BK BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
SENIOR SECONDARY CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL

First Pre-Board EXAMINATION 2023-24 Answer key

Class :XII
Date :11.12.23
Admission No.:

Duration : 3 Hrs
Max. Marks : 70
Roll No.:

General Instructions:

(a) There are 33 questions in this question paper with internal choice.
(b) SECTION A consists of 16 multiple -choice questions carrying 1 mark each.
(c) SECTION B consists of 5 short answer questions carrying 2 marks each.
(d) SECTION C consists of 7 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. (b) 0.1 M Na_3PO_4
2. (b) H_2 is evolved at cathode
3. (a) 38%
4. (c) first
5. (c) Zr^{4+}, Hf^{4+}
6. (c) $[Fe(C_2O_4)_3]^{3+}$
7. (b) $[Co(NH_3)_5Cl]Cl_2$
8. (b) $(CH_3)_2CH(Br)CH_3$
9. (a) sp^3
10. (d) CH_3CONH_2
11. (d) both (a) and (b)
12. (d) Proteins

Directions: These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

(a) If both assertion and reason are correct and reason is the correct explanation for assertion.
(b) If both assertion and reason are correct but reason is not correct explanation for assertion.
(c) the assertion is correct but the reason is incorrect.
(d) the assertion is incorrect but the reason is correct.

13. (a)
14. (d)
15. (a)
16. (c)

SECTION B

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

17. A positive deviation indicates that the vapour pressure above the solution is higher than expected. A negative divergence, on the other hand, indicates that the solution's vapour pressure is lower than expected.

2

18. Lead storage battery is a secondary cell that can be charged by passing a current. Reactions occurring in the lead storage battery while operating (during discharge) are:

At cathode $PbO_2+SO^{2-}_4+4H^++2e-\rightarrow PbSO_4+2H_2O$

At anode$Pb+SO^{2-}_4\rightarrow PbSO_4+2e-$

overall reaction$Pb+PbO2+2H2SO4\rightarrow 2PbSO4+2H2O$.

2

OR

According to Faraday's First Law of Electrolysis, the mass of the substance (m) which is deposited or being liberated at an electrode is directly proportional to the quantity of electricity or charge (Q) passed. The first law can be represented mathematically as, $m \propto Q$

Faraday's second law of electrolysis states that the mass of the substances deposited is proportional to their respective chemical equivalent or equivalent weight when the same quantity of electricity is passed through different cells containing several electrolytes. It can be represented mathematically as, $w \propto E$

19. Define the following : 2

(a) Definition. The Order of Reaction refers to the power dependence of the rate on the concentration of each reactant. Thus, for a first-order reaction, the rate is dependent on the concentration of a single species.

b) Activation energy is defined as the minimum amount of extra energy required by a reacting molecule to get converted into a product. It can also be described as the minimum amount of energy needed to activate or energise molecules or atoms so that they can undergo a chemical reaction or transformation.

20. (a) CH_3Cl + AgF → CH_3F(b) CH_3Cl + NaI → **CH_3 I** 2

21. Account for the following: 2

(a) $3d^54s^1$

(b)due to unpaired electron, vanderwaal forces is stronger

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. Answer:

Given :

w = 100 mg = 0.100 = 0.1 g,

V = 10.0 mL = 0.01 L

π = 13.3 mm Hg = 13.3760 atm,

T = 25°C = 25 + 273 = 298 K

R = 0.0821 L atm mol^{-1} K^{-1}, M = ?

