S.R. Study Material

S R SAMPLE PAPER 2

Class 12 - Chemistry

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

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. A hydrocarbon C_5H_{10} does not react with chlorine in dark but gives a single monochloro compound C_5H_9Cl in bright sunlight. The hydrocarbon is: **[1]**

   a) Cyclopentene b) Cyclopentyne

   c) Pentane d) Cyclopentane

2. Deficiency of Vitamin B_{12} causes **[1]**

   a) Rickets b) Beri Beri

   c) Pernicious anaemia d) Blood clotting

3. CH_3CHO and $C_6H_5CH_2CHO$ can be distinguished chemically by: **[1]**

   a) Iodoform test b) Benedict test

   c) 2,4 DNP test d) Tollen's reagent test

4. One mole of an organic compound 'A' with the formula C_3H_8O reacts completely with two moles of HI to form X and Y. When 'Y' is boiled with aqueous alkali forms Z. Z answers the iodoform test. The compound 'A' is ______. **[1]**

   a) methoxyethane b) ethoxyethane

   c) Propan – 2 – o1 d) Propan – 1 – o1

5. The temperature coefficient of most of the reactions lies between **[1]**

   a) 2 and 4 b) 1 and 4

c) 2 and 3

d) 1 and 3

6. Match the items given in column I with that in column II: **[1]**

Column I	Column II
(a) Resistivity	(i) S cm^2 mol^{-1}
(b) Conductance	(ii) ohm-m
(c) Specific Conductance	(iii) Siemens
(d) Molar Conductivity	(iv) S m^{-1}

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

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

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

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

7. Molecules whose mirror image is non-superimposable over them are known as chiral. Which of the following molecules is chiral in nature? **[1]**

a) 2-Bromopropan-2-ol

b) 2-Bromopropane

c) 2-Bromobutane

d) 1-Bromobutane

8. Peptide linkage is present in: **[1]**

a) Carbohydrates

b) Proteins

c) Vitamins

d) Rubber

9. In the formation of sulphur trioxide $2SO_2(g) + O_2(g) \rightleftarrows 2SO_3(g)$. The rate of reaction is expressed as **[1]**
$-\frac{d[O2]}{dt} = 2.5 \times 10^{-4} \text{mol L}^{-1}\text{s}^{-1}$. The rate of disappearance of SO_2 will be

a) 50.0×10^{-4} mol $L^{-1}s^{-1}$

b) 3.75×10^{-4} mol $L^{-1}s^{-1}$

c) $- 2.25 \times 10^{-4}$ mol $L^{-1}s^{-1}$

d) 5×10^{-4} mol $L^{-1}s^{-1}$

10. Reduction of aldehydes and ketones into hydrocarbons using zinc amalgam and conc. HCl is called _______. **[1]**

a) Clemmensen reduction

b) Wolff – Kishner reduction

c) Cope reduction

d) Dow reduction

11. 3-Pentanol is an example of: **[1]**

a) Primary alcohol

b) Secondary alcohol

c) Tertiary alcohol

d) Aromatic alcohol

12. Which of the following has highest boiling point? **[1]**

a) HCOOH

b) CH_3CH_3

c) CH_3NH_2

d) CH_3OH

13. **Assertion:** Fructose has a total of 16 optical isomers. **[1]**
Reason: There are total of 3 asymmetric centers.

a) If both Assertion and Reason are right and Reason is the right explanation of Assertion.

b) If both Assertion and Reason are right but Reason is not the right explanation of Assertion.

c) If Assertion is right but Reason is wrong.

d) If both Assertion and Reason are wrong.

14. **Assertion (A):** The boiling points of aldehydes and ketones are higher than hydrocarbons and ethers of comparable molecular masses. **[1]**

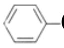
Reason (R): There is a weak molecular association in aldehydes and ketones arising out of the dipole-dipole interactions.

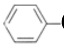
a) Both A and R are true and R is the correct explanation of A.

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):** Cl does not give S_N2 reaction. **[1]**

Reason (R): Cl is o- and p-directing for EAS reaction.

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):** Phenols give o - and p-nitrophenol on nitration with conc. HNO_3 and H_2SO_4 mixture. **[1]**

Reason (R): -OH group in phenol is o-, p-directing.

