



CHEMISTRY HSSC-II

SECTION – A (Marks 17)

26

Time allowed: 25 Minutes

Version Number 4 0 9 1

Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

- 1) Electronic configuration of a transition element X in +2 oxidation state is $[\text{Ar}]3d^5$. What is its atomic number?
A. 25 B. 26 C. 27 D. 24
- 2) Which of the following metal hydroxide is **LEAST** soluble in water?
A. $\text{Ba}(\text{OH})_2$ B. $\text{Ca}(\text{OH})_2$ C. $\text{Sr}(\text{OH})_2$ D. $\text{Mg}(\text{OH})_2$
- 3) The abnormal enlargement of thyroid gland is due to deficiency of _____ in diet.
A. Fluorene B. Chlorine C. Iodine D. Bromine
- 4) Nucleic acids are the repeating units of:
A. Nucleosides B. Nucleotides C. Bases D. Sugars
- 5) Polyethylene is an example of:
A. Condensation polymers B. Addition polymers
C. Biopolymers D. Thermosetting polymers
- 6) Which of the following alloys is used in the preparation of Raney nickel?
A. Ni-Al B. Ni-Cu C. Ni-Ag D. Ni-Cd
- 7) A mixture consists of 40%(+) tartaric acid and 60%(–) tartaric acid. This mixture rotates plane polarized light:
A. Clock wise B. Anti-clock wise
C. Does not rotate D. Unpredictably
- 8) Which of the following is **CORRECT**?
A. SN_1 and E_1 are one step reactions B. SN_2 and E_2 are one step reactions
C. E_1 and E_2 are one step reactions D. SN_1 and SN_2 are one step reactions
- 9) Hydrogen bonding is maximum in:
A. Methoxyethane B. Ethanol C. Triethylamine D. Ethanal
- 10) Acetic acid reacts with Na metal to form:
A. Salt + $\text{CO}_2(\text{g})$ B. Salt + $\text{H}_2(\text{g})$ C. Only Salt D. Salt + H_2O
- 11) Which region of electromagnetic radiations is used in IR spectroscopy?
A. $0.8\mu\text{m} - 2.5\mu\text{m}$ B. $2.5\mu\text{m} - 16\mu\text{m}$
C. $0.8\text{nm} - 2.5\text{nm}$ D. $2.5\text{nm} - 16\text{nm}$
- 12) The hard and rigid rocky earth crust is called:
A. Atmosphere B. Biosphere C. Lithosphere D. Hydrosphere
- 13) Which of the following elements form alloys?
A. Alkali metals B. Alkaline earth metals
C. Halogens D. Transition elements
- 14) Which of the following pair has both members from the same period of periodic table?
A. Na – Ca B. Na – Cl C. Ca – Cl D. Cl – Br
- 15) The carbon atom in formaldehyde is:
A. sp hybridized B. sp^2 hybridized C. sp^3 hybridized D. dsp^2 hybridized
- 16) $\text{R}-\text{CN}$ gives _____ when it is reacted with LiAlH_4 .
A. 1° Amine B. 2° Amine C. 3° Amine D. No reaction
- 17) Pyridine is:
A. Heterocyclic aromatic compound B. Heterocyclic aliphatic compound
C. Carbocyclic aromatic compound D. Carbocyclic aliphatic compound



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27

Time allowed: 2:35 Hours

Total Marks Sections B, C and D: 68

NOTE: Sections B, C and D comprise pages 1 – 2. Answer any seven parts each from Section 'B', 'C' and any two questions from Section 'D' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21) Chapters 13, 14, 21 – 24

Q. 2 Answer any SEVEN parts. All parts carry equal marks.

(7 x 3 = 21)

- (i) Na_2O is more basic than MgO . Give two reasons.
- (ii) Calculate the magnetic moment of a divalent ion in aqueous solution, if its electronic configuration is $[\text{Ar}]3d^5$.
- (iii) Define the terms *diamagnetic* and *paramagnetic*. What feature of electronic structure is directly related to these properties? (1)
- (iv) (a) Define commodity chemicals. (1)
(b) Sulfuric acid (H_2SO_4) is the most important commodity chemical. Give reason. (2)
- (v) Describe the role of CO_2 and H_2O in keeping the earth's atmosphere warm. What is this phenomenon called? (1)
- (vi) (a) What is TMS? (1)
(b) Describe the role of TMS in NMR (2)
- (vii) What are polysaccharides? Draw the structure of cellulose.
- (viii) Justify the following: (1.5)
 - (a) Electron affinity of fluorine is less than that of other halogens. (1.5)
 - (b) Fluorine has the least bond enthalpy among halogens. (1.5)
- (ix) Why are the tetrahalides of C not hydrolysed while those of Si, Ge and Sn get readily hydrolysed? (1)
- (x) (a) What is coordination number in a complex compound? (1)
(b) Write the structure and name of a hexadentate ligand. (2)

SECTION – C (Marks 21) Chapters 15 – 20

Q. 3 Answer any SEVEN parts. All parts carry equal marks.

(7 x 3 = 21)

