

(ENGLISH VERSION)

The questions related to MCQ and SAQ should be answered in the specific printed TABLE accordingly in the Answer Script.

(Multiple Choice Type Questions)

1. Select the correct answer for each question from the given alternatives and write it in the Answer Script : $1 \times 14 = 14$

(i) Which of the following ionic solid compounds shows both Schottky as well as Frenkel defects ?

- (a) AgBr (b) NaCl
(c) CsCl (d) ZnS

(ii) Which is the SI unit of molar conductance ?

- (a) $S \text{ cm mol}^{-1}$ (b) Ohm cm mol^{-1}
(c) $S \text{ m}^2 \text{ mol}^{-1}$ (d) $S \text{ m}^{-1}$

(iii) Which of the following is a colloid system of liquid dispersion medium and gaseous dispersed phase ?

- (a) Foam (b) Gel
(c) Emulsion (d) Sol

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(iv) Which of the following has ability to release bromine from KBr ?

- (a) I_2 (b) SO_2
(c) Br_2 (d) F_2

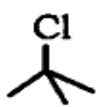
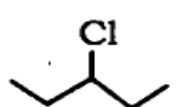
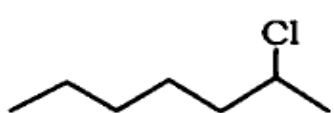
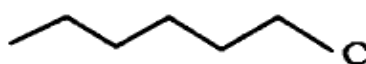
(v) Which of the following transition elements does not exhibit variable oxidation state ?

- (a) Sc (b) Fe
(c) Mn (d) Co

(vi) The hybridisation state of the central metal atom of a square planar complex compound is

- (a) sp^3 (b) dsp^2
(c) d^2sp (d) sp^3d

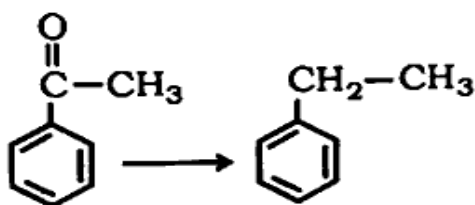
(vii) Which of the following halogen compounds undergoes faster S_N1 reaction ?

- (a)  (b) 
(c)  (d) 

(viii) On reaction with aqueous bromine at room temperature phenol forms which of the following ?

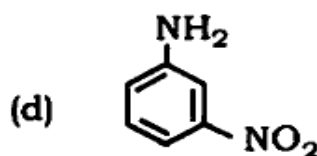
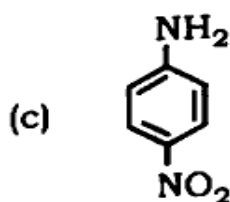
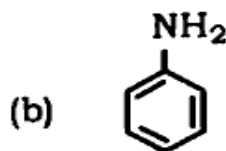
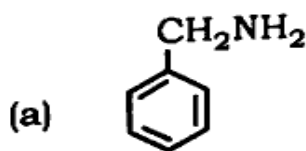
- (a) meta-bromophenol
- (b) 2, 6-dibromophenol
- (c) 2, 4, 6-tribromophenol
- (d) 3, 5-dibromophenol

(ix) Which reagent is used for the following conversion ?



- (a) LiAlH_4
- (b) Zn(Hg), Conc. HCl
- (c) NaBH_4
- (d) H_2, Ni

(x) Which of the following compounds is the most basic ?



