I. Design of the Sample Question Paper

BLUE PRINT OF SAMPLE QUESTION PAPER (CHEMISTRY) for CLASS XII

TIME : 3 HOURS **MAX. MARKS : 70**

Unit/Questions Type	Weightage to Content Unit (Marks)	Unitwise Weightage to Different Forms of Questions							Distribution of Different Types of Questions over the Units						
		MCQ 1 mark	MCQ 2 mark	SA 1 mark	SA 2 mark	SA 3 mark	Assertion Reason	Long Answer	MCQ 1	MCQ 2	SA 1	SA 2	SA 3	AR	LA
1. Solid State	3	1×1=1			1×2=2				1		1				
2. Solutions	5					1×3=3	1×2=2						1	1	
3. Electrochemistry	5		1×2=2			1×3=3				1			1		
4. Chemical Kinetics	5							1×5=5							1
5. Surface Chemistry	3		1×2=2	1×1=1						1	1				
6. General Principles and Processes of Isolation of Elements	5	1×1=1		1×1=1		1×3=3			1		1		1		
7. The p-Block Elements	6	1×1=1			1×2=2	1×3=3			1			1	1		
8. The d- and f- Block Elements	5							1×5=5							1
9. Coordination Compounds	5				1×2=2	1×3=3						1	1		
10. Haloalkanes and Haloarenes	5				1×2=2	1×3=3						1	1		
11. Alcohols, Phenols and Ethers	5					1×3=3	1×2=2						1	1	
12. Aldehydes, Ketones and Carboxylic Acids	5							1×5=5							1
13. Amines	4	1×1=1				1×3=3			1				1		
14. Biomolecules	3					1×3=3							1		
15. Polymers	3			1×1=1	1×2=2						1	1			
16. Chemistry in Everyday Life	3			1×1=1	1×2=2						1	1			
TOTAL	**70**	**4**	**4**	**4**	**12**	**27**	**4**	**15**	**4**	**2**	**4**	**6**	**9**	**2**	**3**

Total Number of Questions of Each Type

II. Expected Length of Answer and Time Required for Each Form of Question shall be as Follows :

Sl. No.	Forms of Questions	Expected Length	Expected Time for Each Question	Total Number of Questions	Total Time Expected
1.	MCQ (I)	-	2 minutes	4	08 minutes
2.	MCQ (II)	-	3 minutes	2	06 minutes
3.	SA (I)	one line	3 minutes	4	12 minutes
4.	SA (II)	20-30 words	4 minutes	6	24 minutes
4.	SA (III)	30-50 words	7 minutes	9	63 minutes
6.	Assertion-Reason	-	3 minutes	2	06 minutes
7.	Long Answer Type	70-100 words	15 minutes	3	45 minutes
8.	Revision	-			16 minutes
		TOTAL	-	**30**	**180 minutes**

III. Weightage to Difficulty Level of Questions

Sl. No.	Estimated Difficulty Level of Questions	Percentage
1.	Easy	18
2.	Average	64
3.	Difficult	18

MODEL QUESTION PAPER-I

CHEMISTRY

Class XII

Time : 3 Hours   *Maximum Marks : 70*

General Instructions :

   (i)   *All the questions are compulsory.*
  (ii)   *Questions 1 to 4, carry one mark each and questions 5 to 6, carry 2 marks each.*
 (iii)   *Questions 7 to 10 are short answer questions carrying 1 mark each.*
 (iv)   *Questions 11 to 16 are short answer questions carrying 2 mark each.*
  (v)   *Questions 17 to 25 are also short answer questions carrying 3 marks each.*
 (vi)   *Questions 26 to 27 are assertion- reason questions carrying 2 marks each.*
 (vii)   *Questions 28 to 30 are long answer questions carrying 5 marks each.*
(viii)   *Use log tables for calculations if necessary.*

Note : Choose one correct option for questions 1 to 4.

1. Which of the following substance will have lowest melting point? **(1)**

   (i) H_2O (ice)

  (ii)   Quartz

 (iii)   Diamond

 (iv) CO_2 (dry ice)

2. Which of the following reactions is an example of autoreduction? **(1)**

   (i) $FeS + \dfrac{3}{2} O_2 \longrightarrow FeO + SO_2$

  (ii) $FeO + SiO_2 \longrightarrow FeSiO_3$

 (iii) $Cu_2O + \dfrac{1}{2} Cu_2S \longrightarrow 3Cu + \dfrac{1}{2} SO_2$

 (iv) $Cu_2S + \dfrac{3}{2} O_2 \longrightarrow Cu_2O + SO_2$

3. In the titration of Mohr salt solution with $KMnO_4$ solution, dilute H_2SO_4 is used to provide acidic medium. The titration gives unsatisfactory result when we use HCl in place of H_2SO_4. This is because. **(1)**

   (i) MnO_4^- oxidises HCl to Cl_2.

