii) $\triangle T_b = K_b . m$
(d) Elevation in boiling point	(iv) p = iCRT

a) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i).

b) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv).

c) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i).

d) (a) - (iv), (b) - (ii), (c) - (i), (d) - (iii).

7. Chlorine reacts with cold and dilute NaOH to give **[1]**

a) NaClO and $NaClO_3$

b) NaCl and NaClO

c) NaCl and $NaClO_3$

d) NaCl and $NaClO_4$

8. Which forms protective and non-corrosive oxide layer? **[1]**

a) Ni

b) Cu

c) Zn

d) Cr

9. If the initial concentration is reduced to $\frac{1}{4}^{th}$ in a zero order reaction, then the time taken for half the reaction to complete: **[1]**

a) doubles

b) remains the same

c) increases four times

d) reduces to one-fourth

10. The reagent that can be used to distinguish acetophenone and benzophenone is **[1]**

a)

b)

aqueous $NaHSO_3$ | I_2 and NaOH

c) Fehling solution | d) 2, 4-dinitrophenyl hydrazine

11. Aspirin is obtained by the acetylation of which of the following compounds? **[1]**

a) Phenol | b) Acetyl salicylic acid

c) Salicylaldehyde | d) Salicylic acid

12. Aniline upon heating with conc. HNO_3 and conc. H_2SO_4 mixture gives: **[1]**

a) o-and p-nitroaniline | b) No reaction

c) The mixture of o, p, and m nitroaniline: | d) o-nitroaniline

13. **Assertion (A):** Primary structure of proteins gives an idea about the conformation of the molecule. **[1]**
Reason (R): The differences in chemical and biological properties of various proteins arise due to the difference in primary structure.

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 but R is false. | d) A is false but R is true.

14. **Assertion:** p-O_2N - $C_6H_5COCH_3$ is prepared by Friedel Crafts acylation of nitrobenzene. **[1]**
Reason: Nitrobenzene easily undergoes electrophilic substitution reaction.

a) If both Assertion & Reason are true and the reason is the correct explanation of the assertion. | b) If both Assertion & Reason are true but the reason is not the correct explanation of the assertion.

c) If Assertion is true statement but Reason is false. | d) If both Assertion and Reason are false statements.

15. **Assertion (A):** Chlorobenzene is resistant to electrophilic substitution reaction. **[1]**
Reason (R): C-Cl bond in chlorobenzene acquires partial double bond characters due to resonance.

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

16. **Assertion (A):** The pKa of O_2N-CH_2-COOH is lower than that of CH_3-COOH. **[1]**
Reason (R): -NO_2 group shows electron withdrawing effect which increases the acidic character of O_2N-CH_2-COOH.

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 but R is false. | d) A is false but R is true.

Section B

17. 45 g of ethylene glycol ($C_2H_6O_2$) is mixed with 600 g of water. Calculate **[2]**

i. the freezing point depression and
ii. the freezing point of the solution.

OR

Why is osmotic pressure of 1 M KCl higher than that of 1 M urea solution?

18. a. On the basis of crystal field theory write the electronic configuration for d^5 ion with a strong field ligand for which $\Delta_0 > P$. **[2]**

b. $[Ni(CO)_4]$ has tetrahedral geometry while $[Ni(CN)_4]^{2-}$ has square planar yet both exhibit dimagnetism. Explain.

[Atomic number : Ni = 28]

19. Describe the perparation of potassium permanganate. How does the acidified permanganate solution react with oxalic acid? Write the ionic equations for the reactions. **[2]**

20. **Answer the following:** **[2]**

(a) For which reaction, the rate of reaction does not decrease with time? **[1]**

(b) For a reaction A + B $\rightarrow$ Products, the rate law is - Rate = k $[A][B]^{3/2}$ Can the reaction be an elementary reaction? Explain. **[1]**

21. Illustrate the Clemmensen reduction reaction giving a suitable example. **[2]**

Section C

22. In the button cell, widely used in watches, the following reaction takes place **[3]**

$Zn\,(s) + Ag_2O\,(s) + H_2O\,(l) \rightarrow Zn^{2+}\,(aq) + 2Ag\,(s) + 20H^-\,(aq)$ Given that

$E^{\Theta}_{(Ag^+/Ag)} = 0.80V, E^{\Theta}_{(Zn^{2+}/Zn)} = -0.76\ V$

Calculate standard emf and standard free Gibbs energy of the cell.

23. For a reaction, **[3]**

$2NH_3(g) \xrightarrow{Pt} N_2(g) + 3H_2(g)$

Rate = k

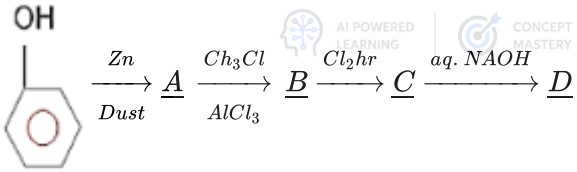
i. Write the order and molecularity of this reaction.

ii. Write the unit of k.