Using formula : $M = \frac{wRT}{\pi V}$

$$\Rightarrow \quad M = \frac{0.1 \times 0.0821 \times 298 \times 760}{13.3 \times 0.01}$$

$$\Rightarrow \quad M = \frac{1859.4008}{0.133} = 13980.4$$

Molar mass, M = 13980.4 g mol^{-1}

23.Given : K = 2.4×10^{-3}

According to the formula, **where** $\begin{cases} a = 1 \\ K = 2.4 \times 10^{-3} \\ x = \frac{3}{4} = 0.75 \end{cases}$

$$t = \frac{2.303}{K} \log \frac{a}{a - x},$$

Putting these values in the above equation

$$t = \frac{2.303}{K} \log \frac{1}{1 - 0.75}$$

$$\text{or} \quad t = \frac{2.303}{2.4 \times 10^{-3}} \log 0.25$$

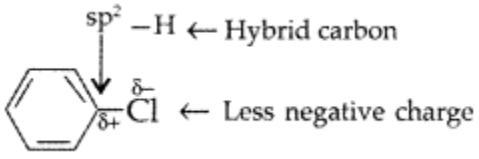
$$\text{or} \quad t = \frac{2.303}{2.4 \times 10^{-3}} \times 0.6020$$

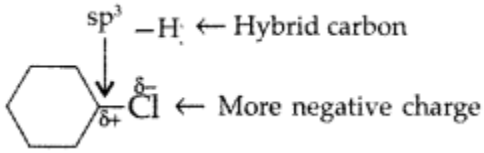
$$\text{or} \quad t = \frac{1.386406}{2.4 \times 10^{-3}} = 577.6$$

$\therefore$ **Time taken,** t **= 577.6 sec.**

24. Explain why :

(a) Chlorobenzene has lower dipole moment than cyclohexyl chloride due to lower magnitude of -ve charge on the Cl atom and shorter C – Cl distance. Due to greater S-character, a sp^2-hybrid carbon is more electronegative than a sp3-hybrid carbon. Therefore, the sp^2-hybrid carbon of C – Cl bond in chlorobenzene has less tendency to release electrons to Cl than a sp^3 hybrid carbon of cyclohexyl chloride.





(b) Alkyl halides and polar molecules are held together by dipole-dipole interaction. The molecules of H_2O are held together by H- bonds. Since the new forces of attraction between water and alkyl halide molecules are weaker than the forces of attraction already existing between alkyl halide-alkyl halide molecules and water-water molecules, therefore alkyl halides are immiscible (not soluble) with water.

(c) Answer: Since the reactivity of S_N1 reactions increases as the stability of intermediate carbocation increases. Of the two 2° bromides, the carbocation intermediate derived from C_6H-$CH(C_6H_5)Br$ i.e.

$C_6H_5CHC_6H_5$ is more stable as compared to the carbocation C6H+5CHCH3 obtained from $C_6H_5CH(CH_3)Br$ because it is stabilized by two phenyl groups due to resonance.

25. Write the IUPAC name of the following compounds:

(a)1-methoxy propane
(b) 2,3-dinitro phenol
(c) Ethane-1,2-diol

26. all the three steps each steps carry 1 marks
27.(a) (i) RCHO to alcohol and acid (ii) RCH2COOH to RCH (Cl) COOH
(b) Tollen's Test
28. In the following cases rearrange the compounds as directed :
(a) loan pair density decides basicity
(4)$C_6H_5NH_2$, (3) C_6H_5 $N(CH_3)_2$,(1) $(C_2H_5)_2NH$ and (2) CH_3NH_2
(b) In a decreasing order of basic strength :
(2) Aniline, p-nitroaniline(1) and p-toluidine(3)
(c) In an increasing order of pK_b values :
(3) $C_2H_5NH_2$,(2) C_6H_5 $NHCH_3$, $(C_2H_5)_2NH$(4) and (1)$C_6H_5NH_2$

OR

State reasons for the following :
(a) Loan density is decreases due to resonance
(b) less carbon and H bond
(c) Inter molecular H bonding

SECTION D

The following questions are case -based questions. Each question carries 4 marks. Read the passage carefully and answer the questions that follow

29.
(a) it has d^1 config.
(b) because its common oxidation state has d^1 config.
(c) more number of unpaired electron.
(d) Mn it has $3d^5$ and $4s^2$