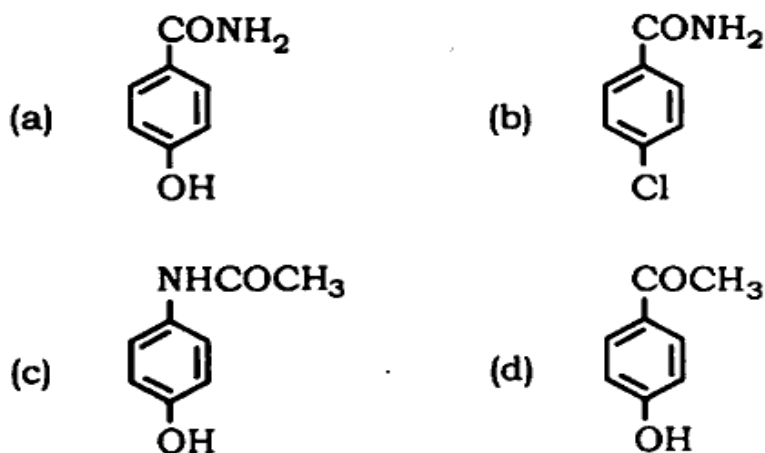
(xi) In which of the following orders are base, phosphate and sugar arranged in nucleic acid chain ?

- (a) Base-phosphate-sugar
- (b) Base-sugar-phosphate
- (c) Phosphate-base-sugar
- (d) Sugar-base-phosphate

(xii) Which of the following is a polyamide polymer ?

- (a) Bakelite
- (b) Terylene
- (c) Teflon
- (d) Nylon-6, 6

(xiii) Which of the following is paracetamol ?



(xiv) Identify the food preservative :

- (a) Sodium chloride
- (b) Sodium metabisulphate
- (c) Sodium benzoate
- (d) All of these

(Short Answer Type Questions)

2. Answer the following questions in brief (Alternatives are to be noted) : 1 x 4 = 4

(i) What is specific conductance or conductivity ?

OR

State whether lead-storage cell is primary battery or secondary battery.

(ii) What is critical micelle concentration (CMC) ?

(iii) Name the lanthanoid element which is well known to exhibit +4 oxidation state.

OR

Out of Mn^{3+} and Cr^{3+} which is more paramagnetic and why ?

(iv) Name the sweetening agent used in the preparation of sweets for a diabetic patient.

(Subjective / Descriptive Type Questions)

3. Answer the following questions briefly (Alternatives are to be noted) : 2 x 5 = 10

(a) (i) Vapour pressure of a pure solvent decreases when non-volatile solid solute is added to it. Explain why.

- (ii) State the Raoult's law of relative lowering of vapour pressure of a solution. 1 + 1

OR

- What is osmotic pressure ? 2
- (b) Write two differences between physical adsorption and chemical adsorption. 2

OR

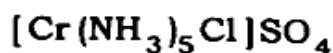
What is emulsion ? Give an example of water in oil type emulsion. <https://www.westbengalboard.com> 1 + 1

- (c) (i) Why does PCl_3 produce white fumes in moist air ?
- (ii) Why is ICl more reactive than I_2 ? 1 + 1

OR

Deduce the molecular shape of BrF_3 on the basis of VSEPR theory. 2

- (d) (i) Calculate the oxidation number of central metal atom of the following complex compound :



- (ii) When aqueous solution of one mole of $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ complex compound is treated with excess of AgNO_3 , 3 moles of AgCl are precipitated. Determine the formula of the complex compound. 1 + 1

(c) (i) How does vulcanisation change the nature of natural rubber ?

(ii) Write the names of the monomers each of Terylene and Dacron. 1 + 1

4. Answer the following questions (in short) (Alternatives are to be noted) : 3 x 9 = 27 .

(a) (i) What is P-type semiconductor ?

(ii) A unit cell consists of a cube in which 'X' atoms are at the corners and 'Y' atoms are at the face centres. If two 'X' atoms are missing from two corners of the unit cell, then determine the formula of the compound.

1 + 2

OR

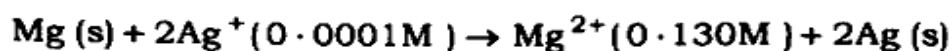
(i) Which type of non-stoichiometric defect is responsible for the pink colour of lithium chloride in presence of excess lithium atom ?

(ii) A metal having atomic mass 50 g mol^{-1} has a body centred cubic crystal (bcc) structure. The density of metal is 5.96 g cm^{-3} . Find the volume of the unit cell.