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. Why do doctors advice gargles by saline water in case of sore throat? **[2]**

18. Transition metals can act as catalysts because these can change their oxidation state. How does Fe(III) catalyze the reaction between iodide and persulphate ions? **[2]**

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

(i) Calculate the overall order of the reaction whose rate law expression was predicted as: **[1]**

Rate = $k[NO]^{3/2}\,[O_2]^{1/2}$

(ii) Can order of reaction be zero? Give example. **[1]**

20. What is the half cell potential for Fe^{3+}/Fe electrode in which $[Fe^{3+}]$ = 0.1m. **[2]**

$E^0 Fe^{3+}/Fe$ = +0.771V

OR

i. Write anode and cathode reactions that occur in dry cell.

ii. How does a dry cell differ from a mercury cell?

21. Convert Toluene to m-Nitrobenzoic acid. **[2]**

Section C

22. Calculate the emf of the following cell at 298 K. **[3]**

$2Cr(s) + 3Fe^{2+}(0.1M) \rightarrow 2Cr^{3+}(0.01M) + 3Fe(s)$

Given, $E^o_{cr^{3+}/cr}$ =-0.74V, $E^o_{Fe^{2+}/Fe}$ = -0.44 V

23. $[Cr(NH_3)_6]^{3+}$ is paramagnetic while $[Ni(CN)_4]^{2-}$is diamagnetic. Explain why? **[3]**

Cr(24) : $[Ar]4s^1 3d^5$

$Cr^{3+}(24)$: $[Ar]4s^0 3d^3$

24. Name the reagents in the following reactions: **[3]**

i. Oxidation of a primary alcohol to a carboxylic acid
ii. Oxidation of a primary alcohol to an aldehyde
iii. Bromination of phenol to 2, 4, 6-tribromophenol
iv. Benzyl alcohol to benzoic acid
v. Dehydration of propan 2-ol-tio propene
vi. Butan -2-one to butan - 2- ol.

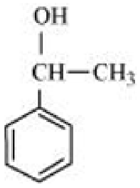
OR

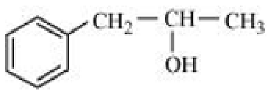
Classify the following as primary, secondary and tertiary alcohols:

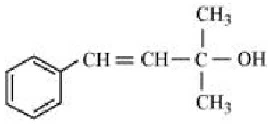
i. $CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_2OH$

ii. $H_2C = CH - CH_2OH$

iii. $CH_3 - CH_2 - CH_2 - OH$

iv. 

v. 

vi. 

25. Write the structures of the following compounds: **[3]**

i. $\propto -$ methoxypropionaldehyde
ii. 3-Hydroxylbutanol
iii. 2-Hydroxycylopentane carbaldehyde
iv. 4-Oxopentanal
v. Di-Sec. butyl ketone

26. Calculate the e.m.f. of the following cell at 298K: **[3]**

$Fe(s) | Fe^{2+}$ (0.001 M) || H^+ (0.01 M) | $H_2(g)$ (1 bar) | Pt(s)

Given that E°_{cell} = +0.44V

[log 2 = 0.3010 log 3 = 0.4771 log 10 = 1]

27. Out of $C_6H_5CH_2Cl$ and $C_6H_5CHClC_6H_5$ which is more easily hydrolysed by aqueous KOH? **[3]**

28. Show that in case of first order reaction, the time required for 99.9% of the reaction to complete its 10 times that required for half of the reaction to take place. **[3]**

(Given: $log2 = 0.3010$)

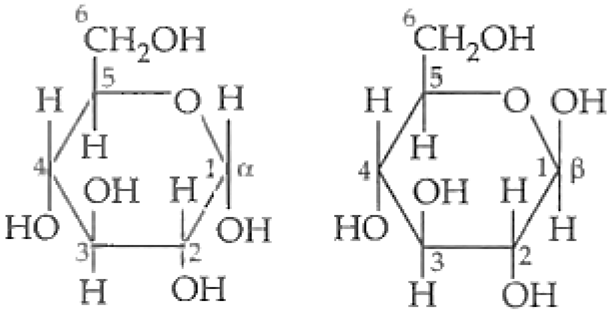
Section D

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

Pentose and hexose undergo intramolecular hemiacetal or hemiketal formation due to combination of the -OH group with the carbonyl group. The actual structure is either of five or six membered ring containing an oxygen atom. In the free state all pentoses and hexoses exist in pyranose form (resembling pyran). However, in the combined state some of them exist as five membered cyclic structures, called fiiranose (resembling furan).

Pyran Furan

The cyclic structure of glucose is represented by Haworth structure:



α-D-(+)-Glucopyranose β-D-(+)-Glucopyranose

α and β-D-glucose have different configurations at anomeric (C-1) carbon atom, hence are called anomers and the C-1 carbon atom is called anomeric carbon (glycosidic carbon).

