



CHEMISTRY

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 branched chain isomer of the hydrocarbon with molecular mass 72u gives only one isomer of monosubstituted alkyl halide? [1]
a) Tertiary butyl chloride
b) Neohexane
c) Isohexane
d) Neopentane
2. Two nucleic acid chains are wound about each other and held together by hydrogen bonds between pairs of bases, this is called [1]
a) Secondary structure of DNA
b) Primary structure of DNA
c) Secondary structure of RNA
d) Primary structure of RNA
3. In Clemmensen reduction, carbonyl compound is treated with _____. [1]
a) sodium amalgam + HNO_3
b) zinc amalgam + nitric acid
c) sodium amalgam + HCl
d) zinc amalgam + HCl
4. The reaction $\text{C}_2\text{H}_5\text{ONa} + \text{C}_2\text{H}_5\text{I} \rightarrow \text{C}_2\text{H}_5\text{OC}_2\text{H}_5 + \text{NaI}$ is known as: [1]
a) Williamson's synthesis
b) Grignard's synthesis
c) Wurtz's synthesis
d) Kolbe's synthesis
5. The unit of rate constant for a first order reaction is [1]
a) Mol/L
b) Mol/L/s
c) $\text{Mol}^2/\text{L}^2/\text{s}^2$
d) s^{-1}

6. Match the items given in column I with that in column II:

[1]

Column I	Column II
(a) Cell Volage $\simeq 1.35$ V	(i) Bacon Cell
(b) Electrolyte is aqueous solution of H_2SO_4 38% by mass	(ii) Mercury Cell
(c) Cell Volage $\simeq 1.4$ V	(iii) Lead-storage Battery
(d) Used to power Apollo space Missions	(iv) Nickel-cadmium Storage Cell

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

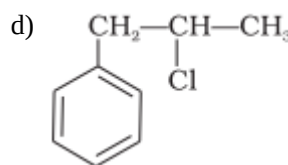
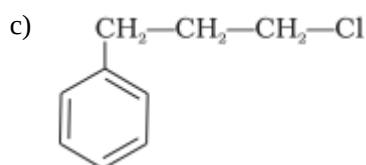
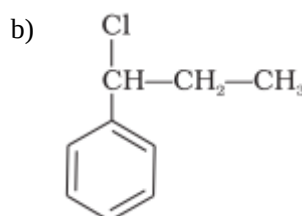
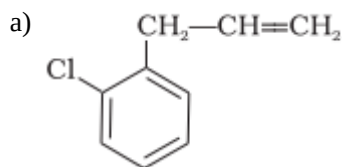
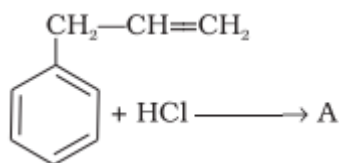
b) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

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

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

7. What is **A** in the following reaction?

[1]



8. Nucleic acids are the polymers of

[1]

a) sugars

b) bases

c) nucleosides

d) nucleotides

9. Milk turns sour at 40°C three times faster than it does at 0°C . this shows that activation energy of souring of milk (in cal) is

a) $\frac{4.606 \times 40}{273 \times 313} \log 3$

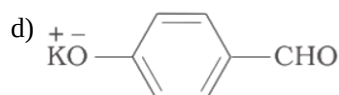
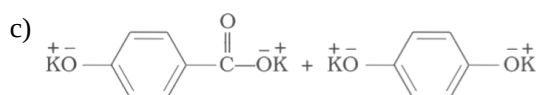
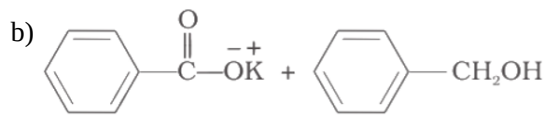
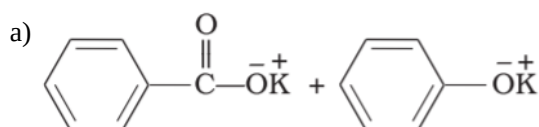
b) $\frac{2.303 \times 273 \times 313 \times 8.314 \times \log 3}{40}$

c) $\frac{4.606 \times 273 \times 313}{40} \log \frac{1}{3}$

d) $\frac{2.303 \times 273 \times 313}{40} \log 3$

10. Which product is formed when the compound is treated with concentrated aqueous KOH solution?

[1]



11. Phenol does **not** undergo nucleophilic substitution reaction easily due to:

[1]