- (i) How would you detect Carbon and Hydrogen in an organic compound? Elaborate your answer with suitable chemical equations. (1)
- (ii) (a) What is resonance energy? (1)
(b) Draw the resonating structures and resonance hybrid of benzene. (2)
- (iii) Classify the following compounds if these are primary, secondary and/or tertiary halides.
 - (a) 2-Bromo-3-methylpentane
 - (b) 1-Bromo-2-methylpentane
 - (c) 2-Bromo-4-methylpropane
- (iv) Compound 'A' with molecular formula $\text{C}_4\text{H}_9\text{Br}$ is treated with aq. KOH solution. The rate of this reaction depends upon the concentration of the compound 'A' only. Write down the structural formula and IUPAC name of compound 'A'.
- (v) How can butan-2-one be converted into 2-methylbutan-2-ol by using Grignard's reagent? Give reactions with conditions.
- (vi) Draw the structures of the following:
 - (a) Resorcinol
 - (b) Hydroquinone
 - (c) Catechol
- (vii) Which of the following Aldehydes can give Aldol condensation reaction? Justify your choice with scientific reason. Also draw the structure of product obtained through Aldol condensation reaction.
 - (a) Benzaldehyde
 - (b) Formaldehyde
 - (c) Acetaldehyde
- (viii) Give suitable mechanism of alkaline hydrolysis of an Ester.
- (ix) Why does Benzene prefer electrophilic substitution reaction and not electrophilic addition reactions?
- (x) Hydrobromination of 2-methyl-1-butene gives major and minor products. Draw the structures and name the rule which governs the formation of major product.

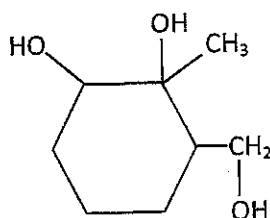
SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks.

(2 x 13 = 26)

(Chapters 15 – 20)

- Q. 5** a. How would acetone reacts with the following. Give reactions with mechanism. (3+3)
- 2,4-dinitrophenyl hydrazine in acidic medium
 - Hydrogen cyanide (HCN) in Basic Medium
- b. Explain the following terms using ethyl alcohol as an example: (2+2)
- Dehydration
 - Ether formation
- c. Give the structure of the product of the following when reacted with $K_2Cr_2O_7 + H_2SO_4$ (3)



(Chapters 13, 14, 21 – 24)

- Q. 4** a. Write the behaviour of Hexaaquacopper(ii) ions with: (6)
- Hydroxide ions
 - Ammonia solution
 - Carbonate ions
- b. Define the term spectroscopy. Also describe the principles of Atomic emission and atomic absorption spectroscopy. (7)

(Chapters 15 – 20)

- Q. 6** a. Describe the rule to determine if a group present in mono substituted benzene is Ortho-Para director or Meta director. Elaborate your answer with examples. (6)

(Chapters 13,14, 21-24)

- b. Beryllium differs from other members of its group. Give any seven points of differences. (7)

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Q. 1 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

- 1) Metal carbonates decompose on heating to give metal oxides and carbon dioxide. Which of the following metal carbonates is thermally **MOST** stable?
A. MgCO_3 B. CaCO_3 C. SrCO_3 D. BaCO_3
- 2) For a mixture containing 50% (+) tartaric acid and 50% (–) tartaric acid, which of the following statement is **CORRECT**?
A. It is a racemic mixture and optically active
B. It is a racemic mixture and optically inactive
C. It is not a racemic mixture and optically active
D. It is not a racemic mixture and optically inactive
- 3) Which of the following occurs during the initiation stage of radical mechanism?
A. Non radicals are formed from radicals
B. Radicals are formed from other radicals
C. Radicals are formed from non radicals
D. Non radicals are formed from other non radicals
- 4) Which of the following will give benzoic acid, when reacted with alkaline KMnO_4 ?
A. Phenol B. Nitrobenzene C. Toluene D. Aniline
- 5) Which of the following is **NOT** monohydric alcohol?
A. Ethanol B. Methanol C. Glycol D. Isopropyl alcohol
- 6) Identify X in the following reaction: $\text{X} + 4\text{NaOH} + 3\text{I}_2 \longrightarrow \text{CHI}_3 + \text{HCOONa} + 3\text{NaI} + 3\text{H}_2\text{O}$
A. Acetaldehyde B. Acetone C. Benzaldehyde D. Formaldehyde
- 7) The order of reactivity of alcohol with respect to $-\text{O}-\text{H}$ bond cleavage is:
A. $\text{CH}_3\text{OH} > 1^\circ \text{Alcohol} > 2^\circ \text{Alcohol} > 3^\circ \text{Alcohol}$
B. $3^\circ \text{Alcohol} > 1^\circ \text{Alcohol} > 2^\circ \text{Alcohol} > \text{CH}_3\text{OH}$
C. $\text{CH}_3\text{OH} > 2^\circ \text{Alcohol} > 1^\circ \text{Alcohol} > 3^\circ \text{Alcohol}$
D. $2^\circ \text{Alcohol} > 1^\circ \text{Alcohol} > \text{CH}_3\text{OH} > 3^\circ \text{Alcohol}$
- 8) Indicate the **MOST** acidic carboxylic acid:
A. Ethanoic acid B. Bromoethanoic acid
C. Chloroethanoic acid D. Dichloroethanoic acid
- 9) The hydrolysis of triglycerides by alkalis is called:
A. Saponification B. Dehydration C. Chlorination D. Esterification
- 10) Which of the following compounds is **NOT** used to adhere two items together?
A. Adhesives B. Resins C. Glue D. Dye
- 11) The designing and creation of chemicals that are **NOT** hazardous to people or environment is related to:
A. Industrial Chemistry B. Green Chemistry
C. Biochemistry D. Environmental Chemistry
- 12) Very high energy electron beams are used in:
A. IR Spectroscopy B. UV Spectroscopy
C. Mass Spectrometry D. NMR Spectroscopy
- 13) Good leaving group among the following is:
A. H_2O B. HO^- C. RO^- D. NH_2^-
- 14) Which of the following is **NOT** a hydrocarbon?
A. Mesitylene B. Resorcinol C. Durene D. Cumene
- 15) Which of the following is an amphoteric hydroxide?
A. $\text{Al}(\text{OH})_3$ B. NaOH C. $\text{Si}(\text{OH})_4$ D. $\text{Mg}(\text{OH})_2$
- 16) The coordination number of carbonyl in $[\text{Ni}(\text{CO})_4]$ is:
A. 4 B. 3 C. 2 D. 0
- 17) 1,3-dibromobutane is:
A. Vicinal dihalide B. Geminal dihalide
C. A dihalide D. A halide

