



CHEMISTRY

Class 12 - Chemistry

Time Allowed: 3 hours

Maximum Marks: 70

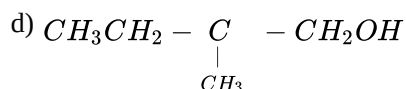
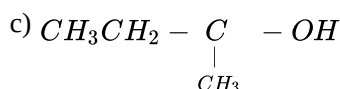
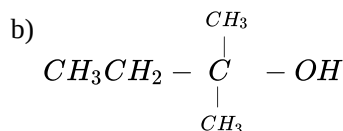
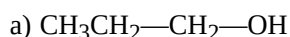
General Instructions:

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 of the following alcohols will yield the corresponding alkyl chloride on reaction with concentrated HCl at room temperature? [1]



2. Progesterone is responsible for [1]

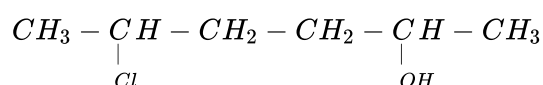
a) preparing the uterus for implantation of fertilised egg.

b) development of secondary female characteristics.

c) controlling menstrual cycle.

d) development of secondary male characteristics.

3. Give IUPAC name of the compound given below. [1]



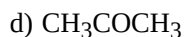
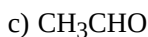
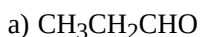
a) 2 - Chloro - 5 - hydroxyhexane

b) 5 - Chlorohexan - 2 - ol

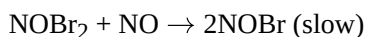
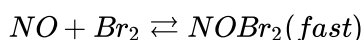
c) 2 - Hydroxy - 5 - chlorohexane

d) 2 - Chlorohexan - 5 - ol

4. Which of the following does not give silver mirror test? [1]



5. The reaction  $2\text{NO} + \text{Br}_2 \rightarrow 2\text{NOBr}$  follows the mechanism given below: [1]



If the concentration of both NO and  $\text{Br}_2$  is increased two times, the rate of reaction would become:

a) 2 times

b) 8 times

c) 4 times

d) 6 times

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

Column I	Column II
(a) $\frac{\Delta P}{P^{\circ}_A}$	(i) $\frac{\Delta T_b}{m}$
(b) $K_b$	(ii) mol fraction of solute
(c) i	(iii) $\frac{\Delta T_f}{m}$
(d) $K_f$	(iv) Ratio of observed molar mass to actual molar mass

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

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

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

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

7. In alkyl halide: [1]

a) All of these

b) the carbon atom of C-halogen bond bears a partial positive charge

c) the halogen atom bears a partial negative charge

d) the carbon-halogen bond of alkyl halide is polarized

8. Which of the following is called chromic acid? [1]

a)  $\text{CrO}$ b)  $\text{H}_2\text{CrO}_4$ c)  $\text{Cr}_3\text{O}_4$ d)  $\text{Cr}_2\text{O}_3$ 

9. For the reaction  $3\text{A} \rightarrow 2\text{B}$ , rate of reaction  $-\frac{d[\text{A}]}{dt}$  is equal to [1]

a)  $\frac{+1}{3} \frac{d[\text{B}]}{dt}$

b)  $\frac{+2}{3} \frac{d[\text{B}]}{dt}$

c)  $\frac{+1}{2} \frac{d[\text{B}]}{dt}$

d)  $\frac{+3}{2} \frac{d[\text{B}]}{dt}$

10. Aldehydes and ketones react with hydroxylamine to form [1]

a) cyanohydrins

b) Oxime

c) semicarbazones

d) hydrazones

11.  $\text{CH}_3 - \text{O} - \text{CH}_3$  when treated with excess HI gives: [1]

a)  $\text{CH}_3 - \text{I} + \text{CH}_4$ b)  $\text{CH}_3 - \text{OH} + \text{CH}_3 - \text{I}$ c)  $2\text{CH}_3 - \text{I}$ d)  $2\text{CH}_3 - \text{OH}$ 

12. In Pyridine, the preferred site of nucleophilic substitution is one of the following positions: [1]



OR

0.3 g of acetic acid ( $M = 60 \text{ g mol}^{-1}$ ) dissolved in 30 g of benzene shows a depression in freezing point equal to  $0.45^\circ \text{C}$ . Calculate the percentage association of acid if it forms a dimer in the solution.

