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CREATING AND SETTING EXAMPLES FOR FUTURE...

CLASS XII : SAMPLE QUESTION PAPER - 2
SUBJECT: CHEMISTRY (043)

Time Allowed: 3 Hours **Maximum Marks: 70**

General instructions:

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 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

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. Primary amine with Hinsberg's reagent forms

(a) *N*-alkylbenzenesulphonamide soluble in KOH solution.

(b) *N*-alkylbenzenesulphonamide insoluble in KOH solution.

(c) *N*,*N*-dialkylbenzenesulphonamide soluble in KOH solution.

(d) *N*,*N*-dialkylbenzenesulphonamide insoluble in KOH solution.

2. Which of the following molecules has highest dipole moment?

(a) CH_3Cl (b) CH_2Cl_2

(c) $CHCl_3$ (d) CCl_4

3. Match the column I with column II and mark the appropriate choice.

Column I		Column II	
(A)	An element which can show +8 oxidation state	(i)	Ce
(B)	An element with +7 as the most stable oxidation state in its oxides	(ii)	Pm
(C)	Radioactive lanthanoid	(iii)	Os
(D)	Lanthanoid which shows +4 oxidation state	(iv)	Mn

(a) (A) → (i), (B) → (ii), (C) → (iii), (D) → (iv)

(b) (A) → (ii), (B) → (iii), (C) → (iv), (D) → (i)

(c) (A) → (iv), (B) → (i), (C) → (ii), (D) → (iii)

(d) (A) → (iii), (B) → (iv), (C) → (ii), (D) → (i)

4. Arrange the following compounds in order of increasing boiling points.
1-Bromopropane, Isopropyl bromide, 1-Bromobutane
(a) 1-Bromobutane < 1-Bromopropane < Isopropyl bromide
(b) 1-Bromopropane < 1-Bromobutane < Isopropyl bromide
(c) 1-Bromopropane < Isopropyl bromide < 1-Bromobutane
(d) Isopropyl bromide < 1-Bromopropane < 1-Bromobutane

5. The rate constant for a first order reaction is $7.0 \times 10^{-4}\ s^{-1}$. If initial concentration of reactant is 0.080 M, what is the half life of reaction?
(a) 990 s
(b) 79.2 s
(c) 12375 s
(d) 10.10×10^{-4} s

6. Which is the product of the following reaction?

$$C_6H_5-\overset{\overset{O}{\|}}{C}-OCH_3 \xrightarrow[2.\ H^+/H_2O]{1.\ C_2H_5MgBr\ (2\ mole)}$$

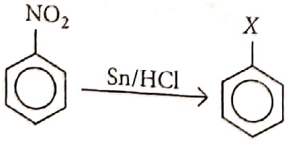
(a) $C_6H_5-CH_2-OH$
(b) $C_6H_5-\underset{\underset{OH}{|}}{CH}-C_2H_5$
(c) $C_6H_5-\overset{\overset{C_2H_5}{|}}{\underset{\underset{OH}{|}}{C}}-C_2H_5$
(d) $C_6H_5-\overset{\overset{O}{\|}}{C}-OC_2H_5$

7. A solution containing 2.675 g of $CoCl_3 \cdot 6NH_3$ (molar mass = 267.5 g mol^{-1}) is passed through a cation exchanger. The chloride ions obtained in solution were treated with excess of $AgNO_3$ to give 4.78 g of AgCl (molar mass = 143.5 g mol^{-1}). The formula of the complex is (At. mass of Ag = 108 u)
(a) $[CoCl(NH_3)_5]Cl_2$
(b) $[Co(NH_3)_6]Cl_3$
(c) $[CoCl_2(NH_3)_4]Cl$
(d) $[CoCl_3(NH_3)_3]$

8. Which one of the following compounds contains β-C_1-C_4 glycosidic linkage?
(a) Sucrose
(b) Amylose
(c) Lactose
(d) Maltose

9. What is the correct order of spin-only magnetic moment (in B.M.) of Mn^{2+}, Cr^{2+} and V^{2+}?
(a) $Mn^{2+} > V^{2+} > Cr^{2+}$
(b) $V^{2+} > Cr^{2+} > Mn^{2+}$
(c) $Mn^{2+} > Cr^{2+} > V^{2+}$
(d) $Cr^{2+} > V^{2+} > Mn^{2+}$

10. For a reaction, activation energy $E_a = 0$ and the rate constant at 200 K is $1.6 \times 10^6\ s^{-1}$. The rate constant at 400 K will be
[Given that gas constant $R = 8.314\ J\ K^{-1}\ mol^{-1}$]
(a) $3.2 \times 10^4\ s^{-1}$
(b) $1.6 \times 10^6\ s^{-1}$
(c) $1.6 \times 10^3\ s^{-1}$
(d) $3.2 \times 10^6\ s^{-1}$

11. 

