II-TERM EXAMINATION : 2024-25

CLASS - XII (CBSE)

Time: 3 hrs. **CHEMISTRY [THEORY]** M.M.: 70

General Instructions : Read the following instructions carefully.

i) There are 33 questions in this question paper with internal choice.
ii) Section – A consist of 16 multiple choice questions carrying 1 marks each.
iii) Section – B consist of 5 short answer questions carrying 2 marks each.
iv) Section – C consist of 7 short answer questions carrying 3 marks each.
v) Section – D consist of 2 case-based questions carrying 4 marks each.
vi) Section – E consist of 3 long answer questions carrying 5 marks each.
vii) All questions are compulsory.
viii) Use of log tables and calculators is not allowed.

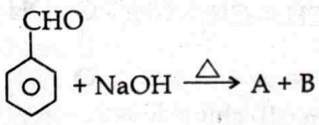
SECTION -A

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

Q.1. The slope in the plot of $\ell og\left[\frac{R_0}{R}\right]$ Vs time t for a first order reaction is : [1]

(a) $+\frac{K}{2.303}$ (b) $+K$ (c) $-\frac{K}{2.303}$ (d) $-K$

Q.2. Consider the following reaction : [1]



Identify A and B.

(a) A = Phenol B = Sodium Benzoate
(b) A = Benzyl alcohol B = Sodium Benzoate
(c) A = Sodium Phenoxide B = Benzoic acid
(d) A = Benzyl alcohol B = Benzoic acid

Q.3. Auto oxidation of chloroform in air and sunlight produces a poisonous gas known as: [1]

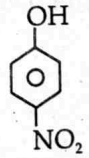
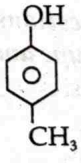
(a) Tear gas
(d) Mustard gas
(c) Phosgene gas
(d) Chlorine gas

Q.4. Rosenmund reduction is used for the preparation of Aldehyde the catalyst used in this reaction is : [1]

(a) Pd-$BaSO_4$ (b) Anhydrous $AlCl_3$
(c) Iron III oxide (d) $Hg\,SO_4$

Q.5. Among the following which is most acidic : [1]

(a)  (b) CH_3CH_2OH

(c)  (d) 

Q.6. From the elements of 3d series given below which is diamagnetic in Nature:

(a) SC^{3+} (b) Cr^{3+} (c) CO^{3+} (d) Ti^{3+}

Q.7. Which of the following 0.1 M aqueous solution will have the lowest freezing point. [1]

(a) Potassium ferro cyanide
(b) Sodium chloride
(c) Magnesium chloride
(d) Glucose

Q.8. The reaction of Lucas reagent is fastest with : [1]

(a) $(CH_3)_3COH$
(b) $CH_3CH_2CH_2OH$
(c) $(CH_3)_2CHOH$
(d) CH_3CH_2OH

Q.9. Nucleophilic addition of Grignard reagent to ketones followed by hydrolysis with dilute acids forms. [1]

(a) Alkene
(b) Primary alcohol
(c) Tertiary alcohol
(d) Secondary alcohol

Q.10. Solubility of gas in liquid decreases with increase in : [1]

(a) Pressure
(b) Temperature
(c) Both a and b
(d) None of the above

Q.11. $CH_3-CH_2-C\equiv CH + H_2O \xrightarrow[H^+]{Hg^{++}}$ [1]

(a) $CH_3CH_2CH_2CH_2OH$

(b) $CH_3-CH_2-\underset{\underset{O}{\|}}{C}-CH_3$

(c) $CH_3-CH_2CH_2-\underset{\underset{O}{\|}}{C}-H$

(d) $CH_3-CH_2-CH_2-\underset{\underset{O}{\|}}{C}-OH$

Q.12. The formula of the complex hexa aqua chromium (III) chloride is : [1]

(a) $[Cr(H_2O)_6]Cl$
(b) $[Cr(H_2O)_6]Cl_2$
(c) $[Cr(H_2O)_6]Cl$
(d) $[Cr(H_2O)_6Cl]$

For questions number 13 to 16. Select the correct options from :

(A) Both Assertion (A) and Reason (R) true but 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 Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

Q.13. **Assertion (A) :** P-nitrophenol is less acidic than phenol. [1]
Reason (R) : Nitro group is electron withdrawing and helps in the stablisation of p-nitrophenoxide ion.

