S.R. Study Material

S R SAMPLE PAPER 3

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. Maximum number of molecules of CH_3I that can react with a molecule of CH_3NH_2 is: **[1]**

a) 2 b) 4

c) 1 d) 3

2. Which of the following is a fibrous protein? **[1]**

a) Glycoprotein b) Keratin

c) Proteoses d) Prolamine

3. Monochlorination of toluene in sunlight followed by hydrolysis by aq. NaOH yields **[1]**

a) benzyl alcohol b) o-cresol

c) 2,4-dihydroxytoluene d) m-cresol

4. The reagent which does not react with both acetone and benzaldehyde. **[1]**

a) Sodium hydrogensulphite b) Phenyl hydrazine

c) Fehling's solution d) Grignard reagent

5. For the reaction A + 3B $\rightarrow$ 2C + 2D, the concentration of A changes from 0.150 M to 0.0135 M in 1 min. The rate of formation of C in mol/L/s is: **[1]**

a) 5×10^5 b) 3×10^{-5}

c) 5×10^{-5} d) 2.5×10^{-5}

6. Match the column and choose correct option **[1]**

Vant'Hoff factor	Behaviour of compound
(a) i = 1	(i) Impossible
(b) i > 1	(ii) Association is the solution
(c) i < 1	(iii) Dissociation in the solution
(d) i = 0	(iv) No dissociation or association

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

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

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

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

7. Chlorobenzene is formed by the reaction of chlorine with benzene in the presence of $AlCl_3$. Which of the following species attacks the benzene ring in this reaction? **[1]**

a) $AlCl_3$

b) $[AlCl_4]^-$

c) Cl^+

d) Cl^-

8. How many carats are in 87.5% gold? **[1]**

a) 15

b) 21

c) 24

d) 18

9. Why is the minimum energy needed for an effective collision? **[1]**

a) Enough energy is needed to give off heat in a reaction.

b) Energy is needed to break bonds.

c) A minimum energy is needed, so that the particles will collide many times per second.

d) Energy is needed to orient the particles correctly.

10. The fragrance of the aldehyde and ketone are used for perfume and similar uses depend on: **[1]**

a) on its reactivity with other functional groups.

b) size and solubility of the aldehyde and ketone molecule.

c) only solubility of aldehydes and ketones.

d) moisture of the air.

11. Phenol on distillation with zinc dust gives **[1]**

a) benzaldehyde

b) benzophenone

c) benzene

d) benzonic acid

12. Which of the following compound give dye test? **[1]**

a) Diphenylamine

b) Methylamine

c) N-ethylpropan-1-amine

d) Aniline

13. **Assertion (A):** Glucose is a reducing sugar. **[1]**

Reason (R): Despite having an aldehydic group, glucose does not give 2,4-DNP test.

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.

[1]

14. **Assertion:** p-O_2N - $C_6H_5COCH_3$ is prepared by Friedel Crafts acylation of nitrobenzene.

Reason: Nitrobenzene easily undergoes electrophilic substitution reaction.

a) If both Assertion & Reason are true and the reason is the correct explanation of the assertion.
b) If both Assertion & Reason are true but the reason is not the correct explanation of the assertion.
c) If Assertion is true statement but Reason is false.
d) If both Assertion and Reason are false statements.

15. **Assertion (A):** The boiling points of alkyl halides decrease in the order: RI > RBr > RCl > RF **[1]**

Reason (R): The boiling points of alkyl chlorides, bromides, and iodides are considerably higher than that of the hydrocarbon of comparable molecular mass.

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):** Dehydration of alcohols with conc. acid at high temperature give saytzeff alkenes as major product. **[1]**

Reason (R): Dehydration of alcohols proceed by carbanion intermediate.

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. Explain the following: $[Fe(CN)_6]^{4-}$ and $[Fe(H_2O)]^{2+}$ are of different colours in dilute solutions. **[2]**

18. Why is any transition series, melting points first increase and then decrease and also they show a dip in the middle? **[2]**

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

(i) What is molecularity? **[1]**

(ii) $t_{1/2}$ of the reaction increases with increase in initial concentration. What is the order of reaction? **[1]**

20. Calculate the volume of water which could be added to 20 ml of 0.65 m HCl to dilute the solution to 0.2 m? **[2]**

OR

A 0.2% aqueous solution of a non-volatile solute exerts vapour pressure of 1.004 bar at 100^0 C. What is the molar mass of the solute?

21. Give reasons: **[2]**

i. chloroacetic acid is stronger than acetic acid.
ii. pH of reaction should be carefully controlled while preparing ammonia derivatives of carbonyl compounds.

Section C

22. In the button cell widely used in watches and other devices the following reaction takes place: **[3]**

$Zn(s) + Ag_2O(s) + H_2O(l) \rightarrow Zn^{2+}(aq) + 2Ag(s) + 2OH^-(aq)$

Determine $\Delta_r G^{(-)}$ and $E^{(-)}$ for the reaction

Given $Zn \rightarrow Zn^{2+} + 2e^-$, E^0 = 0.76V

Given $Ag \rightarrow Ag^+ + 2e^-$, E^0 = 0.344V

23. The following results have been obtained during kinetic studies of the reaction: **[3]**

2A + B $\rightarrow$ C + D

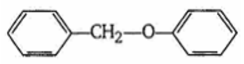
Exp. No.	[A]	[B]	Initial rate of Formation of D
1.	0.1 M	0.1 M	$6.0 \times 10^{-3} M \min^{-1}$
2.	0.3 M	0.2 M	$7.2 \times 10^{-3} M \min^{-1}$
3.	0.3 M	0.4 M	$2.88 \times 10^{-3} M \min^{-1}$
4.	0.4 M	0.1 M	$2.40 \times 10^{-3} M \min^{-1}$

Determine rate law and the rate constant for the reaction.