  (ii)   HCl oxidises MnO_4^- to Mn^{2+}

 (iii)   HCl forms chlorocomplex with Mn^{2+}

 (iv) Fe^{2+} is reduced to Fe^{3+} in the presence of HCl

4. The correct IUPAC name for $CH_2{=}CHCH_2\,NHCH_3$ is _____. **(1)**

   (i)   Allylmethylamine

(ii)   N-methylprop-2-en-1-amine

(iii)   4-amino-pent-1-ene

(iv)   2-amino-4-pentene

**Note : Choose two correct options for questions 5 and 6.**

5. Conductivity of an electrolylic solution depends on _____.   **(2)**

(i)   nature of electrolyte.

(ii)   concentration of electrolyte.

(iii)   area of cross section of the electrode.

(iv)   distance between the electrodes.

6. Which of the following are correct statements?   **(2)**

(i)   Mixing two oppositly charged sols in equal amount neutralises charges and stabalises colloid.

(ii)   Presence of equal and similar charges on colloidal particles provides stability to the colloidal solution.

(iii)   Any amount of dispersed liquid can be added to emulsion without destabilising it.

(iv)   Brownian movement stabilises sols.

7. Why does prolonged dialysis destabilise the colloids?   **(1)**

8. Although carbon and hydrogen are better reducing agents but they are not used to reduce metallic oxides at high temperatures. Why?   **(1)**

9. Which forces impart crystalline nature to a polymer like nylon?   **(1)**

10. Name an artificial sweetener which is derivative of sucrose.   **(1)**

11. Explain why does conductivity of germanium crystals increases on doping with gallium.   **(2)**

12. Explain why NCl_3 gets easily hydrolysed but NF_3 does not.   **(2)**

13. Explain why $[Fe(H_2O)_6]^{3+}$ has high magnetic moment value of 5.92 BM whereas magnetic moment of $[Fe(CN)_6]^{3-}$ has value of only 1.74 BM.   **(2)**

14. Why can arylhalide not be prepared by reaction of phenol with HCl in the presence of $ZnCl_2$?   **(2)**

15. Write the name of starting materials used for the synthesis of following polymer and idntify its monomer unit.   **(2)**
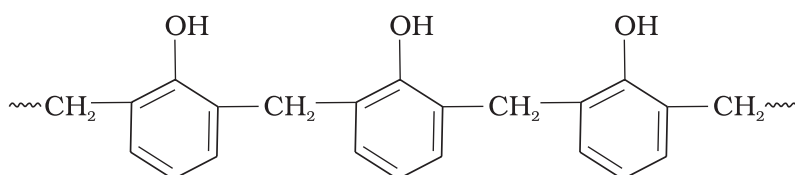
16. How do antidepressant drugs counteract feeling of depression? **(2)**

17. Components of a binary mixture of two liquids A and B were being separated by distillation. After some time separation of components stopped and composition of vapour phase became same as that of liquid phase. Both the components started coming in the distillate. Explain why this happened. **(3)**

18. Identify the cathode and anode in the cell written below. **(3)**
$Cu \mid Cu^{2+} \parallel Cl^{-} \mid Cl_2$, Pt
Write the reduction half reaction and oxidation half reaction of the cell.

19. With the help of an example explain how one can separate two sulphide ores by Froth Floatation method. **(3)**

20. White phosphorus reacts with chlorine and the product gets hydrolysed in the presence of water to produce HCl. Calculate the mass of HCl obtained by the hydrolysis of the product formed by the reactions of 62 g of white phosphorus with chlorine in the presence of water. **(3)**

21. A coordination compound $CrCl_3 \cdot 4H_2O$ precipitates AgCl when treated with $AgNO_3$. The molar conductance of the solution of coordination compound corresponds to a total of two ions. Write structural formula of the compound and name it. **(3)**

