S R Study Material

SPECIAL SAMPLE PAPER 3

Class 12 - Chemistry

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

General Instructions:

Read the following instructions carefully.

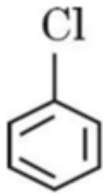
1. There are **33** questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
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. Which of the following is most reactive towards nucleophilic substitution reaction? **[1]**

   a) CH_2=CH-CH_2-Cl

   b) CH_3-CH_2-CH_2-Cl

   c) 

   d) CH_2 = CH-C

2. Which amino acid produces Thyroxine hormone? **[1]**

   a) Proline

   b) Arginine

   c) Leucine

   d) Tyrosine

3. The reaction of an alkyl halide with sodium alkoxide forming ether is known as: **[1]**

   a) Wurtz reaction

   b) Kolbe reaction

   c) Williamson synthesis

   d) Reimer-Tiemann reaction

4. What compound is produced when cyclohexene is treated with concentrated $KMnO_4$? **[1]**

   a) Succinic acid

   b) Adipic acid

   c) Hexanoic acid

   d) Cyclohexanecarboxylic acid

5. For a certain reaction R $\longrightarrow$ products, a plot of log [R] vs. time gives a straight line with a slope of 1.25 s^{-1}. The order of the reaction is: **[1]**

a) One

b) Zero

c) Two

d) Fractional

6. Match the items of column I with appropriate entries of column II. **[1]**

Column I	Column II
(a) For electrolyte $CaSO_4$	(i) i = 5
(b) For ideal Solution	(ii) i = 2
(c) For electrolyte $Al_2(SO_4)_3$	(iii) i = 4
(d) For electrolyte Na_3PO_4	(iv) i = 1

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

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

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

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

7. A dibromo derivative of an alkane reacts with sodium metal to form an alicyclic hydrocarbon. The derivative is **[1]**

a) 1, 1 – dibromopropane

b) 2, 2 – dibromobutane

c) 1, 2 – dibromoethane

d) 1, 4 – dibromobutane

8. When $KMnO_4$ solution is added to oxalic acid solution, the decolourisation is slow in the beginning but becomes instantaneous after some time because: **[1]**

a) CO_2 is formed as the products

b) Reaction is exothermic

c) Mn^{2+} acts as autocatalyst

d) MnO_4^- catalysis the reaction

9. The unit of rate constant for the reaction $2A + 2B \rightarrow A_2B_2$ which has rate = k $[A]^2[B]$ is: **[1]**

a) s^{-1}

b) mol L^{-1}

c) mol L^{-1} s^{-1}

d) mol^{-2} L^2 s^{-1}

10. The base hydrolysis of an ester is called_____. **[1]**

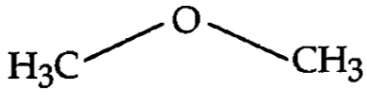
a) saponification

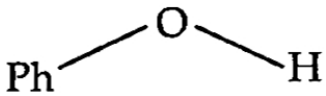
b) esterification

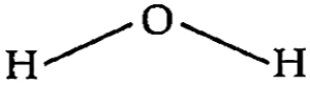
c) hydrolysis

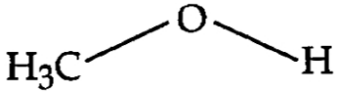
d) neutralization

11. The compounds that is most difficult to protonate is: **[1]**

a) 

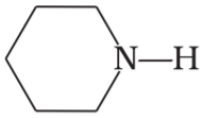
b) 

c) 

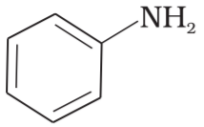
d) 

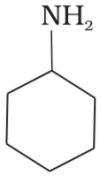
12. Which of the following is the weakest Brönsted base? **[1]**

a) CH_3NH_2

b) 

c)

d) 



13. **Assertion:** Fructose can reduce Tollen's reagent. **[1]**

Reason: Fructose is a ketone.

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):** Benzaldehyde undergoes aldol condensation. **[1]**

Reason (R): Aldehydes that do not have α-hydrogen undergo aldol condensation.

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) Both A and R are false.