24. Explain why is ortho nitrophenol more acidic than ortho methoxyphenol? **[3]**

OR

What will come in place of A, B, C and D. In the following reaction



25. Two moles of compound (A) on treatment with a strong base gives two compounds (B) and (C). The compound (B) on dehydrogenation with Cu gives (A) while acidification of (C) gives carboxylic acid (D) having molecular formula CH_2O_2. Identify (A) to (D). **[3]**

26. Write the Nernst equation and calculate the emf of the following cell at 298 K: **[3]**

Zn | Zn^{2+} (0·001 M) || H^+ (0·01 M) | H_2 (g) (1 bar) | Pt (s)

Given : $E^{\ominus}_{Zn^{2+}/Zn}$ = -0·76 V

$E^{\ominus}_{H^+/H_2}$ = 0·00 V

[log 10 = 1]

27. How can you convert the following? **[3]**

i. But-1-ene to 1-iodobutane

ii. Benzene to acetophenone

iii. Ethanol to propanenitrile

28. A solution of $Ni(NO_3)_2$ is electrolysed between platinum electrodes using a current of 5 amperes for 20 minutes. **[3]**

What mass of Ni is deposited at the cathode?

Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

The actinoids include the fourteen elements from Th to Lr. The actinoids are radioactive elements and the earlier members have relatively long half-lives, the latter ones have half-life values ranging from a day to 3 minutes for lawrencium. The latter members could be prepared only in nanogram quantities. Actinoids show a greater range of oxidation states. The elements, in the first half of the series frequently exhibit higher oxidation states. The actinoids resemble the lanthanoids in having more compounds in +3 state than in the +4 state. All the actinoids are believed to have the electronic configuration of $7s^2$ and variable occupancy of the 5f and 6d subshells. The magnetic properties of the actinoids are more complex than those of the lanthanoids. The variation in the magnetic susceptibility of the actinoids with the number of unpaired 5f electrons is roughly parallel to the corresponding results for the lanthanoid.

i. Actinoid contraction is greater from element to element than lanthanoid contraction. Why? (1)

ii. Actinoids show irregularities in their electronic configuration. Justify? (1)

iii. The actinoid metals are all silvery in appearance but display a variety of structures than lanthanoid give reason. (2)

OR

The magnetic properties of the actinoids are more complex than those of the lanthanoids. Why? (2)

30. **Read the following text carefully and answer the questions that follow:** **[4]**

Aariv Sharma is very fond of a special drink made by his grandmother using different fruits available in their hometown. It has an outstanding taste and also provide great health benefits of natural fruits. He thought of utilizing his grandmother recipe to create a new product in the beverage market that provide health benefits and also contain fizziness of various soft drinks available in the market.

i. How he can add fizz to the special drink made by his grandmother? (1)

ii. What is the law stated in the chapter that can help Aariv to make his drink fizzy? (1)

iii. What precautions he should take while bottling so that his product does not lose fizz during storage and handling across long distances? (2)

OR

The mole fraction of helium in a saturated solution at 20^oC is $1.2 \times$ 10-6. Find the pressure of helium above the solution. Given Henry's constant at 20^oC is 144.97 kbar. (2)

Section E

31. **Attempt any five of the following:** **[5]**

(a) What happens when D-glucose is treated with the following? Give equations to support your answer. **[1]**

a. HI

b. HNO_3

(b) Give one example each for water-soluble vitamins and fat-soluble vitamins. **[1]**

(c) Write the reactions of glucose with: **[1]**

a. $H_2\ N-OH$

b. Br_2 water

(d) i. Name any two bases which are common to both DNA and RNA. **[1]**

ii. Which vitamin deficiency causes:

1. Bone deformities in children?
2. Pernicious anaemia?

(e) What is the basic structural difference between glucose and fructose? **[1]**

(f) Give the reaction of glucose with acetic anhydride. Presence of which group is confirmed by this reaction? **[1]**

(g) Define denaturation of protein. What is the effect of denaturation on the structure of protein? **[1]**

32. i. Ratio of $[Ar(NH_3)_2]^+$ and $[Ar^+]$ in 0.1 M NH_3 solution. **[5]**

ii. Ratio of $[Ag(S_2O_3)_2]^{3-}$ and [Ag+] in 0.1 M $S_2O_3^{2-}$ solution Given that the stability/ formation constant (k_f) for $[Ag(NH_3)_2]^+ a$ and $[Ag(S_2O_3)_2]^{3-}$ are 1.7×10^7 and 1.0×10^{13} respectively.

OR

Write the formulas for the following coordination compounds:

a. Tetraammineaquachloridocobalt(III) chloride

b. Potassium tetrahydroxidozincate(II)

c. Potassium trioxalatoaluminate(III)

d. Dichloridobis(ethane-1, 2-diamine)cobalt(III)

e. Tetracarbonylnickel(0)

33. Giving an example for each describe the following reactions : **[5]**

i. Hofmann bromamide reaction.

ii. Gattermann reaction.

iii. Coupling reaction.

OR

i. Write the structures of A and B in the following reactions:

a. $C_6H_5N_2^+Cl^- \xrightarrow{CuCN} A \xrightarrow{H_2O/H^+} B$

b. $CH_3COOH \xrightarrow[\Delta]{NH_3} A \xrightarrow{NaOBr} B$

ii. Write the chemical reaction of methyl amine with benzoyl chloride and write the IUPAC name of the product obtained.

iii. Arrange the following in the increasing order of their pK_b values: $C_6H_5NH_2$, NH_3, $C_2H_5NH_2$, $(C_2H_5)_2$ NH