Aakash
+BYJU'S

Answers & Solutions
for

Time : 45 min.   **M.M. : 200**

CUET UG-2023
(Chemistry)

IMPORTANT INSTRUCTIONS:

1. The test is of 45 Minutes duration.

2. The test contains 50 Questions out of which 40 questions need to be attempted.

3. Marking Scheme of the test:

   a. Correct answer or the most appropriate answer: Five marks (+5)

   b. Any incorrect option marked will be given minus one mark (–1).

   c. Unanswered/Marked for Review will be given no mark (0).

Choose the correct answer :

1. Which of the following compound(s) on being warmed with I_2 solution and NaOH, will give Iodoform?
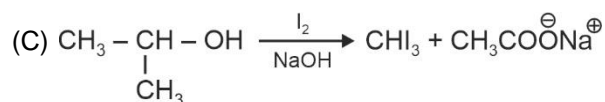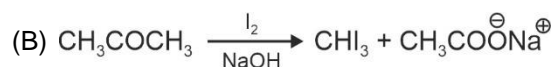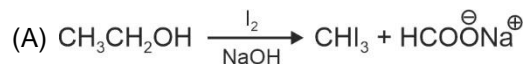
   A. CH_3CH_2OH

   B. CH_3COCH_3

   C. $H_3C-CH-OH$ with CH_3 below

   D. CH_3OH

   (1) A, C, D only

   (2) B only

   (3) A, B, C only

   (4) A and B only

Answer (3)

Sol. Compounds containing $CH_3-\overset{\overset{\displaystyle O}{||}}{C}-$ group or

$CH_3-\underset{\underset{\displaystyle OH}{|}}{CH}-$ group give positive iodoform test.

(A) $CH_3CH_2OH \xrightarrow[NaOH]{I_2} CHI_3 + HC\overset{\ominus}{O}O\overset{\oplus}{N}a$

(B) $CH_3COCH_3 \xrightarrow[NaOH]{I_2} CHI_3 + CH_3C\overset{\ominus}{O}O\overset{\oplus}{N}a$

(C) $CH_3-\underset{\underset{\displaystyle CH_3}{|}}{CH}-OH \xrightarrow[NaOH]{I_2} CHI_3 + CH_3C\overset{\ominus}{O}O\overset{\oplus}{N}a$

2. 5 M sugar solution is 30% sugar by mass. Calculated density of the solution will be, given that molecular weight of sugar is 342 g/mol.

(1) 5.7 g mL^{-1}

(2) 1.5 g mL^{-1}

(3) 3.3 g mL^{-1}

(4) 18.4 g mL^{-1}

Answer (1)

Sol. 1000 mL solution contains 5 mole sugar.

Let the density of solution be d g mL^{-1}.

Mass of solution = (1000 × d) g

(1000 × d) g solution contains (342 × 5) g sugar

$$\frac{342 \times 5}{1000 \times d} \times 100 = 30$$

$$\Rightarrow \quad d = \frac{342 \times 5 \times 100}{1000 \times 30} = 5.7 \text{ g mL}^{-1}$$

3. Which of the following is NOT correctly matched?

A. Element of 1st transition series with highest 2nd ionisation enthalpy : Cu

B. Element of 1st transition series with lowest atomisation : Zn

C. Last element of 2nd transition series : Hg

D. Element of 1st transition series with highest 3rd ionisation enthalpy : Zn

Choose the correct answer from the options given below:

(1) B only

(2) C only

(3) D only

(4) A only

Answer (2)

Sol. • Cu$^+$ (Z = 29) : $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$

It has completely filled orbital hence second ionisation potential is highest for Cu.

• Enthalpy of atomisation of zinc is lowest because of weak metallic bonding. ($\Delta_a H° = 126$ kJ mol^{-1})

• Last element of second transition series is cadium.

• Zn^{2+} (Z = 30) : $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$

It has completely filled orbital hence third ionisation potential is highest for Zn in 1st transition series.