22. Which of the following compounds would undergo S_N1 reaction faster and why? **(3)**
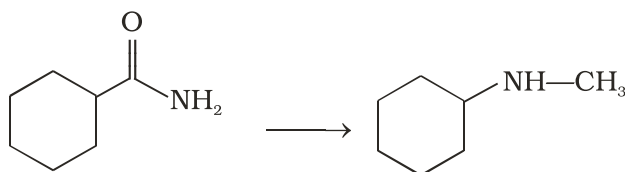
CH₂Cl

CH₂Cl
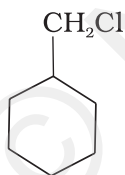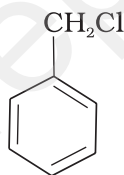
(A)   (B)

23. Ethers can be prepared by Williamson synthesis in which an alkyl halide is reacted with sodium alkoxide. Explain why di-*tert*-butyl ether can't be prepared by this method. **(3)**

24. Suggest a route by which the following conversion can be accomplished. **(3)**

O

NH₂   NH—CH₃

25. Three structures are given below in which two glucose units are linked. Which of these linkages between glucose units are between C1 and C4 and which linkages are between C1 and C6. Is the compound (I) reducing in nature? Explain. **(3)**

(I)

(II)   (III)
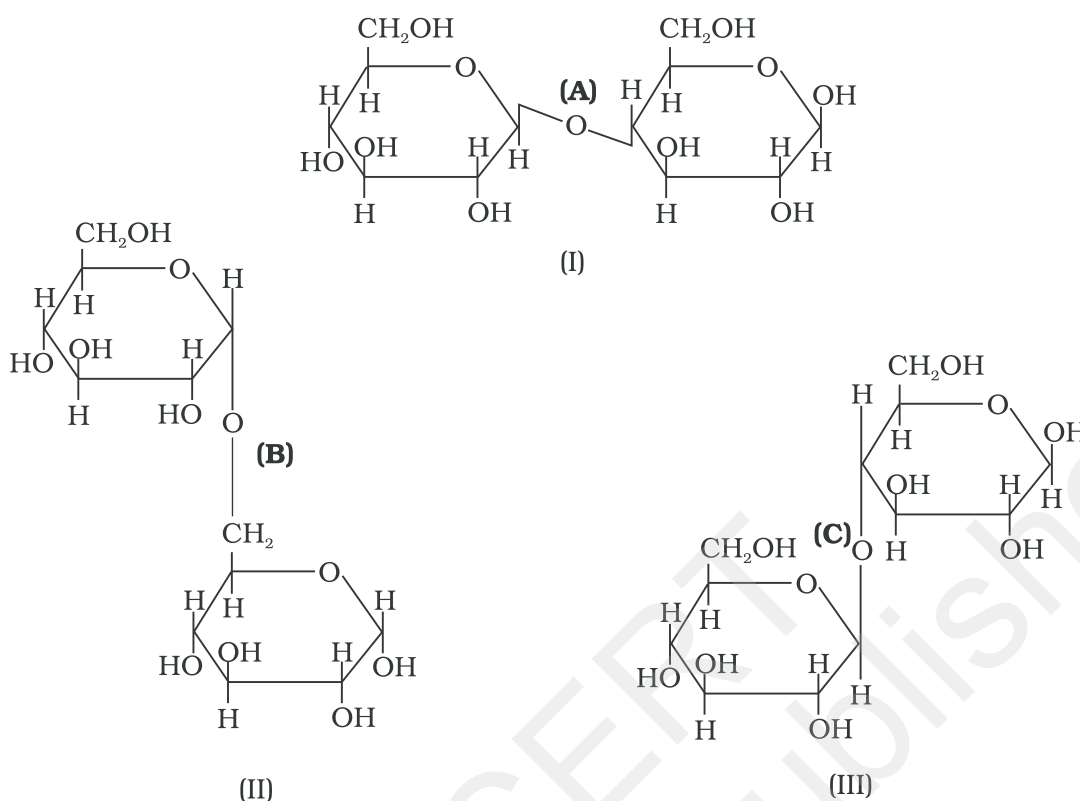
Note : In question 26 and 27. A statement of assertion followed by a statement of reason is given. Choose the correct option out of the options given below each equation.

26. **Assertion** : Molarity of a solution in liquid state changes with temperature.

    Reason : The volume of a solution changes with change in temperature. **(2)**

    (i) Assertion and reason both are correct statements and reason is correct explanation for assertion.

    (ii) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

    (iii) Assertion is correct statement but reason is wrong statement.