24. Give the major products that are formed by heating each of the following ethers with HI. **[3]**

i. $CH_3 - CH_2 - \overset{\overset{CH_3}{|}}{C}H - CH_2 - O - CH_2 - CH_3$

ii. $CH_3 - CH_2 - CH_2 - O - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_2 - CH_3$

iii. 

OR

Name the reagents used in the following reactions:

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

25. Oxidation of ketones involves carbon-carbon bond cleavage. Name and write the products formed on oxidation of 2, 5-dimethylhexan-3-one. **[3]**

26. Calculate the potential of hydrogen electrode in contact with a solution whose PH is 10. **[3]**

27. Does the presence of two chiral carbon atoms always make the molecule optically active? Explain giving an example. **[3]**

28. **[3]**

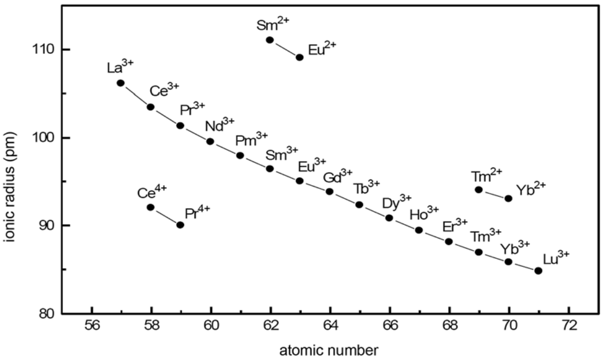
a. Write the formulation for the galvanic cell in which the reaction $Cu(s) + 2Ag^{+}(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$ takes place.
Identify the cathode and the anode reactions in it.

b. Write Nernst equation and calculate the emf of the following cell: Sn(s) | Sn^{2+}(0.04M) || H^{+}(0.02M) | H_2(g)|Pt(s)
$\left(Given \;\; E^{\ominus}{}_{Sn^{2+}/Sn} = -0.14V\right)$

Section D

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

The f-block consists of the two series, lanthanoids (the fourteen elements following lanthanum) and actinoids (the fourteen elements following actinium). Because lanthanum closely resembles the lanthanoids. The chemistry of the actinoids is much more complicated. The complication arises partly owing to the occurrence of a wide range of oxidation states in these elements and partly because their radioactivity creates special problems in their study. The overall decrease in atomic and ionic radii from lanthanum to lutetium (the lanthanoid contraction) is a unique feature in the chemistry of the lanthanoids. In the lanthanoids, La(II) and Ln(III) compounds are predominant species.



(i) Which metal in the first transition series (3d series) exhibits +1 oxidation state most frequently and why?

OR

The atomic radii of the metals of the third (5d) series of transition elements are virtually the same as those of the corresponding members of the second (4d) series. Give reason.

(ii) The transition metals (with the exception of Zn, Cd and Hg) are hard and have high melting and boiling points. Give reason.

(iii) Both O_2 and F_2 stabilize high oxidation states of transition metals but the ability of oxygen to do so exceeds that of fluorine. Give reason.

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

In order to overcome the scarcity of drinking water in a remote village in Gujarat, Arnav and Aariv two young entrepreneurs still in their high school, have developed a unique water purifier that is capable of converting sea water into drinking water. It works on the principle of concentration difference between two solutions.

(i) Name the phenomenon/process based on which this product is made?

(ii) How difference in concentration of solutions help in converting sea water into drinking water?

(iii) What arrangement they must have created in their product to covert sea water into drinking water?

OR

Equimolar solutions of NaCl and glucose are not isotonic. Why?

Section E

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

(i) Why are polysaccharides considered non-sugars? **[1]**

(ii) Write function of carbohydrates in plants. **[1]**

(iii) Write uses of B-Complex. **[1]**

(iv) What type of linkage holds together the monomers of DNA? **[1]**

(v) How do enzymes help a substrate to be attacked by the reagent effectively? **[1]**

(vi) Deficiency of which vitamin causes night-blindness. **[1]**

(vii) Which monosaccharide units are present in starch, cellulose and glycogen and which linkages link these units? **[1]**

32. Give the oxidation state, d-orbital occupation and coordination number of the central metal ion in the following complexes: **[5]**

i. $K_3\left[Co(C_2O_4)_3\right]$
ii. cis$-\left[Cr(en)_2Cl_2\right]Cl$
iii. $(NH_4)_2\left[CoF_4\right]$

iv. $[Mn(H_2O)_6]\,SO_4$

OR

i. Draw all the possible isomers having the formula -Cr[$(NH_3)_4Cl_2]^+$

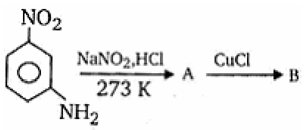
ii. Illustrate the following with an example:

a. Linkage isomerism

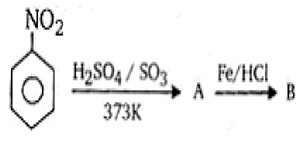
b. Coordination isomerism.

iii. Why is $[NiCl_4]^{2-}$ programanetic (Ni = 28)?

33. Identify A and B in the following reactions: **[5]**

i. 

ii. $CH_3CH_2CH_2Br \xrightarrow{NaGN} A \xrightarrow{LiAJH_i} B$

iii. 

OR

Write IUPAC names of the following compounds and classify them into primary, secondary and tertiary amines.

1. $(CH_3)_2CHNH_2$
2. $CH_3(CH_2)_2NH_2$
3. $CH_3NHCH(CH_3)_2$
4. $(CH_3)_3CNH_2$
5. $C_6H_5NHCH_3$