15. **Assertion (A):** Bromobenzene upon reaction with Br_2/Fe gives 1, 4-dibromobenzene as the major product. **[1]**

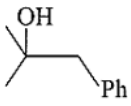
Reason (R): In bromobenzene. the inductive effect of the bromo group is more dominant than the mesomeric effect in directing the incoming electrophile.

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):ph**MgBr on reaction with  produce  as product. **[1]**

Reason (R): Reaction of CH_3MgBr with cyclic ether is nucleophilic addition 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.

Section B

17. i. Write the IUPAC name of $[Mn(H_2O)_6]SO_4$. **[2]**

ii. Why is $[Fe(CN)_6]^{4-}$ diamagnetic while $[FeF_6]^{3-}$ is paramagnetic?

[At. No. Fe = 26]

18. Explain the following observation: The enthalpies of atomisation of transition metals are quite high. **[2]**

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

(a) Give two examples of non-chemical process which obeys the first order kinetics. **[1]**

(b) For the reaction **[1]**

$2N_2O_5(g) \longrightarrow 4NO_2(g) + O_2(g)$,

the rate of formation of NO_2 (g) is 2.8×10^{-3} M s^{-1}. Calculate the rate of disappearance of N_2O_5 (g).

20. Define the terms: Van't Hoff factor **[2]**

OR

a. Find the van't Hoff factor for aqueous KCl, assuming complete dissociation.

b. A solution of an organic compound is prepared by dissolving 68.4 g in 1000 g of water. Calculate the molar mass of the compound when elevation in boiling point is 0.104 K and K_b for water is 0.52 K kg mol^{-1}.

21. Predict the products formed when CH_3CH_2CHO reacts with the following reagents: (Any **two**) **[2]**

i. PhMgBr and then H_3O+

ii. $LiAlH_4$

iii. HCN

Section C

22. One half-cell in a voltaic cell is constructed from a silver wire dipped in silver nitrate solution of unknown concentration. The other half-cell consists of a zinc electrode in 1.0 M solution of $Zn(NO_3)_2$. A voltage of 1.48 V is measured for this cell. Use this information to calculate the concentration of silver nitrate solution. **[3]**

[Given, $E^{\circ}_{Zn^{2+}/Zn} = -0.763V$ and $E^{\circ}_{Ag^{+}/Ag} = +0.80V$].

23. For a reaction, **[3]**

$2NH_3(g) \xrightarrow{Pt} N_2(g) + 3H_2(g)$

Rate = k

i. Write the order and molecularity of this reaction.

ii. Write the unit of k.

24. Draw the structure and name the product formed if the following alcohols are oxidized. Assume that an excess of oxidizing agent is used. **[3]**

i. $CH_3CH_2CH_2CH_2OH$

ii. 2-Butanol

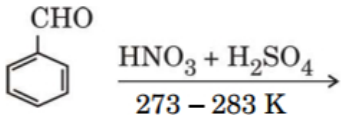
iii. 2-methylpropanol

OR

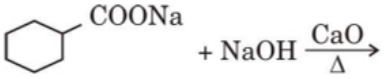
Write the mechanism of the reaction of HI with methoxymethane.

25. Write the major products in the following: **[3]**

i.



ii.



iii.

$$CH_3 - \underset{\underset{H}{|}}{C} = O \xrightarrow{NH_2OH}$$

26. Calculate $E^{o}(Ni^{2+}|Ni)$, if emf of the cell, $Ni(s)|Ni^{2+}(0.01M) \parallel Cu^{2+}(0.1M)|Cu(s)$ is 0.059 V. [Given, $E^{\circ}_{Cu^{2+}/Cu}$ = + 0.34 V]. **[3]**

27. An organic compound A on heating with NH_3 and cuprous oxide at high pressure gives compound B. The compound B on treatment with ice-cold solution of $NaNO_2$ and HCl gives C, which on heating with copper turning and HCl gives A again. Identify A, B & C. compound. **[3]**

28. Calculate the maximum work and log Kc for the given reaction at 298 K : **[3]**

$Ni\ (s) + 2\ Ag^{+}\ (aq) \rightleftharpoons Ni^{2+}\ (aq) + 2Ag\ (s)$

Given:

$E^{o}_{Ni^{2+}/Ni} = -0.25\ V,\ E^{O}_{Ag^{+}/Ag} = +0.80\ V$

$1F = 96500\ C\ mol^{-1}$

Section D

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

The involvement of (n - 1)d electrons in the behaviour of transition elements impart certain distinct characteristics to these elements. Thus, in addition to variable oxidation states, they exhibit paramagnetic behaviour, catalytic properties and tendency for the formation of coloured ions. The transition metals react with a number of non-metals like oxygen, nitrogen and halogens. $KMnO_4$ and $K_2Cr_2O_7$ are common examples.