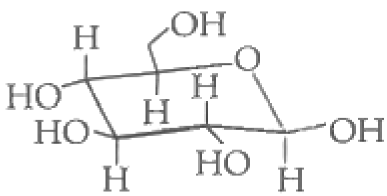
The six-membered cyclic structure of glucose is called the pyranose structure.

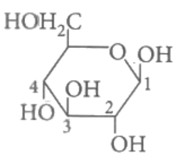
(i) What percentage of β-D-(+) glucopyranose is found at equilibrium in the aqueous solution?

OR

What are α-D(+)-glucose and β-D(+)glucose?

(ii) The following carbohydrate is



(iii) In the carbon structure,  anomeric carbon is

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

The existence of coordination compounds with the same formula but different arrangements of the ligands was crucial in the development of coordination chemistry. Two or more compounds with the same formula but different arrangements of the atoms are called isomers. Isomers are compounds with the same molecular formula but different structural formulas and do not necessarily share similar properties. There are many different classes of isomers, like stereoisomers, enantiomers, and geometrical isomers. There are two main forms of isomerism: structural isomerism and stereoisomerism. The different chemical formulas in structural isomers are caused either by a difference in what ligands are bonded to the central atoms or how the individual ligands are bonded to the central atoms.

(i) What type of isomerism is observed in $[Cr(H_2O)_4CI_2]^+$?.

(ii) What kind of isomerism exists between $[Cr(H_2O)_6]CI_3$ (violet) and $[Cr(H_2O)_5CI]CI_2H_2O$ (greyish -

green)?

(iii) Define linkage isomersm.

OR

What type of isomerism is observed in palladium complexes of the type $[Pd(C_6H_5)_2(SCN)_2]$ and $[Pd(C_6H_5)_2(NCS)_2]$?

Section E

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

(i) Transition metals and their compounds generally exhibit a paramagnetic behaviour. Give reason. **[1]**

(ii) Size of trivalent lanthanoid cations decreases with increase in the atomic number. (give reason) **[1]**

(iii) What is the most common oxidation state of lanthanoids and actinoids? **[1]**

(iv) La^{3+} (Z = 57) and Lu^{3+} (Z = 71) do not show any colour in solutions. Give reason. **[1]**

(v) How would you account for the following? Among lanthanoids, Ln (III) compounds are predominant. However, occasionally in solutions or in solid compounds, +2 and +4 ions are also obtained. **[1]**

(vi) Out of Al, Zn, Mg and Fe which is the maximum density element? **[1]**

(vii) Account for the following: There are irregularities in the electronic configuration of actinoids. **[1]**

32. a. A 0.2 percent aqueous solution of a non-volatile solute exerts a vapour pressure of 1.004 bar at $100^0\ C$. What is the molar mass of the solute? (Given: Vapour pressure of pure water at $100^0\ C$ is 1.013 bar and molar mass of water is 18 g mol^{-1}.) **[5]**

b. Calculate the freezing point of a solution containing 18 g glucose, $C_6H_{12}O_6$ and 68.4 g sucrose, $C_{12}H_{22}O_{11}$ in 200 g of water. The freezing point of pure water is 273 K and K_f for water is 1.86 km^{-1}.

OR

The air is a mixture of a number of gases. The major components are oxygen and nitrogen with the approximate proportion of 20% is to 79% by volume at 298 K. The water is in equilibrium with air at a pressure of 10 atm. At 298 K if Henry's law constants for oxygen and nitrogen are 3.30×10^7 mm and 6.51×10^7 mm respectively, calculate the composition of these gases in water.

33. a. Arrange the following compounds **[5]**

i. In increasing order of basic strength: $C_6H_5NH_2$, $C_6H_5N(CH_3)_2$, $(C_2H_5)_2NH$ and CH_3NH_2.

ii. In decreasing order of pK_b values: $C_2H_5NH_2$, $C_6H_5NHCH_3$, $(C_2H_5)_2NH$ and $C_6H_5NH_2$.

iii. In increasing order of basic strength in water: $C_6H_5NH_2$, $(C_2H_5)_2NH$, $(C_2H_5)_3N$, $C_2H_5NH_2$.

OR

Account for the following:

i. Aniline is a weaker base compared to ethanamine.

ii. Aniline does not undergo Friedel-Crafts reaction.

iii. Only aliphatic primary amines can be prepared by Gabriel Phthalimide synthesis.