(Given:  $K_f$  for benzene =  $5.12 \text{ K kg mol}^{-1}$ )

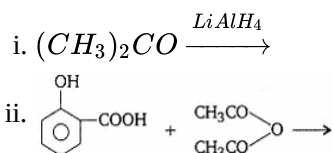
21. Arrange the following compounds in increasing order of their boiling points : [2]  
 $\text{CH}_3\text{CHO}$ ,  $\text{CH}_3\text{CH}_2\text{OH}$ ,  $\text{CH}_3\text{OCH}_3$ ,  $\text{CH}_3\text{CH}_2\text{CH}_3$

### Section C

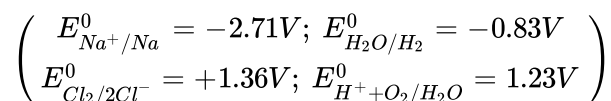
22. Conductivity of  $2 \times 10^{-3} \text{ M}$  methanoic acid is  $8 \times 10^{-5} \text{ S cm}^{-1}$ . Calculate its molar conductivity and degree of dissociation if  $\Lambda_m^\circ$  for methanoic acid is  $404 \text{ S cm}^2 \text{ mol}^{-1}$ . [3]
23. A first order reaction has a rate constant of  $0.0051 \text{ min}^{-1}$ . If we begin with  $0.10 \text{ M}$  concentration of the reactant what concentration of the reactant will be left after 3 hours? [3]
24. o- nitrophenol has lower boiling point (is more volatile) than p - nitrophenol. [3]

OR

Complete the following reactions:



25. An organic compound A ( $\text{C}_7\text{H}_6\text{Cl}_2$ ) on treatment with NaOH solution gives another compound B ( $\text{C}_7\text{H}_6\text{O}$ ). B on oxidation gives an acid C ( $\text{C}_7\text{H}_6\text{O}_2$ ) which on treatment with a mixture of conc.  $\text{HNO}_3$  and  $\text{H}_2\text{SO}_4$  gives a compound D ( $\text{C}_7\text{H}_5\text{NO}_4$ ). B on treatment with conc. NaOH gives a compound E ( $\text{C}_7\text{H}_8\text{O}$ ) and  $\text{C}_6\text{H}_5\text{COONa}$ . Deduce the structures of A, B, C, D and E. [3]
26. A voltaic cell is set-up at  $25^\circ \text{C}$  with following half cells  $\text{Al}|\text{Al}^{3+}(0.001 \text{ M})$  and  $\text{Ni}|\text{Ni}^{2+}(0.50 \text{ M})$  [3]  
Write an equation for the reaction that occurs when the cell generates an electric current and determine the cell potential.  
[Given,  $E_{\text{Ni}^{2+}/\text{Ni}}^\ominus = -0.25 \text{ V}$ , and  $E_{\text{Al}^{3+}/\text{Al}}^\ominus = -1.66 \text{ V}$   $\log(8 \times 10^{-6}) = -5.09690$ ]
27. How can you convert the following : [3]
- Sodium phenoxide to o-hydroxybenzoic acid
  - Acetone to propene
  - Phenol to chlorobenzene
28. Explain why electrolysis of aqueous solution of NaCl gives  $\text{H}_2$  at cathode and  $\text{Cl}_2$  at anode. Write overall reaction. [3]



### Section D

29. Read the following text carefully and answer the questions that follow: [4]  
The actinoids include the fourteen elements from Th to Lr. The actinoids are radioactive elements and the earlier members have relatively long half-lives, the latter ones have half-life values ranging from a day to 3 minutes for lawrencium. The latter members could be prepared only in nanogram quantities. Actinoids show a greater range of oxidation states. The elements, in the first half of the series frequently exhibit higher oxidation states. The actinoids resemble the lanthanoids in having more compounds in +3 state than in the +4 state. All the actinoids

are believed to have the electronic configuration of  $7s^2$  and variable occupancy of the 5f and 6d subshells. The magnetic properties of the actinoids are more complex than those of the lanthanoids. The variation in the magnetic susceptibility of the actinoids with the number of unpaired 5f electrons is roughly parallel to the corresponding results for the lanthanoid.

