



PRINCE ACADEMY

OF HIGHER EDUCATION

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BOARD SAMPLE PAPER- II (2025-26)

Time : 03 : 00 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 multiple choice questions. Each question carry 1 mark.

- The product formed as a result of reaction of CH_3MgBr and CO_2 followed by hydrolysis is :
(a) CH_3CHO (b) CH_3COCH_3 (c) $HCOOH$ (d) CH_3COOH
- Nucleotides are composed of :
(a) Pentose sugar and phosphoric acid
(b) Nitrogenous base, pentose sugar and phosphoric acid
(c) Nitrogenous base and phosphoric acid
(d) Pentose sugar and nitrogenous base
- Which of the following alkyl halides will undergo S_N1 reaction most readily ?
(a) $(CH_3)_3 - I$ (b) $(CH_3)_3 - Cl$ (c) $(CH_3)_3 - Br$ (d) $(CH_3)_3 - F$
- Decarboxylation of sodium benzoate on heating with soda lime gives :
(a) Benzene (b) Benzoic acid (c) Benzaldehyde (d) Toluene
- Dehydration of tertiary butyl alcohols with Cu at 573 K gives :
(a) Alkyne (b) Alkene (c) Aldehyde (d) Ketone
- In the Arrhenius equation, when $\log k$ is plotted against $1/T$, a straight line is obtained whose :
(a) Slope is $\frac{A}{R}$ and intercept is E_a . (b) Slope is A and intercept is $\frac{-E_a}{R}$.
(c) Slope is $\frac{-E_a}{RT}$ and intercept is $\log A$. (d) Slope is $\frac{-E_a}{2.303R}$ and intercept is $\log A$.

7. Phenol on reaction with aqueous bromine at room temperature gives :
 (a) 2-bromophenol (b) 3-bromophenol (c) 4-bromophenol (d) 2, 4, 6-tribromophenol
8. The specific sequence in which amino acids are arranged in a protein is called :
 (a) Secondary structure (b) Primary structure
 (c) Tertiary structure (d) Quaternary structure
9. While doing qualitative analysis in chemistry lab, Abhishek added yellow coloured potassium chromate solution into a test tube. He was surprised to see the colour of the solution changing immediately to orange. He realised that the test tube was not clean and contained a few drops of some liquid. Which of the following substances will be the most likely liquid to be present in the test tube before adding potassium chromate solution?
 (a) Sodium hydrogen carbonate solution (b) Methyl orange solution
 (c) Sodium hydroxide solution (d) HCl solution
10. Ravi has two test tubes containing CH_3CH_2COOH and CH_3CH_2CHO , but he forgot to label test tube. Which test help him to identify that which test tube contain CH_3CH_2COOH .
 (a) Sodium bicarbonate test (b) Hinsberg test
 (c) Iodoform test (d) Tollen's test
11. Which of the following vitamin of B group can be stored in our body?
 (a) Vitamin B₁ (b) Vitamin B₂ (c) Vitamin B₆ (d) Vitamin B₁₂
12. The role of a catalyst is to change :
 (a) equilibrium constant (b) enthalpy of reaction
 (c) Gibbs energy of reaction (d) activation energy of reaction

In the following questions (Q. no.13 to 16) 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 correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

13. Assertion (A) : Aniline is a stronger base than Acetanilide.
 Reason (R) : The unshared electron pair on nitrogen atom in aniline becomes more available for protonation.
14. Assertion (A) : The pK_a of $O_2N - CH_2 - COOH$ is lower than that of $CH_3 - COOH$.
 Reason (R) : $-NO_2$ group shows electron withdrawing effect which increases the acidic character of $O_2N - CH_2 - COOH$.
15. Assertion (A) : Transition metals have high enthalpy of atomization.
 Reason (R) : This is because transition metals have low melting points.
16. Assertion (A) : When NaCl is added in water, elevation in boiling point is observed.
 Reason (R) : Elevation in boiling point is a colligative property.

SECTION - B

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

17. Draw the structures of major monohalo products in each of the following reactions :



OR

(b) Give reasons for the following:

(i) Grignard reagent should be prepared under anhydrous conditions.

(ii) Alkyl halides give alcohol with aqueous KOH whereas in the presence of alcoholic KOH, alkenes are formed.

18. What happens when D-glucose is treated with the following reagents ?

(a) Br₂ water (b) HCN

19. Write the chemical equations when :

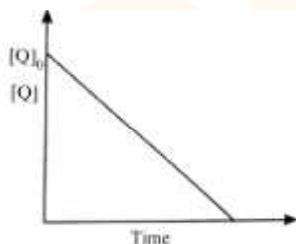
(a) Pentan-3-one is treated with H_2N-NH_2 followed by heating with KOH in high boiling solvent such as ethylene glycol.

(b) Two molecules of $HCHO$ are treated with conc. NaOH.

20. During the chemical reaction $P + Q \rightarrow R + S$. Harish make following observations.

(a) The time taken for 75% completion of P is two times the time taken for 50% completion.

(b) The concentration of Q varies with as time as shown in graph.



According to you what is the overall order of reaction calculated by Harish.