Q.14. **Assertion A :** Acetophenone and benzophenone can be distinguish by Iodoform test. [1]
Reason (R) : Both are carbonyl compounds

Q.15. **Assertion (A) :** C-X bond in halocalkane is non polar bond. [1]
Reason (R) : Halogen atom (x) is more electronegative than carbon.

Q.16. **Assertion (A) :** Elevation in boiling point is a colligateae property. [1]
Reason (R) : Elevation in boiling point is directly proportional to molarity.

SECTION-B

This section contains 5 questions with internal choice in one question. The following questions are vey short answer type and carry 2 marks each.

Q.17. Define the following terms: [2]

(a) Azeotropic mixture
(b) order of a reaction

Q.18. Calculate the freezing point of solution when 1.9 gm of $MgCl_2$ is dissolved in 50gm of water Assuming complete dissociation of $MgCl_2$. [2]

$[K_f = 1.86\ K\ kg\ mol^{-1}]$

Q.19. (a) Out of chlorobenzene and benzyl chloride which one easily hydrolyse by aqueous NaOH and why ? [2]

(b) Arrange the following in increasing order of their reactivity for nucleophilic addition reaction.

HCHO, CH_3CHO, $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$, $CH_3-\overset{\overset{O}{\|}}{C}-CH_2-CH_3$

Q.20. (a) How will you convert the following : [2]

(i) Toluene from chlorobenzene

(ii) 3-hydroxybutanal from ethanol

OR

(b) Write major product of each reaction :

(i) $CH_3-CH_2-CH=CH_2+HBr \xrightarrow{\text{Peroxide}}$

(ii) $C_6H_5ONa+C_2H_5Br \longrightarrow$

Q.21. Phenol react with dil HNO_3 at low temperature the product are separated into two beaker. Their boiling point is as follows : [2]

Beaker	B.P
1	489 K
2	387 K

Predit the compound present in beaker 1 and 2 why they have different boiling point.

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.

Q.22. (a) Explain why $[Fe(H_2O)_6]^{3+}$ has magnate moment value of 5.92 BM whereas $[Fe(CN)_6]^{3-}$ has a value of 1.73 BM. [3]

(b) Write the hybridisation and magnetic character of $[Co(C_2O_4)_3]^{3-}$.

(c) What is chelating ligand ? Give an example.

Q.23. The rate constant of a reaction at 227 °C and 427 °C are 0.02 s^{-1} and 0.07 s^{-1} respectively calculate Activation energy and half life at 227°C ($R = 8.314\ JK^{-1}\ mol^{-1}$) [3]

Q.24. Write chemical equations for the following reaction (Do any three) [3]

(a) Williamson synthesis

(b) Finkelstein Reaction

(c) Sand mayer's reaction

(d) Dow's process

Q.25. (a) Give a chemical test to distinguish between the following pairs of compounds : [3]

(i) Propanone and propanal

(ii) Ethanal and ethanoic acid

(b) Phenol is less acidic than carboxylic acid why ?

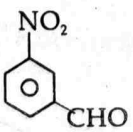
Q.26. Give chemical equation for the following : [3]

(i) Phenol react with bromine water.

(ii) Sodium ehthanoate is heated with soda lime.

(iii) Methanal is heated with conc. NaOH.

Q.27. (a) Write IUPAC name of these compound : [3]

(i) 

(ii) $CH_3-CH=C(CH_3)CH_2-CH(OH)CH_3$

b) Give reason :

(i) Grignard reagent is stored in dry conditions.

(ii) Aldehydes and ketones have lower boiling point than corresponding alcohols. Explain.

Q.28. A first order reaction takes 40 minute for 30% decomposition. Calculate the time for 80% decomposition (log 7 = 0.845, log 2 = 0.30) : [3]

SECTION-D

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

Q.29. Ketone play a prominent role in organic chemistry. The ketone moiety is extremely common in natural product and pharmaceuticals and in dyes, fragrondes and flavours of is also a versatile reaction centre in organic synthesis. Many frequently used reaction including Wolf-kischner reduction, Mannich reaction Wittig reaction and grignard reaction describe a wide array of transformations of ketone. The development of a practical route to ketone from feed stock chemicals has long been a subject of interest. Carboxylic acid and organohalides are bench -stable feedstock chemicals commonly used in organic synthesis. When producing ketone from carboxylic acid and organohalides, the stoichiometric approach requires preparation of necessary intermediates such as amides or aldehydes and grignard reagents.