- i. Actinoid contraction is greater from element to element than lanthanoid contraction. Why? (1)
- ii. Actinoids show irregularities in their electronic configuration. Justify? (1)
- iii. The actinoid metals are all silvery in appearance but display a variety of structures than lanthanoid give reason. (2)

**OR**

The magnetic properties of the actinoids are more complex than those of the lanthanoids. Why? (2)

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

A raw mango placed in concentrated salt solution loses water via osmosis and shrivel into pickle. Wilted flowers revive when placed in fresh water. A carrot that has become limp because of water loss into the atmosphere can be placed into the water making it firm once again. Water will move into its cells through osmosis. When placed in water containing less than 0.9% (mass/volume) salt, blood cells swell due to flow of water in them by osmosis.

- i. People taking a lot of salt or salty food suffer from puffiness or edema. What is the reason behind this?
- ii. The preservation of meat by salting and of fruits by adding sugar protects against bacterial action. How?
- iii. Why the direction of osmosis gets reversed if a pressure larger than the osmotic pressure is applied to the solution side? Write its one application.

**OR**

What care is generally taken during intravenous injections and why?

#### Section E

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

- (a) Give the reaction of glucose with acetic anhydride. Presence of which group is confirmed by this reaction? [1]
- (b) Name the disaccharide which on hydrolysis gives two molecules of glucose. [1]
- (c) What are nucleic acids? Why two strands in DNA are not identical but are complementary? [1]
- (d)
  - 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?
- (e) Name the disaccharide which on hydrolysis gives glucose and galactose. [1]
- (f) Give the reaction of glucose with hydrogen cyanide. Presence of which group is confirmed by this reaction? [1]
- (g) Write the full forms of DNA and RNA. [1]

32. i. Define crystal field splitting energy. On the basis of crystal field theory, write the electronic configuration for  $d^4$  ion if  $\Delta_0 < P$ . [5]

ii.  $[\text{Ni}(\text{CN})_4]^{2-}$  is colourless whereas  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$  is green. Why? (At. no. of Ni = 28)

**OR**

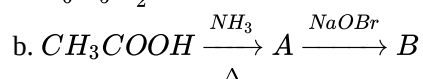
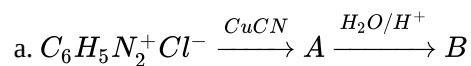
Using IUPAC norms write the formulas for the following:

- a. Tetrahydroxozincate(II)
- b. Potassium tetrachloridopalladate(II)

- c. Diamminedichloridoplatinum(II)
- d. Potassium tetracyanonickelate(II)
- e. Pentaamminenitrito-O-cobalt(III)
- f. Hexaamminecobalt(III) sulphate
- g. Potassium tri(oxalato)chromate(III)
- h. Hexaammineplatinum(IV)
- i. Tetrabromidocuprate(II)
- j. Pentaamminenitrito-N-cobalt(III)

33. i. Write the structures of A and B in the following reactions:

[5]



ii. Write the chemical reaction of methyl amine with benzoyl chloride and write the IUPAC name of the product obtained.

iii. Arrange the following in the increasing order of their  $pK_b$  values:  $C_6H_5NH_2$ ,  $NH_3$ ,  $C_2H_5NH_2$ ,  $(C_2H_5)_2NH$

OR

i. Write the structures of main products when benzene diazonium chloride reacts with the following reagents:



ii. Arrange the following in the increasing order of their basic character in an aqueous solution:  $C_2H_5NH_2$ ,  $(C_2H_5)_2NH$ ,  $(C_2H_5)_3N$ . Give justification.