- a) Instability of phenoxide ion
b) Partial double bond character of C-OH bond
c) Acidic nature of phenol
d) Partial double bond character of C-C bond
12. Which of the following is a secondary amine _ [1]
a) N,N-dimethylaniline
b) 3 – pentanamine
c) N-ethyl propan -1-amine
d) cyclohexylamine
13. **Assertion (A):** Albumin is a globular protein. [1]
Reason (R): Polypeptide chain coils around to give a straight chain.
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):** RCHO, RCOCH₃ and cyclic ketones react with sodium bisulphite. [1]
Reason (R): Crystalline solid derivatives are formed when aldehydes or ketones are shaken with saturated aqueous solution of sodium bisulphite.
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):** Aryl halide gives a mixture of o- and p-products. [1]
Reason (R): Aryl halides undergo electrophilic substitutions more readily than benzene.
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):** Phenol gives 2,4,6-trinitrophenol on treatment with concentrated HNO₃ and concentrated H₂SO₄. [1]
Reason (R): -OH group in phenol is m-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.

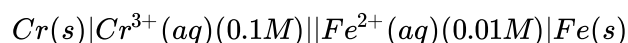
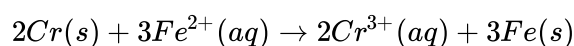
Section B

17. Suggest the most important type of intermolecular attractive interaction in the following pairs. [2]
i. n-hexane and n-octane
ii. I₂ and CCl₄
iii. NaClO₄ and water
iv. Methanol and acetone
v. Acetonitrile (CH₃CN) and acetone (C₃H₆O)
18. Name the oxometal anions of the first series of the transition metals in which the metal exhibits the oxidation state to its group number. [2]
19. **Answer the following:** [2]

- (a) A reaction is 50% complete in 2 hours and 75% complete in 4 hours. What is the order of the reaction? [1]
- (b) A first order reaction is found to have a rate constant $k = 5.5 \times 10^{-14} \text{ s}^{-1}$. Find the half-life of reaction. [1]
20. At 298 K, the molar conductivities at infinite dilution of NH_4Cl , NaOH and NaCl are 129.8, 217.4 and 108.9 $\text{cm}^2\text{mol}^{-1}$ respectively. The molar conductivity of 0.01 M NH_4OH solution is 9.33 $\text{cm}^2\text{mol}^{-1}$, calculate the degree of dissociation of NH_4OH at this dilution? [2]

OR

Calculate E_{cell} for following:



$$E_{(\text{Cr}^{3+}/\text{Cr})}^{\ominus} = -0.74 \text{ V}$$

$$E_{(\text{Fe}^{2+}/\text{Fe})}^{\ominus} = -0.44 \text{ V}$$

21. a. Give reasons: [2]
- Benzoic acid is a stronger acid than acetic acid.
 - Methanal is more reactive towards nucleophilic addition reaction than ethanal.
- b. Give a simple chemical test to distinguish between propanal and propanone.

Section C

22. Silver is deposited on a metallic vessel by passing a current of 0.2 amps. for 3 hrs. Calculate the weight of silver deposited. (At mass of silver = 108 amu, 1 F = 96500 C)? [3]
23. a. Using valence bond theory, predict the shape and magnetic character of $\text{Ni}(\text{CO})_4$ [Ni = 28]. [3]
- b. Give one example of application of coordination compounds in medicines.
24. Name the reagents used in the following reactions: [3]
- Oxidation of a primary alcohol to carboxylic acid.
 - Oxidation of a primary alcohol to an aldehyde.
 - Bromination of phenol to 2, 4, 6-tribromophenol.

OR

Write the mechanism of the reaction of HI with methoxymethane.

25. Write down functional isomers of a carbonyl compound with molecular formula $\text{C}_3\text{H}_6\text{O}$. Which isomer will react faster with HCN and why? Explain the mechanism of the reaction also. Will the reaction lead to the completion with the conversion of the whole reactant into the product at reaction conditions? If a strong acid is added to the reaction mixture what will be the effect on the concentration of the product and why? [3]
26. Write electrode reactions taking place in Ni - Cd cell. Is it primary or secondary cell? [3]
27. What are the IUPAC names of the insecticide DDT and benzenehexachloride? Why is their use banned in India and other countries? [3]
28. The rate constant for a first order reaction is 60 s^{-1} . How much time will it take to reduce the concentration of the reactant to $\frac{1}{10}$ th its initial value? [3]

Section D

29. Read the following text carefully and answer the questions that follow: [4]
- Living system are made up of complex molecules called Biomolecules. Carbohydrate, proteins, enzymes,

nucleic acids, lipids, hormones ATP, DNA and RNA play an important role in our daily life. Carbohydrates provide us energy. Protein help in growth and maintenance of body. Nucleic acids, RNA helps in protein synthesis, DNA helps in transfer of genetic characteristics. Fat are source of energy and protect our vital organs.