(Avogadro's No. = $6.022 \times 10^{23} \text{ mol}^{-1}$) 1 + 2

- (b) (i) What is van't Hoff factor ?
- (ii) 36 g of glucose dissolved per litre of the solution has an osmotic pressure 4.98 bar at 300 K. If the osmotic pressure of the solution is 1.52 bar at the same temperature, what would be its molar concentration ?
(Given, molar mass of glucose = 180 g mol^{-1}) 1 + 2

- (c) (i) Why does specific conductance or conductivity of a solution decreases on dilution ?
- (ii) Represent the galvanic cell in which the following reaction takes place :



Also calculate its *emf*.

(Given that, $E^\circ_{\text{cell}} = 3.17\text{V}$) 1 + 2

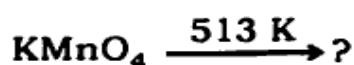
OR

- (i) How much charge is required for the reduction of one mol MnO_4^- to Mn^{2+} ?
- (ii) How much copper is deposited on the cathode if a current of 3 amperes is passed through aqueous copper sulphate solution for 15 minutes ? (Atomic mass of copper = 63.5 g mol^{-1}) 1 + 2

- (d) (i) Why is blast furnace used in case of extraction of iron but not in case of extraction of zinc ?
- (ii) What are the functions of sodium cyanide in case of extraction of silver from silver ore and cryolite in case of extraction of aluminium from alumina ? 1 + 2

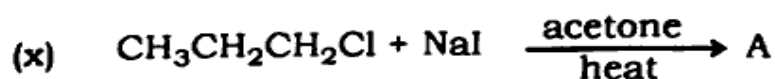
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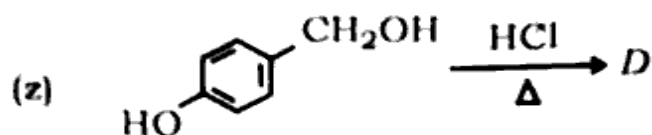
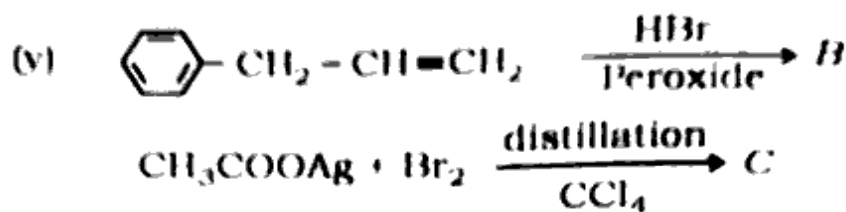
- (i) Write balanced chemical equations for the reactions involved in the extraction of copper from copper matte.
- (ii) What is thermit mixture ? 2 + 1
- (e) (i) Complete the following reaction :



- (ii) Write the name and chemical formula for orange-red vapour which is formed when NaCl is heated with potassium dichromate and concentrated H_2SO_4 .
- (iii) Why is actinoid contraction greater than lanthanoid contraction ? 1 + 1 + 1

- (f) (i) Identify the major organic products in each of the following reactions :





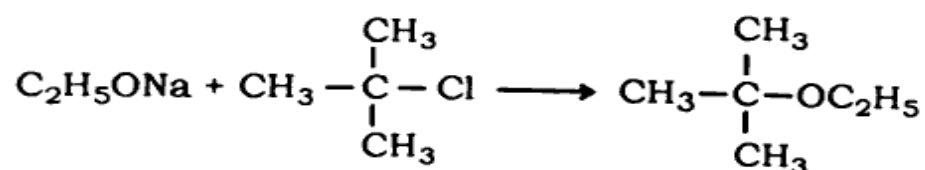
- (i) For the preparation of alkyl chloride from alcohol, thionyl chloride is preferred. Give reason. 2 + 1
- (g) (i) How would you convert — (Give only arrow head reaction)

Cumene \rightarrow Phenol ?