    (iv) Assertion and reason both are incorrect statements.

    (v) Assertion is wrong statement but reason is correct statement.

27. **Assertion** : *p*-nitrophenol is more acidic than phenol.

    Reason : Nitro group helps in the stabilisation of the phenoxide ion by dispersal of negative charge due to resonance. **(2)**

    (i) Assertion and reason both are correct statements and reason is correct explanation for assertion.

    (ii) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

   (iii) Assertion is correct statement but reason is wrong statement.

(iv)   Assertion and reason both are incorrect statements.

(v)   Assertion is wrong statement but reason is correct statement.

28.   How are most probable kinetic energy and the energy of activation affected with increase in temperature.   **(5)**

<div align="center">or</div>

Explain the difference between instantaneous rate of a reaction and average rate of a reaction.

29.   Identify compounds A to E and also explain the reactions involved.   **(5)**
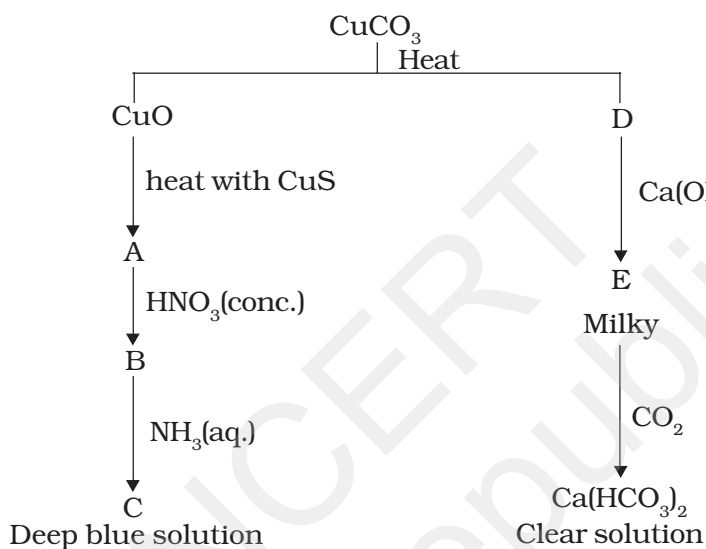
<div align="center">or</div>

A violet compound of manganese (A) decomposes on heating to liberate oxygen and compounds (B) and (C) of manganese are formed. Compound (C) reacts with KOH in the presence of KNO_3 to give compound (B). On heating compound (C) with a mixture of conc. H_2SO_4 and NaCl, chlorine gas is liberated and a compound (D) of manganese along with other products is formed. Identify compounds (A) to (D) and also explain the reaction invovled.

30.   An alkene 'A' (Molecular formula C_5H_{10}) on ozonolysis gives a mixture of two compounds 'B' and 'C'. Compound 'B' gives positive Fehling's test and also forms iodoform on treatment with iodine and NaOH solution. Compound 'C', does not give Fehling's test but forms iodoform. Identify the compounds 'A', 'B' and 'C' giving suitable explanation and write the reactions of ozonolysis and iodoform formation from either 'B' or 'C'.   **(5)**

<div align="center">or</div>

Explain the reactivity of α-hydrogen atoms in ethanal. Write the reaction when (a) a mixture of ethanal and benzaldehyde is treated with NaOH (aq) and (b) when only benzaldehyde is treated with conc. KOH solution. Write the names of reaction in both the cases.

Guidelines for Evaluation (Marking Scheme)

1. (iv) (1)

2. (iii) (1)

3. (i) (1)

4. (ii) (1)

5. (i), (ii) (2)

6. (ii), (iv) (2)

7. Traces of electrolytes stabilise the colloids. On prolonged dialysis electrolyte is completely removed thus making the colloide unstable. (1)

8. At high temperature carbon and hydrogen react with metals to form carbides and hydrides respectively. (1)

9. Strong intermolecular forces like hydrogen-bonding, lead to close packing of chains that imparts crystalline character to polymers like nylon. (1)

10. Sucrolose (1)

11. On doping germanium with galium some of the positions of lattice of germenium are occupied by galium. Galium atom has only three valence electrons. Therefore, fourth valency of nearby germanium atom is not satisfied. These places remain vacant. This place is deficient of electrons and is therefore called electron hole or electron vacancy. Electron from neighbouring atom can come and fills the gap, thereby creating a hole in its original position. Under the influence of electric field electrons move towards positively charged plates using these holes and conduct electricity. The holes appear to move towards negatively charged plates. (2)