4. Match List I with List II.

	LIST I		LIST II
A.	Ascorbic acid	I.	Xerophthalmia
B.	Vitamin D	II.	Osteomalacia
C.	Riboflavin	III.	Bleeding of Gums
D.	Vitamin A	IV.	Cheilosis

Choose the correct answer from the options given below:

(1) A-II, B-III, C-IV, D-I

(2) A-I, B-II, C-III, D-IV

(3) A-III, B-II, C-IV, D-I

(4) A-III, B-IV, C-II, D-I

Answer (3)

Sol.

Vitamins	Deficiency diseases
Ascorbic acid	Bleeding of gums
Vitamin D	Osteomalacia
Riboflavin	Cheilosis
Vitamin A	Xerophthalmia

5. The negatively charged sol among the following is :

(1) Fe(OH)$_3$ sol

(2) Haemoglobin

(3) TiO$_2$ sol

(4) Sb$_2$S$_3$ sol

Answer (4)

Sol. • Fe(OH)$_3$ sol, haemoglobin, TiO$_2$ sol are positively charged.

• Sb$_2$S$_3$ sol is negatively charged.

6. Match List I with List II

	LIST I		LIST II
A.	Serotonin	I.	Antihistamine
B.	Phenelzine	II.	Antibiotic
C.	Terfenadine	III.	Tranquilizer
D.	Vancomycin	IV.	Anti depressant drug

Choose the correct answer from the options given below:

(1) A-III, B-I, C-IV, D-II

(2) A-I, B-II, C-III, D-IV

(3) A-III, B-IV, C-I, D-II

(4) A-II, B-III, C-IV, D-I

Answer (3)

Sol.

Drugs	Class of drugs
Serotonin	Tranquilizer
Phenelzine	Anti depressant drug
Terfenadine	Antihistamine
Vancomycin	Antibiotic

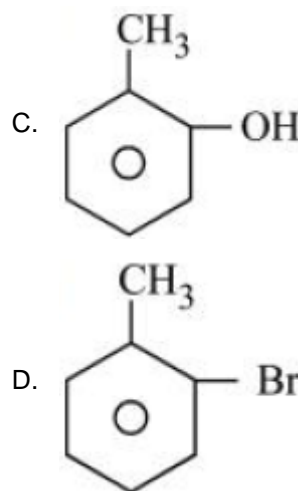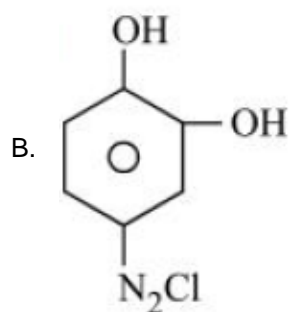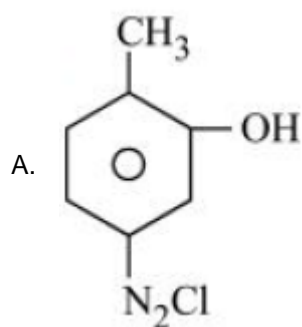**7.** A galvanic cell can be converted to an electrolytic cell when

(1) $E_{ext} < 1.1$ V

(2) $E_{ext} = 1.1$ V

(3) $E_{ext} > 1.1$ V

(4) The chemical reaction stops on completion

Answer (3)

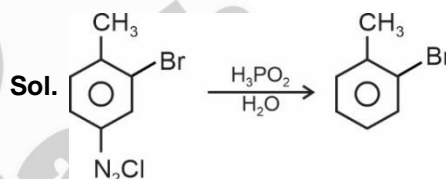**Sol.** $E_{ext} > 1.1$ V for galvanic cell (Daniell cell) then the it starts working as electrolytic cell.

8.

Identify 'X'

A.

B.

C.

D.
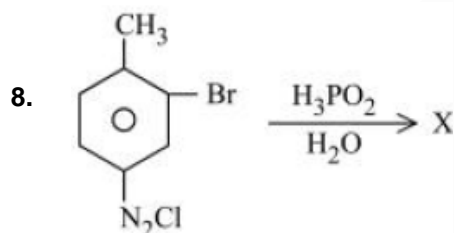
Choose the correct answer from the options given below:

(1) A   (2) B

(3) C   (4) D

Answer (4)

Sol.