- (ii) How would you distinguish among 1°, 2° and 3° alcohols by using Lucas reagent ? 1 + 2

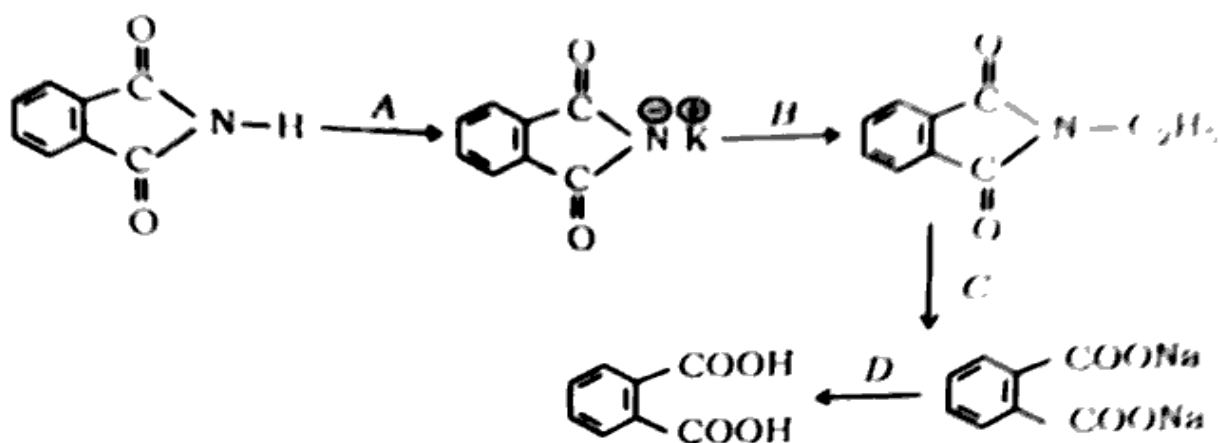
OR

- (i) Give an example of Reimer-Tiemann reaction.
- (ii) The following reaction is not an appropriate reaction for the preparation of *t*-butyl ethyl ether :



- (x) What would be the major product of this reaction ?
- (y) Write a suitable reaction for preparation of *t*-butyl ethyl ether. 1 + 2

(h) (i) Identify reagents in the following reactions



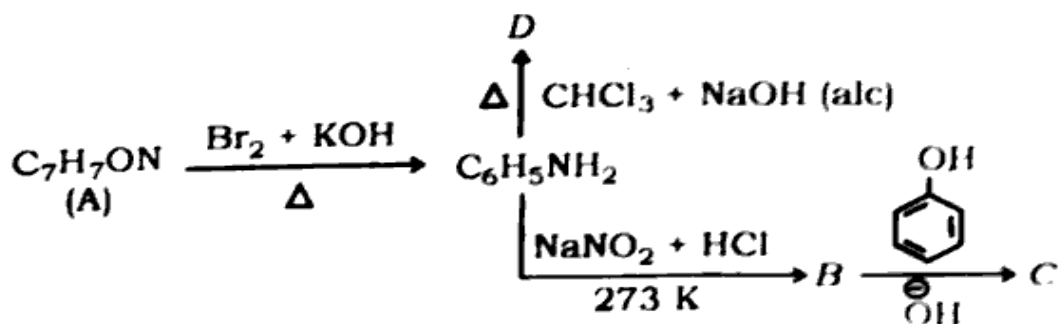
(ii) Give one chemical test to distinguish between methyl amine and dimethyl amine. 2 + 1

OR

(i) Write chemical equation for the following reaction :

Nitrobenzene dissolved in 50% ethanol solution is heated with zinc dust and ammonium chloride.