21. In an experiment Abhay make following observation.

Concentration of KCl solution in mol/L	Conductivity at 298-15 K in $S\ cm^{-1}$	Molar Conductivity at 298-15 K in $S\ cm^2\ mol^{-1}$
1.000	0.1113	111.3
0.100	0.0129	129.0
0.010	0.00141	141.0

Based on the data given above, give possible reason for the variation of conductivity and molar conductivity with concentration.

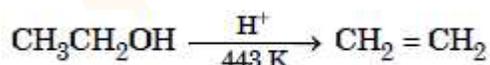
SECTION - C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each -

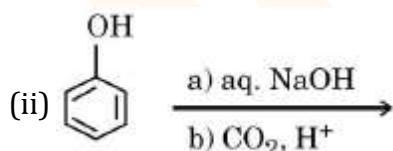
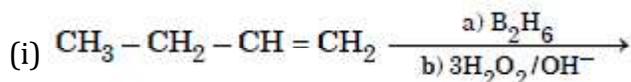
22. Compound (A) ($C_6H_{12}O_2$) on reduction with $LiAlH_4$ gives two compounds (B) and (C). The compound (B) on oxidation with PCC gives compound (D) which upon treatment with dilute NaOH and subsequent heating gives compound (E). compound (E) on catalytic hydrogenation gives compound (C). The compound (D) is oxidized further to give compound (F) which is found to be a monobasic acid (Molecular weight = 60). Identify the compounds (A), (B), (C), (D), (E) and (F).

OR

- (i) Draw structure of the 2,4-dinitrophenylhydrazone of benzaldehyde.
(ii) Arrange the following in increasing order of their reactivity towards HCN :
 CH_3COCH_3 , $(CH_3)_3C-COCH_3$, CH_3CHO
(iii) How can you convert phenyl magnesium bromide to benzoic acid ?
(iv) Give a simple chemical test to distinguish between benzaldehyde and ethanal.
23. Answer the following : (any three)
- (a) What is peptide linkage ?
(b) The two strand of DNA are complementary to each other.
(c) Which one of the following is a polysaccharide ?
Sucrose, Glucose, Starch, Fructose
(d) Give one example each for water-soluble vitamins and fat-soluble vitamins.
24. (a) Write the mechanism of the following reaction :



- (b) Write the main product in each of the following reactions :



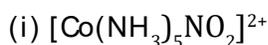
25. (a) Write the formula for the following coordination compound :

Potassium tetrahydrozincate (II)

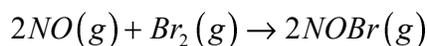
- (b) Arrange the following complexes in the increasing order of conductivity of their solution :



- (c) Identify the type of isomerism exhibited by the following complexes :



26. (a) Out of chlorobenzene and 2,4,6-trinitrochlorobenzene, which is more reactive towards nucleophilic substitution and why ?
 (b) How will you convert chlorobenzene to biphenyl
 (c) Kripa during chlorination of isopentane in presence of light observe that four isomeric monochloro product will form. She is confused that if there are only three type of hydrogen in isopentane 1°, 2°, 3°, than how four product are possible. Can you help her to solve the problem.
27. (i) The following initial rate data were obtained for the reaction :



Expt. No.	[NO]/mol L ⁻¹	[Br ₂]/mol L ⁻¹	Initial Rate (mol L ⁻¹ s ⁻¹)
1	0.05	0.05	1.0 × 10 ⁻³
2	0.05	0.15	3.0 × 10 ⁻³
3	0.15	0.05	9.0 × 10 ⁻³

- (a) What is the order with respect to NO and Br₂ in the reaction ?
 (b) Calculate the rate constant (k).
 (ii) Define Activation energy.
28. When a certain conductivity cell was filled with 0.05 M KCl solution, it has a resistance of 100 ohm at 25°C. When the same cell was filled with 0.02 M AgNO₃ solution, the resistance was 90 ohm. Calculate the conductivity and molar conductivity of AgNO₃ solution.
 (Given : Conductivity of 0.05 M KCl solution = 1.35 × 10⁻² ohm⁻¹ cm⁻¹)

OR

Calculate emf of the following cell : Zn(s) | Zn²⁺ (0.1M) || Sn²⁺ (0.001M) | Sn(s)

Given : $E_{Zn^{2+}/Zn}^{\circ} = -0.76V$, $E_{Sn^{2+}/Sn}^{\circ} = -0.14V$ [log 10 = 1]

SECTION - D

The following questions are case-based questions. Read the case carefully and answer the questions that follow.

29. The Valence Bond Theory (VBT) explains the formation, magnetic behaviour and geometrical shapes of coordination compounds whereas for coordination compounds is based on the effect of different crystal fields (provided by ligands taken as point charges), on the degeneracy of d-orbital energies of the central metal atom/ion. The splitting of the d-orbitals provides different electronic arrangements in strong and weak crystal fields. The crystal field theory attributes the colour of the coordination compounds to d-d transition of the electron. Coordination compounds find extensive applications in metallurgical processes, analytical and medicinal chemistry.