9. Match List I with List II

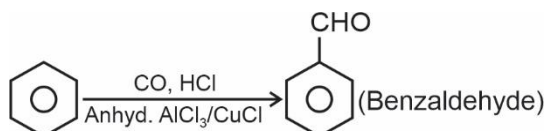|	LIST I		LIST II
A.	Gatterman-Koch reaction	I.	Diphenyl
B.	Stephens reaction	II.	Ethyl amine
C.	Hoffmann Bromamide degradation	III.	Benzaldehyde
D.	Fittig reaction	IV.	Acetaldehyde

Choose the correct answer from the options given below:

(1) A-IV, B-III, C-II, D-I

(2) A-III, B-IV, C-II, D-I

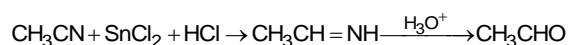(3) A-III, B-II, C-IV, D-I

(4) A-IV, B-III, C-I, D-II

Answer (2)

Sol.

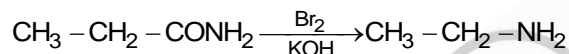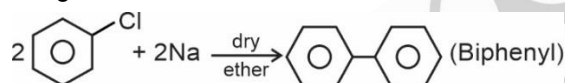| Name of Reaction	Products formed
Gatterman-Koch reaction	Benzaldehyde
Stephens reaction	Acetaldehyde
Hoffmann Bromamide degradation	Ethyl amine
Fittig reaction	Diphenyl

- Gatterman-Koch reaction :

- Stephens reaction :

$$CH_3CN + SnCl_2 + HCl \rightarrow CH_3CH = NH \xrightarrow{H_3O^+} CH_3CHO$$

- Hoffmann Bromamide degradation :

$$CH_3 - CH_2 - CONH_2 \xrightarrow[KOH]{Br_2} CH_3 - CH_2 - NH_2$$

- Fittig reaction :

10. Which of the following is not caused due to deficiency of hormones?

(1) Diabetes

(2) Goitre

(3) Cancer

(4) Hypoglycemia

Answer (3)

Sol. Diabetes, Goitre and Hypoglycemia are caused by the deficiency of hormones.

Cancer is not caused due to deficiency of hormones.

11. Which of the following substance/s will precipitate the emulsion which is negatively charged?

A. KCl

B. Glucose

C. NaCl

D. Urea

Choose the correct answer from the options given below:

(1) B, C only

(2) A, D only

(3) A, C only

(4) B, D only

Answer (3)

Sol. Electrolytes are added for the precipitation of colloidal particles. The reason is that colloids interact with ions carrying charge opposite to that present on themselves.

12. The one which is a covalent green oil is:

(1) CrO_3

(2) Mn_2O_7

(3) V_2O_5

(4) CrO

Answer (2)

Sol. Mn_2O_7 is a covalent green oil.

13. With reference to transition metals which of the following statements are correct?

A. Electronic configuration is represented by $(n-2)d^{1-10}ns^{1-2}$

B. They exhibit catalytic property

C. Some of them form interstitial compounds

D. In $Ni(CO)_4$ and $Fe(CO)_5$, the oxidation state of Ni and Fe are +4 and +5 respectively

Choose the correct answer from the options given below:

(1) A, B, C only

(2) B, C, D only

(3) A, B, D only

(4) B, C only

Answer (4)

Sol. • General electronic configuration of d block elements → $(n-1)d^{1-10}ns^{0-2}$.

- They exhibit catalytic properties.

- Form interstitial compounds.

- Oxidation state of both Ni and Fe in $Ni(CO)_4$ and $Fe(CO)_5$ is zero.

14. Identify the most stable complex.

(1) $[Co(NH_3)_6]Cl_3$

(2) $[CoCl_2(en)_2]Br$

(3) $[Co(en)_3]Cl_3$

(4) $K[CoCl_4(en)]$

Answer (3)

Sol. • More is the number of chelating groups attached, more will be the stability of the complex.

∴ $[Co(en)_3]Cl_3$ is the most stable complex.