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Q. 2 Answer any SEVEN parts. All parts carry equal marks.

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- PbO_2 is amphoteric in nature. Give two chemical reactions showing its amphoteric nature.
- Write the formulas of the following coordination compounds.
 - Tetraamineaquachlorocobalt(III) chloride
 - Tetracarbonylnickel(0)
 - Potassium trioxalatoaluminate(III)
- Define enzymes and give any two industrial applications of enzymes.
- Write down the raw materials needed for the preparation of hair dye.
- Ozone is harmful as well as useful. Justify the statement.
- What information can be obtained from NMR spectrum?
 - What is cm^{-1} in IR spectrum?
- Hydrogen iodide (HI) is stronger acid than Hydrogen fluoride (HF). Give reason.
- Beryllium salts never have more than four molecules of water of crystallization. Justify this statement.
- Transition elements or their compounds are used as catalyst in chemical reactions. Justify the statement with example.
- How is oil spillage dangerous for under water plants?

SECTION – C (Marks 21) Chapters 15 – 20

Q. 3 Answer any SEVEN parts. All parts carry equal marks.

(7 x 3 = 21)

- Complete the reaction with mechanism:
 + $\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2\text{Cl} \xrightarrow{\text{AlCl}_3}$
- Identify the compounds A, B and C in the following reaction.
 $\text{H}_3\text{C}-\text{CH}_2-\text{Br} \xrightarrow{\text{Mg/Ether}} \text{A} \xrightarrow[\text{ii. H}_3\text{O}^+]{\text{i. CO}_2} \text{B} \xrightarrow{\text{CH}_3\text{OH}/\text{H}^+} \text{C}$
- How can you prepare disilver acetylid and dicopper acetylid? (Give reactions)
- Write the steps involved in the preparation of terephthalic acid from toluene. (Mechanism is not required)
- Give reasons;
 - Primary amines have high melting and boiling points as compared to their analogous alkanes. (1.5)
 - Methyl amine is stronger base than ammonia. (1.5)
- How would you prepare diethyl ether from ethanol? Give reaction with mechanism.
- Write the structure of the following compounds:
 - cis-1,2-dimethylcyclopentane
 - Lactic acid
 - Durene
- What is decarboxylation? (1)
 - Give mechanism of thermal decarboxylation of malonic acid (2)
- Complete the following reactions.
 - $\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2 \xrightarrow{\text{LiAlH}_4}$
 - $\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH} \xrightarrow{\text{LiAlH}_4}$
 - $\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 \xrightarrow{\text{LiAlH}_4}$
- Acetic acid is more acidic than phenol. Give reason.

SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks.

(2 x 13 = 26)

(Chapters 15 – 20)

- Q. 4** a. Explain the following electrophilic substitution reactions of benzene with mechanism: **(3+3)**
i. Sulphonation
ii. Nitration
- b. Which type of aldehyde gives Cannizzaro's reaction? Explain with mechanism. **(1+6)**

(Chapters 13, 14, 21 – 24)

- Q. 5** a. Explain the treatment of industrial waste water to remove contamination from it. **(7)**
b. Describe the reactions of hexaaquairon(II) ions with: **(3+3)**
i. Hydroxide ions
ii. Ammonia solution

(Chapters 15 – 20)

- Q. 6** a. Describe the role of the following in substitution and elimination reactions of alkyl halides. **(2+2+2)**
i. Structure of substrate
ii. Nature of Base
iii. Nature of solvent

(Chapters 13,14, 21-24)

- b. What is meant by pesticides? Describe any six of its types. **(1+6)**

— 2HA 1909 (ON) —