30.
(i) Amino acids show amphoteric behavior. Why?
(c) Both (a) and (b)
(ii). The name of linkage joining two amino acids
(b) Peptide linkage
(iii) What are polypeptides?
(a) 10 < α-amino acids joined together
(iv) What type of bonding helps in stabilizing the α-helix structure of proteins?
(b) Hydrogen bonding

SECTION E

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

31. Predict the products of electrolysis in each of the following:

(i) Ag and Ag

(ii) Ag and O_2

(iii) H_2 and O_2

(iv) Cu and Cl_2

OR

(a). reaction at cathode and anode 3+2

(b) **Q= I x t and w = MIt/charge x F**

32.(a) A double salt is a combination of two salt compounds. A complex salt is a molecular structure that is composed of one or more complex ions. Double salts can give simple ions when added to water. Complex salts do not give simple ions when added to water.

(b) Write IUPAC names of the following :

(i) Potassium trioxalatoferrate(III) (ii) Hexaammineplatinum(IV) chloride

(c) Cl should be in same side

OR

(a) The complex $[Cr(NH_3)_6]^{3+}$ is formed by d2sp3 hybridization therefore it has octahedral geometry. Since it has three unpaired electrons therefore it is paramagnetic in nature. Explaination 2marks

(At. no. Cr = 24)

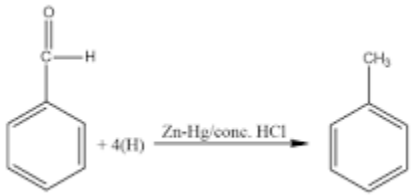
(b) **Triamminechloridonickel (II) nitrate**.

33. Give plausible explanation for each of the following:

(i) (a) In cyclohexanone, the carbonyl carbon is not hindered. Hence, the nucleophile CN^- ion can easily attack the carbonyl carbon. However in 2,2,6-trimethyl cyclohexanone, the carbonyl carbon is sterically hindered due to presence of methyl groups. Hence, the nucleophile CN^- ion cannot easily attack the carbonyl carbon.

(b) Due to resonance one NH2 group undergoes or involved in resonance and hence can't participate in the formation of semicarhazone. Lone pair of NH2 group is not involved in resonance and is available for nucleophillic attack.

(c) The formation of esters from a carboxylic acid and an alcohol in the presence of acid catalyst is a reversible reaction.To shift the equilibrium in forward direction the water or ester formed should be removed as fast as it is formed.



(ii) (a) Benzaldehyde Toluene (b)Tolune to benzaldehyde reaction is Etard reaction

OR

Sol. C = 69.77%, H = 11.63%

O = 100 − (69.77 + 11.63) = 18.6%

Element	Percentage (x)	Molar mass (y)	Moles (x/y)	Simple ratio
C	69.77	12	5.81	5
H	11.63	1	11.63	10
O	18.6	16	1.16	1

Empirical formula of given compound = $C_5H_{10}O$ (1)

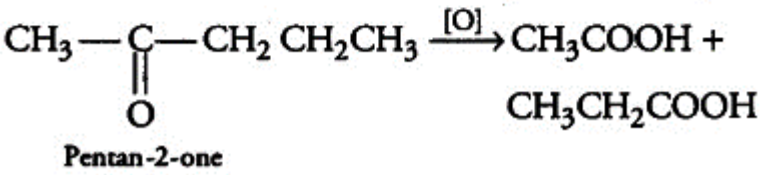
Empirical formula mass

$$= 5\times 12 + 10\times 1 + 1\times 16 = 86$$

$$n = \frac{86}{86} = 1$$

$\therefore$ Molecular formula = $(C_5H_{10}O)_1 = C_5H_{10}O$ (1)

Since, it does not give Tollen's test but gives positive iodoform test, hence it is a methyl ketone, i.e. have $-COCH_3$ group. Since, on oxidation, it gives ethanoic acid and propanoic acid, it is pentan-2-one.



Pentan-2-one

Hence, the compound is pentan-2-one. (1)

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