- i. Why are carbohydrates optically active? (1)
- ii. Name two acidic amino acids. (1)
- iii. Name a protein which has quaternary structure. (2)

OR

What are products of hydrolysis of fats? (2)

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

The coordination compounds are of great importance. These compounds are widely present in the mineral, plant and animal worlds and are known to play many important functions in the area of analytical chemistry, metallurgy, biological systems, industry and medicine. The selective estimation of these ions can be done due to the difference in the stability constants of calcium and magnesium complexes. Coordination compounds are of great importance in biological systems. The pigment responsible for photosynthesis, chlorophyll, is a coordination compound of magnesium. Among the other compounds of biological importance with coordinated metal ions are enzymes like carboxypeptidase and carbonic anhydrase (catalysts of biological systems). Coordination compounds are used as catalysts for many industrial processes. Articles can be electroplated with silver and gold much more smoothly and evenly from solutions of the complexes, $[\text{Ag}(\text{CN})_2]^-$ and $[\text{Au}(\text{CN})_2]^-$ than from a solution of simple metal ions.

- i. How can excess of copper and iron are removed? (1)
- ii. Purification of metals can be achieved through the formation and subsequent decomposition of their coordination compounds. Give one example. (1)
- iii. Coordination compounds find use in many qualitative and quantitative chemical analysis. Justify. (2)

OR

Gold is a co-ordinate compound. Justify. (2)

Section E

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

- (a) Draw and show manganate and permanganate ions, structurally? [1]
- (b) Use the data to answer the following and also justify giving reason: [1]

	Cr	Mn	Fe	Co
$E_{\text{M}^{2+}/\text{M}}^{\circ}$	-0.91	-1.18	-0.44	-0.28
$E_{\text{M}^{3+}/\text{M}^{2+}}^{\circ}$	-0.41	+1.57	+0.77	+1.97

- a. Which is a stronger reducing agent in aqueous medium, Cr^{2+} or Fe^{2+} and why?
- b. Which is the most stable ion in +2 oxidation and why?
- (c) The chemistry of the actinoids is more complex as compared to lanthanoids. Why? [1]
- (d) Why does vanadium pentoxide act as a catalyst? [1]
- (e) La^{3+} ($Z = 57$) and Lu^{3+} ($Z = 71$) do not show any colour in solutions. Give reason. [1]
- (f) Which element in the first series of transition elements does not exhibit variable oxidation states and why? [1]
- (g) Out of Al, Zn, Mg and Fe which is the maximum density element? [1]

32. The freezing point of a solution containing 0.2 g acetic acid in 20.0 g of benzene is lowered by 0.45°C . [5]

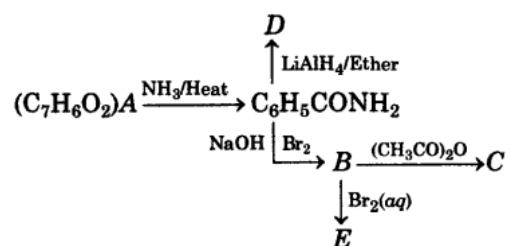
Calculate:

- the molar mass of acetic acid from this data
- van't Hoff factor. [For benzene, $K_f = 5.12 \text{ K kg mol}^{-1}$] What conclusion can you draw from the value of van't Hoff factor obtained?

OR

Why is the mass determined by measuring a colligative property in case of some solutes abnormal? Discuss it with the help of Van't Hoff factor.

33. An aromatic compound 'A' of molecular formula $\text{C}_7\text{H}_6\text{O}_2$ undergoes a series of reactions as shown below. Write [5]
the structures of A, B, C, D and E in the following reactions.



OR

a. An aromatic compound 'A' on treatment with aqueous ammonia and heating forms compound 'B' which on heating with Br_2 and KOH forms a compound 'C' of molecular formula $\text{C}_6\text{H}_7\text{N}$. Write the structures and IUPAC names of compounds A, B and C.

b. Complete the following reactions:

- $\text{C}_6\text{H}_5\text{NH}_2 + \text{CHCl}_3 + \text{alc. KOH} \rightarrow$
- $\text{C}_6\text{H}_5\text{N}_2\text{Cl} + \text{H}_3\text{PO}_2 + \text{H}_2\text{O} \rightarrow$