. In the above reaction, X stands for
(a) $SnCl_2$
(b) OH^-
(c) NH_2
(d) Cl

12. An organic compound of molecular formula C_3H_6O did not give a silver mirror with Tollens' reagent, but gave an oxime with hydroxylamine, it may be
(a) $CH_3-CO-CH_3$
(b) C_2H_5CHO
(c) $CH_2=CH-CH_2-OH$
(d) $CH_3-O-CH=CH_2$

13. **Assertion (A) :** $[Mn(CN)_6]^{3-}$, $[Fe(CN)_6]^{3-}$ and $[Co(C_2O_4)_3]^{3-}$ are d^2sp^3 hybridised.
Reason (R) : $[MnCl_6]^{3-}$ and $[FeF_6]^{3-}$ are paramagnetic and have 4 and 5 unpaired electrons respectively.
Select the most appropriate answer from the options given below:
(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 (A) :** Molar conductivity of a weak electrolyte at infinite dilution cannot be determined experimentally.
Reason (R) : Kohlrausch's law helps to find the molar conductivity of a weak electrolyte at infinite dilution.
Select the most appropriate answer from the options given below:
(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.

15. **Assertion (A) :** Both DNA and RNA consist of pentose sugar.
Reason (R) : RNA has uracil as one of the nitrogen bases.
Select the most appropriate answer from the options given below:
(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) :** Half-life period of a reaction of first order is independent of initial concentration.
Reason (R) : Half-life period for a first order reaction, $t_{1/2} = \frac{2.303}{k} \log 2$.
Select the most appropriate answer from the options given below:
(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

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

17. (a) Why aquatic animals are more comfortable in cold water than in warm water?
(b) Gas (*A*) is more soluble in water than gas (*B*) at the same temperature. Which one of the two gases will have the higher value of K_H (Henry's constant) and why?

OR

(a) Cutting onions taken form the fridge is more comfortable than cutting onions laying at room temperature. Explain.
(b) Why is vapour pressure of solution of glucose in water lower than that of pure water?

18. (a) Write the IUPAC name of $PtCl(NH_2CH_3)(NH_3)_2]Cl$.
(b) (i) Which complex of silver is formed during photography?
(ii) Name the complex used in the treatment of cancer.

19. A cell is prepared by dipping copper rod in 1 M copper sulphate solution and zinc rod in 1 M zinc sulphate solution. The standard reduction potential of copper and zinc are 0.34 V and –0.76 V respectively.
    (i) What will be the cell reaction?
    (ii) What will be the standard electromotive force of the cell?
    (iii) Which electrode will be positive?

20. Write the structure of the major organic product in each of the following reactions **(any 2)** :
    (i) $(CH_3)_3CBr + KOH \xrightarrow[\text{heat}]{\text{ethanol}}$
    (ii) $CH_3CH = C(CH_3)_2 + HBr \longrightarrow$
    (iii) $CH_3CH_2CH_2Cl + NaI \xrightarrow[\text{heat}]{\text{acetone}}$

21. Define the following terms.
    (i) Carbohydrate (ii) Monosaccharide

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. (a) Express the relation between the conductivity and the molar conductivity (Λ_m) of a solution.
    (b) Calculate the emf of half cells given below :
    (i) Pt, H_2|HCl
    2 atm, $H^+ = 0.02$; $E^\circ_{OP} = 0$ V
    (ii) Pt, Cl_2|HCl
    10 atm, $C1^- = 0.1$; $E^\circ_{OP} = -1.36$ V

23. (i) The electronic configuration of Ce is :
    $_{58}Ce = [Xe]\ 4f^1\ 5d^1\ 6s^2$
    Calculate the spin only magnetic moment of Ce^{3+} ion.
    (ii) Why is copper regarded as a transition element although copper atom has completely filled *d*-orbitals in its ground state ?
    (iii) Why is Sc^{3+} colourless in aqueous solution whereas Ti^{3+} is coloured ?

24. Give reasons for the following statements :
    (i) Benzaldehyde is less reactive than propanal in nucleophilic addition reactions.
    (ii) Carboxylic acids do not give reactions of carbonyl group.
    (iii) 4-Nitrobenzoic acid is a stronger acid than benzoic acid.