Answer the following questions :

- (a) What is crystal field splitting energy ?

(b) Give reason for the violet colour of the complex $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ on the basis of crystal field theory.

(c) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ is paramagnetic while $[\text{Ni}(\text{CN})_4]^{2-}$ is diamagnetic.

Explain why. [Atomic No. : Cr = 24, Ni = 28]

OR

(c) Explain why $[\text{Fe}(\text{CN})_6]^{3-}$ is an inner orbital complex, whereas $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ is an outer orbital complex.

[Atomic No. : Fe = 26]

30. Batteries and fuel cells are very useful forms of galvanic cell. Any battery or cell that we use as a source of electrical energy is basically a galvanic cell. However, for a battery to be of practical use it should be reasonably light, compact and its voltage should not vary appreciably during its use. There are mainly two types of batteries primary batteries and secondary batteries.

In the primary batteries, the reaction occurs only once and after use over a period of time the battery becomes dead and cannot be reused again, whereas the secondary batteries are rechargeable.

Production of electricity by thermal plants is not a very efficient method and is a major source of pollution. To solve this problem, galvanic cells are designed in such a way that energy of combustion of fuels is directly converted into electrical energy, and these are known as fuel cells. One such fuel cell was used in the Apollo space programme.

Answer the following questions :

(a) How do primary batteries differ from secondary batteries ?

(b) The cell potential of Mercury cell is 1.35 V, and remains constant during its life. Give reason.

(c) Write the reactions involved in the recharging of the lead storage battery.

OR

(c) Write two advantages of fuel cells over other galvanic cells.

SECTION - E

The following questions are long answer type and carry 5 marks each, with internal choice

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31. (a) (i) When pyrolusite ore is fused with KOH, in presence of air, a dark green coloured product 'A' is obtained which changes to purple coloured compound 'B' in acidic medium.

(I) Write the formulae of 'A' and 'B'.

(II) Write the ionic equation for the reaction when compound 'B' reacts with Fe^{2+} in acidic medium.

(ii) Give reasons:

(I) Ce^{4+} in aqueous solution is a good oxidising agent

(II) The actinoid contraction is greater from element to element than lanthanoid contraction.

(III) $E_{\text{Zn}^{2+}/\text{Zn}}^{\circ}$ value is more negative than expected, whereas $E_{\text{Cu}^{2+}/\text{Cu}}^{\circ}$ is positive.

OR

(b) (i) While studying the periodic properties, Arti came across an abnormal behaviour in the atomic size of Hf. She found that, even though Hf is placed below Zr in the same group, both have almost similar atomic sizes.

(I) Which phenomenon is responsible for the above behaviour? Define it.

(II) Mention any other consequence of the above phenomenon.

(ii) Give reasons for the following:

(I) Transition metals exhibit catalytic properties.

(II) Transition metals show variable oxidation state.

(III) Sc is a transition element, while Zn is not.

32. (a) (i) At the same temperature, CO_2 gas is more soluble in water than O_2 gas. Which one of them will have higher value of K_H and why?

(ii) How does the size of blood cells change when placed in an aqueous solution containing more than 0.9% (mass/volume) sodium chloride?

(iii) 1 molal aqueous solution of an electrolyte A_2B_3 is 60% ionized. Calculate the boiling point of the solution.

(Given : K_b for $\text{H}_2\text{O} = 0.52 \text{ K kg mol}^{-1}$)

OR

(b) (i) The vapour pressures of A and B at 25°C are 75 mm Hg and 25 mm Hg, respectively. If A and B are mixed such that the mole fraction of A in the mixture is 0.4, then calculate the mole fraction of B in vapour phase.

(ii) Define colligative property. Which colligative property is preferred for the molar mass determination of macromolecules?

(iii) Why are equimolar solutions of sodium chloride and glucose not isotonic?

33. Answer any five questions of the following :

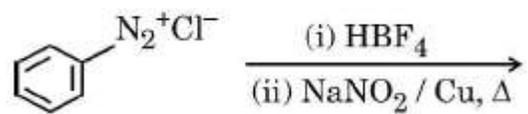
(a) N,N-diethyl-benzenesulphonamide is insoluble in alkali. Give reason.

(b) Aniline does not undergo Friedel-Crafts reaction. Why?

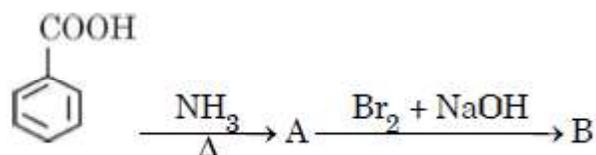
(c) Write a simple chemical test to distinguish between methylamine and aniline.

(d) Write the chemical reaction involved in Gabriel phthalimide synthesis.

(e) Complete the following reaction :



(f) Write the structures of A and B in the following reaction :



(g) In a chemistry practical class, the teacher gave his students an amine 'X' having molecular formula C_2H_7N , and asked the students to identify the type of amine. One of the students, Neeta, observed that it reacts with $C_6H_5SO_2Cl$ to give a compound which dissolves in NaOH solution. Can you help Neeta to identify the compound 'X'?

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