12. NCl_3 is unstable in comparison to NF_3 because N—Cl bond is weak in comparison to N—O bond while N—F bond is strong in comparison to N—O bond. (2)

13. Iron in $[Fe(CN)_6]^{3-}$ involves d^2sp^3 hybridisation with one unpaired electron and iron in $[Fe(H_2O)_6]^{3+}$ involves sp^3d^2 hybridisation with five unpaired electrons. This difference is due to the presence of strong ligand CN^- in $[Fe(CN)_6^{3-}]$ and weak ligand H_2O in $[Fe(H_2O)_6]^{3+}$ (2)

    Distribution of marks

    • Writing hybridisation (1 mark)
    • Explanation (1 mark)

14. C—O bond in phenols is more stable due to resonance effect and it has double bond character hence breaking of this bond is difficult.

    Distribution of marks

    • Writing structure of phenol and aryl halide (½ mark)
    • Writing resonance structure (½ mark)
    • Explanation (1 mark)

15. **Distribution of marks**

   - Monomer Unit   (1 mark)
   - Starting materials phenol   ($\frac{1}{2} \times 2 = 1$)
     and formaldehyde

16. Antidepressent drugs inhibit the enzyme which catalyses the degradation of noradrenaline. Thus noradrenaline which acts as a nurotransmitter is slowly metabolised and continues to activate its receptor for a longer period of time. This activation of receptor for a long time counteracts the effect of depression.

17. Since both the components are appearing in the distillate and composition of liquid and vapour is same, this shows that liquids have formed azeotropic mixture. Hence, this cannot be separated at this stage by distillation.

   Distribution of marks

   - Recognising that azeotropic mixture has formed   (1 mark)
   - Explanation   (2 mark)

18. Anode : $Cu \longrightarrow Cu^{2+} + 2e^-$

   Cathode : $Cl_2 + 2e^- \longrightarrow 2Cl^-$
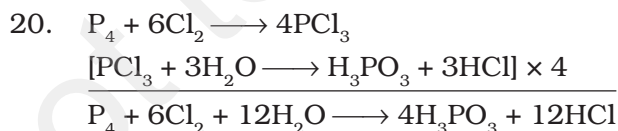
   Copper is anode as it is getting oxidised

   Cl_2 is the cathode as it is getting reduced.

   Distribution of marks

   - Anode reaction   (1 mark)
   - Cathode reaction   (1 mark)
   - Recognising electrodes on which
     oxidation and reduction occur   ($\frac{1}{2} + \frac{1}{2} = 1$ mark)

19. Two sulphide ores can be separated by adjusting proportion of oil to water or by using depressants. For example, in case of an ore containing ZnS and PbS, the depressant NaCN is used. It forms complex with ZnS and prevents its coming with froth, but PbS remains with froth and can be separated.

20. $P_4 + 6Cl_2 \longrightarrow 4PCl_3$

   $$\frac{[PCl_3 + 3H_2O \longrightarrow H_3PO_3 + 3HCl] \times 4}{P_4 + 6Cl_2 + 12H_2O \longrightarrow 4H_3PO_3 + 12HCl}$$

   1 mol of white phosphorus produces 12 mol HCl

   62g of white phosphorus has been taken which is equivalent to $\frac{62}{124} = \frac{1}{2}$ mol.

   Therefore 6 mol HCl will be formed.

   6 mol HCl = 6 × 36.5 = 219.0 g HCl

Distribution of marks

- For writing overall reaction (1 mark)
- Calculation of number of moles of HCl formed (1 mark)
- Calculation of mass of HCl formed (1 mark)

21. **Distribution of marks**

- Identification : $[Co(H_2O)_4Cl_2)Cl$ (1 mark)
- Name : Tetraaquadichlorocobalt(III)chloride (1 mark)
- Explanation (1 mark)

22. (B) Undergoes S_N1 reaction faster than (A) because in case of (B) the carbocation formed after the loss of Cl^- ion is stabilised by resonance, whereas, no such stabilisation is possible in the carbocation obtained from (A).