15. Match List-I with List-II

	LIST-I		LIST-II
A.	Multimolecular colloids	I.	Nitro cellulose
B.	Macromolecular colloids	II.	Sulphur molecule
C.	Associated colloids	III.	Nylon
D.	Colloidion	IV.	Soaps

Choose the correct answer from the options given below:

(1) A-II, B-IV, C-I, D-III

(2) A-II, B-III, C-IV, D-I
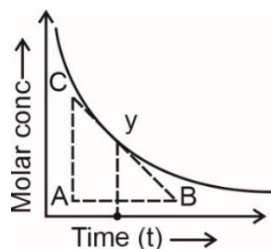
(3) A-III, B-II, C-IV, D-I

(4) A-III, B-IV, C-I, D-II

Answer (2)

Sol. Multimolecular colloid – S_8 sulphur molecules
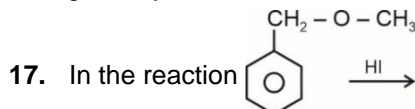
Macromolecular colloid – Nylon

Associated colloid – Soaps

Colloidion – Nitro cellulose
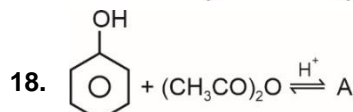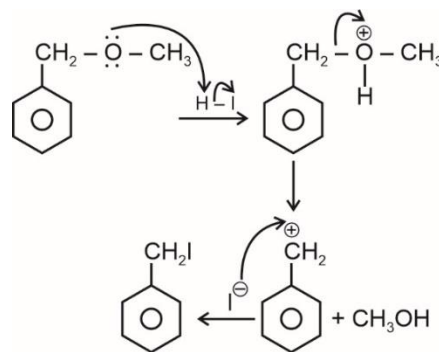
16. Given graph is for:

(1) Average rate of reaction

(2) Instantaneous reaction rate

(3) Initial rate for product

(4) Final rate for reactant

Answer (2)

Sol. Rate of reaction at a particular instant of time is given by instantaneous rate of reaction.
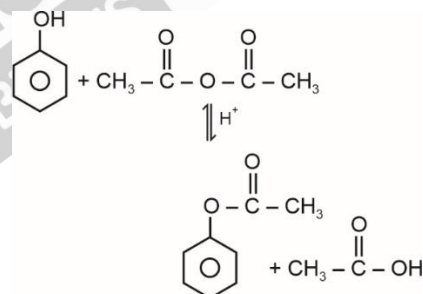
17. In the reaction

the products are:

Answer (3)

Sol.

18.

A will be:

Answer (1)

Sol.

19. Match the List I with List II.

	List I		List II
A.	Cubic	I.	Graphite
B.	Triclinic	II.	White Tin
C.	Hexagonal	III.	Zinc Blende
D.	Tetragonal	IV.	Potassium dichromate

Choose the correct answer from the options given below:

(1) A-II, B-III, C-I, D-IV

(2) A-IV, B-III, C-I, D-II

(3) A-II, B-I, C-III, D-IV

(4) A-III, B-IV, C-I, D-II

Answer (4)

Sol.

Crystal system		Examples
Cubic	–	Zinc Blende
Triclinic	–	Potassium dichromate
Hexagonal	–	Graphite
Tetragonal	–	White Tin

20. A group-14 element is converted into n-type semiconductor by doping it with:

(1) Aluminium

(2) Silicon

(3) Gallium

(4) Phosphorous

Answer (4)

Sol. • Group-14 elements when doped with group-15 elements gives n-type semi-conductor.

• Phosphorous is a group-15 element.

21. In the metallurgy of Al, purified Al_2O_3 is mixed with Na_3AlF_6 or CaF_2. The role of Na_3AlF_6 or CaF_2 is to:

(1) Decrease the conductivity of Al_2O_3

(2) Lower the melting point of Al_2O_3

(3) Reduce Al_2O_3

(4) Oxidise Al_2O_3

Answer (2)

Sol. In metallurgy of Aluminium, pure Alumina (Al_2O_3) is mixed with cryolite (Na_3AlF_6) or CaF_2 to lower its melting point.