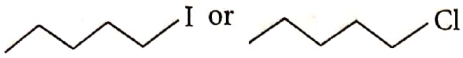
OR

An organic compound '*X*' with the molecular formula $C_5H_{10}O$ forms 2,4-DNP derivative, does not reduce Tollens' reagent but gives positive iodoform test on heating with I_2 in the presence of NaOH. Compound '*X*' gives ethanoic acid and propanoic acid on vigorous oxidation. Write the
    (i) structure of the compound '*X*'.
    (ii) structure of the product obtained when compound '*X*' reacts with 2,4-DNP reagent.
    (iii) structures of the products obtained when compound '*X*' is heated with I_2 in the presence of NaOH.

25. (a) Can the acid chloride of an α-amino acid be made by treating it with $SOCl_2$?
    (b) Which α-amino acid can form cross link peptide chains?
    (c) Is a diet consisting mainly of rice an adequate diet? Why or Why not?

26. (a) Write the reaction and state the conditions for each of the following conversions :
        (i) Propene to propanol
        (ii) Chlorobenzene to phenol
    (b) Write the reaction and the conditions only for the commercial preparation of phenol from cumene.

27. Answer the following questions:
(a) What is meant by chirality of a compound? Give an example.
(b) Which one of the following compounds is more easily hydrolysed by KOH and why?
$CH_3CHClCH_2CH_3$ or $CH_3CH_2CH_2Cl$
(c) Which one undergoes S_N2 substitution reaction faster and why?



28. Depict the galvanic cell in which the reaction
$Zn_{(s)} + 2Ag^+_{(aq)} \rightarrow Zn^{2+}_{(aq)} + 2Ag_{(s)}$ takes place. Further answer:
(i) Which of the electrode is negatively charged?
(ii) The carriers of the current in the cell.
(iii) Individual reaction at each electrode.

SECTION D

The following questions are case-based questions. Each question has an internal choice and carries 4 (2+1+1) marks each. Read the passage carefully and answer the questions that follow.

29. The rate of a reaction can be measured experimentally by plotting a graph between the concentration of any of the reactants (or products) as a function of time. Generally, any property which is related to the concentration of one of the species taking part in the reaction is selected and then change in this property is measured as a function of time. The reaction can be easily studied by measuring the concentration at different intervals of time. The concentration at different time intervals can be calculated by first measuring the increase in pressure of the reaction mixture at different intervals of time. The average rate of reaction is determined by change in the concentration of reactants at two different times.

Average rate of reaction $= -\frac{\Delta[x]}{\Delta t} = -\frac{x_2 - x_1}{t_2 - t_1}$

The instantaneous rate of reaction is determined graphically by drawing a tangent to the curve at a point corresponding to the given time. Then the slope of this tangent gives the instantaneous rate of the reaction at that time.

Answer the following questions :

(a) For the reaction : $2H_2O_{2(aq)} \longrightarrow 2H_2O_{(l)} + O_{2(g)}$
if the initial concentration of H_2O_2 is 0.5 M and its concentration after 5 min is 0.3 M. Then, what will be the rate of decomposition of H_2O_2?

(b) Concentration of a reactant *A*, changed from 0.44 M to 0.32 M in 25 minutes. What will be the average rate of the reaction during this interval?

OR

For a reaction $2A \rightarrow 3B$, if the rate of formation of *B* is *x* mole/L, then what will be the rate of consumption of *A*?

(c) Define average rate of a reaction.

30. Due to the presence of lone pair of electrons on nitrogen atom, amines are basic in nature. The basic character of amines can be compared on the basis of inductive effect of alkyl groups, steric effect and resonance involvement of lone pair of electrons. Among aliphatic amines, +*I* effect of alkyl groups pushes the electrons towards nitrogen atom and increases the basic character.
In gas phase, the order of basic character is $3° > 2° > 1° > NH_3$.
In aqueous solution, the order of basic character is $2° > 1° > 3° > NH_3$ (for methylamines) and $2° > 3° > 1° > NH_3$ (if alkyl group is bigger than methyl group).

Answer the following questions :

(a) (I) Arrange the following compounds in a decreasing order of their pK_b values :
$C_2H_5NH_2$, $C_6H_5NHCH_3$, $(C_2H_5)_2NH$ and $C_6H_5NH_2$

(II) Arrange the following compounds in decreasing order of their basic strength in aqueous solution:
$(CH_3)_3N$, $(CH_3)_2NH$, CH_3NH_2

(b) The solubility of $C_6H_5\overset{+}{N}H_3Cl^-$ would be highest, among the following solvents in

(i) acidic buffer of pH = 3

(ii) basic buffer of pH = 10

(iii) neutral buffer of pH = 7

(iv) pure water.

(c) Identify the correct statement about the basic nature of amines.

(i) Alkylamines are weaker bases than ammonia.