Answer the following questions:

(a) Convert acetic acid to acetone. Give chemical equation only. [1]

(b) Distinguish between acetone and acetaldehyde with one good chemical test. [1]

(c) Do the following conversions: [2]

(i) Acetophenone to ethyl benzene

(ii) Cyclohexanone to cyclohexanone oxime

OR

Write chemical equation for the following :

(i) Wolff kishner reduction

(ii) Aldol condensation

Q.30. The nature of bonding, structure of the coordination compound can be explained to some extent by valence bond theory. The central metal atom/ion makes available a number of vacant orbitals equal to its coordiantion number. The appropriate atomic orbitals (s, p and d) of the metal hybridise to give a set of equivalent orbitals of definite geometry such as square planer tetrahedral, octahedral and so on. A strong covalent bond is formed only when the orbitals overlap to the maximum extent. The d orbitals involved in the hybridisation may be either inner d orbtals ie. (n-1) d or outer d orbitals ie nd. The complexes formed are called inner orbital complex (low spin complex) and outer orbital complex (high spin complex) respectively. Further the complexes can be paramagnetic or diamagnetic in nature. The draw backs of this theory are that this involves number of assumptions and also does not explain the colour of the complex. Answer the following questions:

(a) Predict state of hybridisation and magnetic moment of $[COF_6]^{3-}$ [1]

(b) Write IUPAC name of $[Co\ (en)_2\ Cl\ Br]$ [1]

(c) Using valence bond theory find shape and hybridisation of $[Ni\ (NH_3)_6]^{2+}$ (At no of Ni = 28) [2]

OR

Find coordination number and oxidation number of cr in $[Cr\ (OX)_2\ Cl_2]^{3-}$

SECTION-E

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

Q.31. Attempt any five from the following : [5]

(i) Zn, Cd, Hg has low heat of atomisation why ?

(ii) Transition metals forms coloured ions why ?

(iii) Transition metal forms complexes why ?

(iv) $La\ (OH)_3$ is more basic than $Lu\ (OH)_3$.

(v) Out of $KMnO_4$ and K_2MnO_4 which one is paramagnetic and why ?

(vi) Draw geometrical isomers of $[Co(en)_2 C\ell_2]^+$.

(vii) Why do transition elements show variable oxidation state ? [3]

Q.32. (a) (i) Give reason :

(1) formic acid is more acidic than acetic acid why ?

(2) Presence of NO_2 group at ortho and para position in aryl halide increases its reactivity for nucleophilic substitution.

(3) Alcohols are soluble in water why ?

(ii) Give equation for following : [2]

(1) Ethanoic acid is heated with ethanol in presence of ions sulphuric acid.

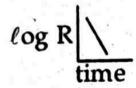
(2) Phenol react with acetylchloride in presence of pyridine.

OR

(b) An organic compound A having molecular formula C_3H_6O gives lodoform reaction and forms a compound B. B on heating with Ag powder give compound C. C reacts with dil H_2SO_4 and $HgSO_4$ to obtain D. D undergoes Aldol condensation to form E. Identify B, C, D, E and write the balanced chemical euqtions for the involved name reactions. [5]

Q.33. (a) (i) Define Pseudo unimolecular reaction with example. [1]

(ii) What is effect of catalyst on activation energy of reaction. [1]

(iii)  Consider the following : [3]

(a) What is the order of Reaction

(b) What is value of slope

(c) What is unit of rate constant

OR

(b) (i) Define ideal solution. [1]

(ii) Why are aquatic species more comfortable in cold water in comparison to warm water. [1]

(iii) Calculate mass of $CaCl_2$ (molar mass = 111) to be dissolved in 500 gm of water to lower its freezing point by 2k assuming that $CaCl_2$ undergoes complete dissociation (K_f for water = 1.86 K kg mol^{-1}) [3]

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