(ii) An aromatic compound 'A' of molecular formula C_7H_7ON undergoes a series of reactions as shown below. Write the structures of A, B, C and D in the following reactions :



1 + 2

- (i) (i) What is the monomer of proteins ?
(ii) What is peptide linkage ? Draw the structure of Gly-Ala dipeptide linkage. 1 + 2

5. Answer the following questions (Alternatives are to be noted)

5 × 3 = 15

- (a) (i) Establish the integrated form of rate equation of first order reaction.
(ii) Show that in a first order reaction, time required for completion of 99.9% is ten times of half-life period ($t_{1/2}$) of the reaction. 3 + 2

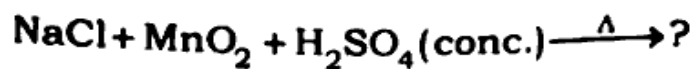
OR

- (i) What is pseudo-first order reaction ? Give an example.
(ii) Define activation energy of a reaction.
(iii) The decomposition of ammonia on platinum surface $(2\text{NH}_3(\text{g}) \xrightarrow{\text{Pt}} \text{N}_2(\text{g}) + 3\text{H}_2(\text{g}))$ is a zero order reaction with rate constant $(K) = 2.5 \times 10^{-4} \text{ MS}^{-1}$.
What are the rates of production of N_2 and H_2 ?

2 + 1 + 2

(b) (i) Compare the bleaching property of Cl_2 and SO_2

(ii) Complete the following reaction :

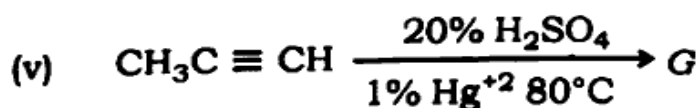
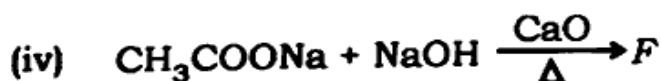
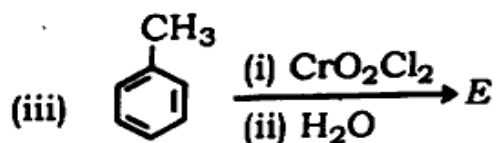
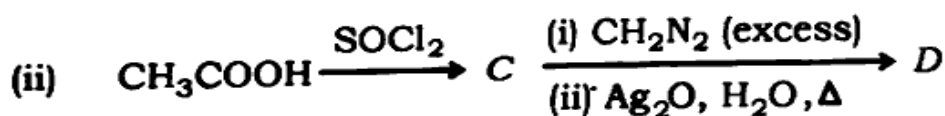
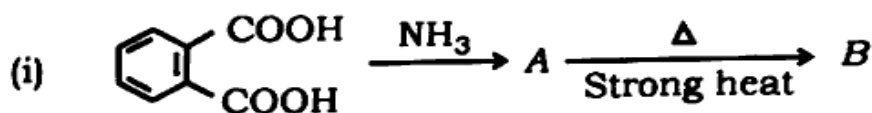


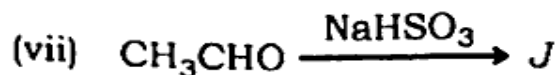
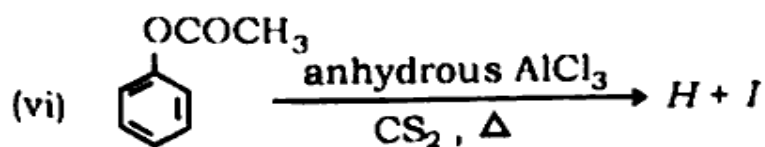
(iii) Give reason for the following :

(x) Electron gain enthalpy or electron affinity of Cl_2 is more than F_2 .

(y) Noble gases have very low boiling point. 2 + 1 + 2

(c) Identify the following compounds 'A' to 'J' (write only structural formula) : $\frac{1}{2} \times 10 = 5$





OR

- (i) An organic compound produces acetic acid and ethyl alcohol on acid hydrolysis. Write the structural formula of the compound. How can you prepare the compound from acetaldehyde in one step ?
- (ii) Give an example of Cannizzaro reaction.
- (iii) How would you convert — (Give only arrow head reaction)
- (x) Acetone \rightarrow Mesitylene ?
- (y) Benzaldehyde \rightarrow Cinnamaldehyde ? 2 + 1 + 2