Distribution of marks

- Resonance structures (1½ mark)
- Reason (1½ mark)

23. In tert-butyl halides, elimination is favoured over substitution therefore alkene is the only reaction product and no ether is formed.
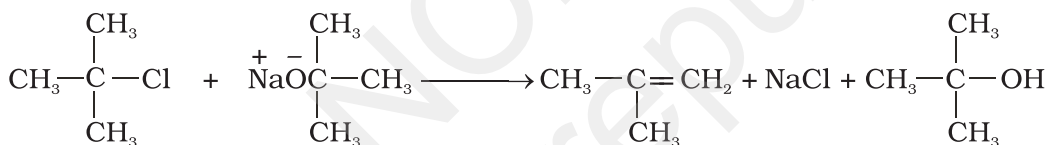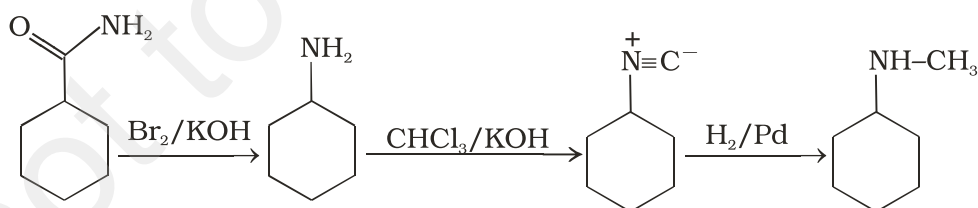

(*tert*-Butylchloride) (2-Methylprop-1-ene)

Distribution of marks

- Reaction (1½ mark)
- Explanation (1½ mark)

24.

Distribution of marks

- One mark for each step (1 × 3 = 3 marks)

25. (A) and (C) are between C1 and C4. (B) is between C1 and C6.

Distribution of marks

- ½ mark for each correct identification (½×3=1½ marks)

- Yes, compound is reducing in nature   (½ mark)
- Explanation   (1 marks)

26.   (i)   (2)
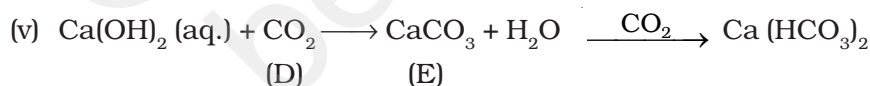
27.   (i)   (2)

28. **Distribution of marks**
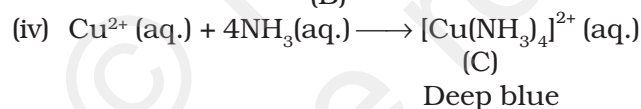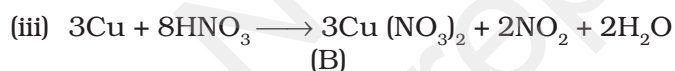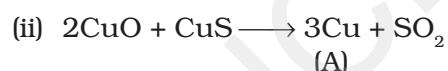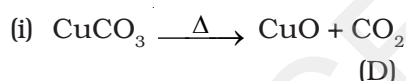
- Graph for distribution of energy   (2 marks)
- Explanation   (3 marks)

<div align="center">or</div>

Distribution of marks

- Graph for instantaneous rate   (1 mark)
- Graph for average rate   (1 mark)
- Explanation   (3 marks)

29.   A = Cu   B = Cu $(NO_3)_2$ C = $[Cu(NH_3)_4]^{2+}$ D = CO_2 E = $CaCO_3$

    (i) $CuCO_3 \xrightarrow{\Delta} CuO + CO_2$
                                          (D)

   (ii) $2CuO + CuS \longrightarrow 3Cu + SO_2$
                                  (A)

  (iii) $3Cu + 8HNO_3 \longrightarrow 3Cu (NO_3)_2 + 2NO_2 + 2H_2O$
                                 (B)

  (iv) Cu^{2+} (aq.) + $4NH_3$(aq.) $\longrightarrow [Cu(NH_3)_4]^{2+}$ (aq.)
                                      (C)
                                  Deep blue

   (v) $Ca(OH)_2$ (aq.) + $CO_2 \longrightarrow CaCO_3 + H_2O \xrightarrow{CO_2} Ca (HCO_3)_2$
                       (D)   (E)
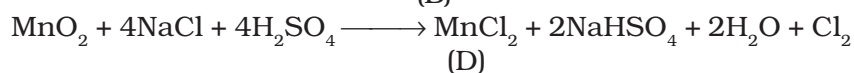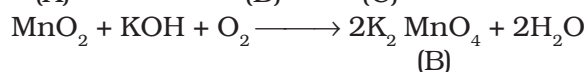
Distribution of marks