(ii) Arylamines are stronger bases than alkylamines.

(iii) Secondary aliphatic amines are stronger bases than primary aliphatic amines.

(iv) Tertiary aliphatic amines are weaker bases than arylamines.

OR

The correct increasing order of their pK_b values is

(i) aniline < benzyl amine < cyclohexylamine

(ii) cyclohexylamine < benzyl amine < aniline

(iii) cyclohexylamine < aniline < benzyl amine

(iv) benzyl amine < cyclohexylamine < aniline.

SECTION E

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

31. (a) (i) $[Ni(Cl)_2(P(CH_3)_3)_2]$ is a paramagnetic complex of Ni(II). Analogous Pd(II) complex is diamagnetic. How many geometrical isomers will be possible for Ni(II) and Pd(II) complexes?

(ii) $[Fe(H_2O)_6]^{3+}$ is strongly paramagnetic whereas $[Fe(CN)_6]^{3-}$ is weakly paramagnetic. Explain.

(iii) Magnetic moment of $[MnCl_4]^{2-}$ is 5.92 B.M. Explain giving reason.

(b) (i) Iron has higher enthalpy of atomization than that of copper. Explain why?

(ii) Why do transition elements show variable oxidation states?

OR

(a) A team of students of a local college were on an industrial visit tour. During this they went to a metal factory where silver plating is being done on copper cutleries. In the factory they are using concentrated solution of $AgNO_3$ as electrolyte. The plating of silver looks dull. The leader of the team who is a professor of chemistry suggested the factory owner to use potassium dicyanidoargentate(I) complex instead of $AgNO_3$ solution as electrolyte. They got good quality of plating after changing the electrolyte. Now answer the following questions :

(i) Write the formula of the complex mentioned above.

(ii) Explain the reasons for obtaining bright plating.

(b) What is the difference between a complex and a double salt?

(c) Explain the following observations :

(i) Many of the transition elements are known to form interstitial compounds.

(ii) There is a general increase in density from titanium ($Z = 22$) to copper ($Z = 29$).

32. (a) How do you convert the following :
(i) Phenol to anisole
(ii) Ethanol to propan-2-ol

(b) Why phenol undergoes electrophilic substitution more easily than benzene?

(c) Two moles of an organic compound '*A*' on treatment with a strong base give two compounds '*B*' and '*C*'. Compound '*B*' on dehydrogenation with Cu gives '*A*' while acidification of '*C*' yields carboxylic acid '*D*' with molecular formula of CH_2O_2. Identify the compounds *A*, *B*, *C* and *D* and write all chemical reactions involved.

OR

(a) Write the equations for the following reactions:
(i) Salicylic acid is treated with acetic anhydride in the presence of conc. H_2SO_4.
(ii) Bromination of anisole in ethanoic acid medium.
(iii) Phenol is treated with chloroform in the presence of NaOH.

(b) Distinguish between following :
(i) $CH_3 - CH = CH - CO - CH_3$ and
$CH_3 - CH_2 - CO - CH = CH_2$
(ii) Benzaldehyde and Benzoic acid.

33. (a) (i) An aqueous solution containing 12.48 g of barium chloride in 1.0 kg of water boils at 373.0832 K. Calculate the degree of dissociation of barium chloride.
[Given K_b for $H_2O = 0.52$ K m^{-1}; Molar mass of $BaCl_2 = 208.34$ g mol^{-1}]
(ii) Out of 0.1 molal aqueous solution of glucose and 0.1 molal aqueous solution of KCl, which one will have higher boiling point and why?
(iii) Predict whether van't Hoff factor, (*i*) is less than one or greater than one in the following :
(I) CH_3COOH dissolved in water
(II) CH_3COOH dissolved in benzene

OR

(b) (i) Calculate the freezing point of solution when 1.9 g of $MgCl_2$ ($M = 95$ g mol^{-1}) was dissolved in 50 g of water, assuming $MgCl_2$ undergoes complete ionization. (K_f for water = 1.86 K kg mol^{-1})
(ii) When 2.56 g of sulphur was dissolved in 100 g of CS_2, the freezing point lowered by 0.383 K. Calculate the formula of sulphur (S_x).
(K_f for $CS_2 = 3.83$ K kg mol^{-1}, atomic mass of sulphur = 32 g mol^{-1})
(iii) 3.9 g of benzoic acid dissolved in 49 g of benzene shows a depression in freezing point of 1.62 K. Calculate the van't Hoff factor and predict the nature of solute (associated or dissociated).
(Given : Molar mass of benzoic acid = 122 g mol^{-1}, K_f for benzene = 4.9 K kg mol^{-1})