The two series of inner transition elements, lanthanoids and actinoids, constitute the f-block of the periodic table. In the lanthanoids, there is regular decrease in atomic size with increase in atomic number due to the imperfect shielding effect of 4f-orbital electrons which causes contraction.

Answer the following questions:

a. Why do transition metals and their compounds act as good catalysts? **(1)**

b. What is the cause of contraction in the atomic size of lanthanoids? **(1)**

c. Define lanthanoid contraction. How does it affect the atomic radii of the third transition series and the second transition series? **(2)**

OR

c. In aqueous media, which is a stronger reducing agent - Cr^{2+} or Fe^{2+} and why? **(2)**

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

Many chemical and biological processes depend on osmosis, the selective passage of solvent molecules through the porous membrane from a dilute solution to a more concentrated one. The osmotic pressure π depends on molar concentration of the solution (π = CRT). If two solutions are of equal solute concentration and, hence, have the same osmotic pressure, they are said to be isotonic. If two solutions are of unequal osmotic pressures, the more concentrated solution is said to be hypertonic and the more diluted solution is described as hypotonic. Osmosis is the major mechanism, for transporting water upward in the plants. Transpiration is the leaves supports the transport mechanism of water. The osmotic pressure of seawater is about 30 atm; this is the pressure that must be applied to the seawater (separated from pure water using a semi-permeable membrane) to get drinking water.

i. What will happen if a plant cell kept in a hypertonic solution? (1)

ii. Blood cells are isotonic with 0.9% sodium chloride solution. What happens if we place blood cells in a solution containing in 1.2% sodium chloride solution? (1)

iii. What happens when the external pressure applied becomes more than the osmotic pressure of solution? (2)

OR

Which mechanisms helps in the transportation of water in a plant? (2)

Section E

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

(a) i. How are carbohydrates stored in animal body? Mention any one organ where they are present. **[1]**

ii. What is the basic structural difference between starch and cellulose?

(b) Which of the two components of starch is water soluble? **[1]**

(c) What is the basic structural difference between glucose and fructose? **[1]**

(d) Name the disaccharide which on hydrolysis gives glucose and galactose. **[1]**

(e) What type of protein is present in keratin? **[1]**

(f) Name the disaccharide which on hydrolysis gives two molecules of glucose. **[1]**

(g) What is the structural feature characterising reducing sugars? **[1]**

32. **[5]**

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)?

OR

Write down the IUPAC name for each of the following complexes and indicate the oxidation state, electronic configuration, and coordination number. Also, give stereochemistry and magnetic moment of the complex:

a. $K[Cr(H_2O)_2\}(C_2O_4)_2].3H_2O$

b. $[Co(NH_3)_5Cl]Cl_2$

c. $CrCl_3(py)_3$

d. $Cs[FeCl_4]$

e. $K_4[Mn(CN)_6]$

33. **[5]**

a. Write the reactions involved in the following:

i. Hoffmann bromamide degradation reaction

ii. Diazotisation

iii. Gabriel phthalimide synthesis

b. Give reasons:

i. $(CH_3)_2NH$ is more basic than $(CH_3)_3N$ in an aqueous solution.

ii. Aromatic diazonium salts are more stable than aliphatic diazonium salt.

OR

a. An aromatic compound 'A' on treatment with aquecous ammonia and heating forms compound 'B' which on heating with Br_2 and KOH forms a compound 'C' of molecular formula C_6H_7N. Write the structures and IUPAC names of compounds A, B and C.

b. Complete the following reactions:

i. $C_6H_5NH_2 + CHCl_3 + \text{alc. KOH} \rightarrow$

ii. $C_6H_5N_2Cl + H_3PO_2 + H_2O \rightarrow$