- Identification   (5×½ = 2½ marks)
- Reactions   (5×½ = 2½ marks)

<div align="center">or</div>

A = $KMnO_4$ B = K_2MnO_4 C = MnO_2 D = $MnCl_2$

$KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$
(A)   (B)   (C)

$MnO_2 + KOH + O_2 \longrightarrow 2K_2 MnO_4 + 2H_2O$
                               (B)

$MnO_2 + 4NaCl + 4H_2SO_4 \longrightarrow MnCl_2 + 2NaHSO_4 + 2H_2O + Cl_2$
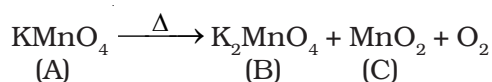   (D)

Distribution of marks
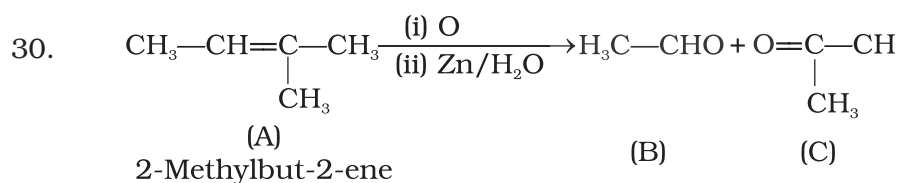
- Identification   (½×4 = 2 marks)
- Reactions   (½×3 = 1½ marks)
- Explanation   (1½ marks)

30.

$$CH_3-CH=\underset{\underset{CH_3}{|}}{C}-CH_3 \xrightarrow[\text{(ii) Zn/H}_2\text{O}]{\text{(i) O}} H_3C-CHO + O=\underset{\underset{CH_3}{|}}{C}-CH$$

(A)   (B)   (C)
2-Methylbut-2-ene
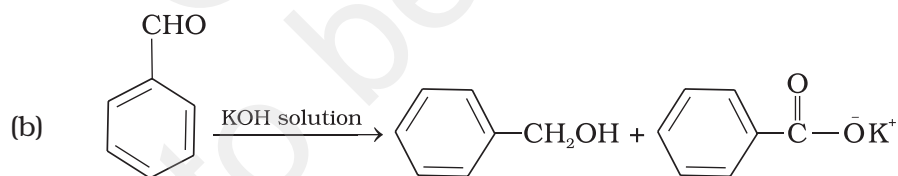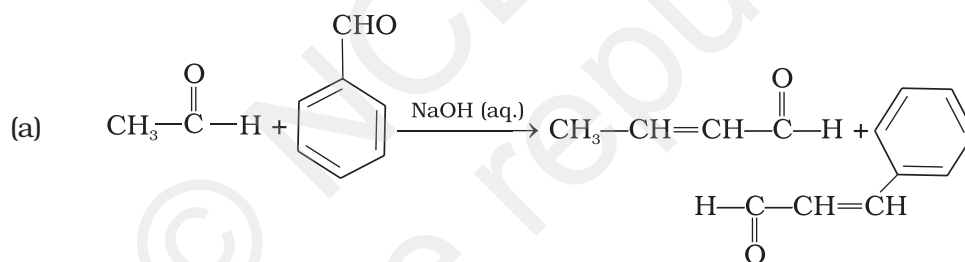
Distribution of marks

- Identification   (½ + ½ + ½ = 1½ marks)
- Reason   (½ + ½ + ½ = 1½ marks)
- Reactions   (2 × 1 = 2 marks)

Other isomers of 'A' will not give products corresponding to the given test.

or

(a) $CH_3-\underset{\underset{O}{\|}}{C}-H$ + [benzene ring with CHO] $\xrightarrow{\text{NaOH (aq.)}}$ $CH_3-CH=CH-\underset{\underset{O}{\|}}{C}-H$ + [benzene ring with $H-\underset{\underset{O}{\|}}{C}-CH=CH$]

(b)   [benzene ring with CHO] $\xrightarrow{\text{KOH solution}}$ [benzene ring]$-CH_2OH$ + [benzene ring with $\underset{\underset{O}{\|}}{C}-\bar{O}K^+$]

Names :   (a) Aldol condensation

(b) Cannizaro's reaction

Distribution of marks

- Electron withdrawing effect of >C=O group   (1 mark)
- For showing resonance   (1 mark)
- Writing 2 products in each reaction   (½ × 4 = 2 mark)
- Names of two reactions   (½ × 2 = 1 mark)