22. Arrange these transition metal ions, based on decreasing number of unpaired electrons.

A. Fe^{2+}

B. Mn^{2+}

C. Co^{2+}

D. Sc^{3+}

E. Cu^{2+}

Choose the correct answer from the options given below:

(1) B > A > C > E > D

(2) B > C > A > D > E

(3) D > E > C > B > A

(4) A > B > C > D > E

Answer (1)

Sol. A. $Fe^{2+} = 3d^6 \Rightarrow$ 4 unpaired electrons

B. $Mn^{2+} = 3d^5 \Rightarrow$ 5 unpaired electrons

C. $Co^{2+} = 3d^7 \Rightarrow$ 3 unpaired electrons

D. $Sc^{3+} = 3d^0 \Rightarrow$ 0 unpaired electron

E. $Cu^{2+} = 3d^9 \Rightarrow$ 1 unpaired electrons

Order of decreasing number of unpaired electrons

$Mn^{2+} > Fe^{2+} > Co^{2+} > Cu^{2+} > Sc^{3+}$

(B)   (A)   (C)   (E)   (D)

**23.** The correct order of relative reactivity of alkyl halides towards S_N1 reaction is:

(I) $PhCH_2Cl$

(II) Ph_2CHCl

(III) $Ph_3C\text{-}Cl$

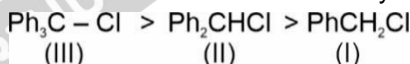(1) I > II > III   (2) III > I > II

(3) III > II > I   (4) II > III > I

Answer (3)

Sol. S_N1 reactivity of alkyl halide is based on the stability of carbocation formed. The carbocation intermediate formed by Ph_3CCl most stable because it is stabilised by three phenyl rings followed by Ph_2CHCl then $PhCH_2Cl$.

Order of carbocation intermediate stability:
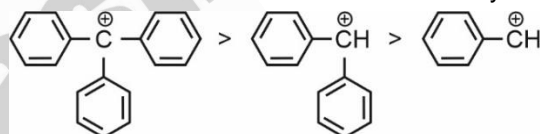
Hence order of relative reactivity towards S_N1 –

$$Ph_3C-Cl > Ph_2CHCl > PhCH_2Cl$$
$$\text{(III)} \qquad \text{(II)} \qquad \text{(I)}$$

24. Identify the following compound.
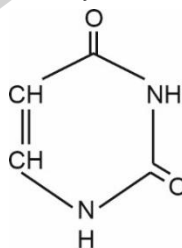
(1) Uracil   (2) Thymine

(3) Cytosine   (4) Guanine

Answer (1)

Sol. Given structure belongs to pyrimidine nitrogenous base present in RNA i.e., Uracil.

Uracil

25. Match List I with Lit II

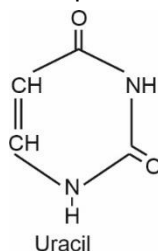|	List I (Order)		List II (Units of k)
A	Zero order reactions	I	s^{-1}
B	1st order	II	$mol^{-2}L^2s^{-1}$
C	2nd order	III	$molL^{-1}s^{-1}$
D	3rd order	IV	$mol^{-1}Ls^{-1}$

Choose the correct answer from the options given below:

(1) A-III, B-I, C-II, D-IV (2) A-III, B-II, C-I, D-IV

(3) A-III, B-I, C-IV, D-II (4) A-I, B-III, C-IV, D-II

Answer (3)

Sol. Unit of rate constant (k)

$$= \frac{concentration}{time} \times \frac{1}{(concentration)^n}$$

	Order	Unit of k
A.	Zero order	$\frac{molL^{-1}}{s} \times \frac{1}{(mol\ L^{-1})^0} = mol\ L^{-1}s^{-1}$
B.	First order	$\frac{molL^{-1}}{s} \times \frac{1}{(mol\ L^{-1})^1} = s^{-1}$
C.	Second order	$\frac{molL^{-1}}{s} \times \frac{1}{(mol\ L^{-1})^2} = mol^{-1}\ L\ s^{-1}$
D.	Third order	$\frac{molL^{-1}}{s} \frac{1}{(mol\ L^{-1})^3} = mol^{-2}\ L^2\ s^{-1}$

26. Match List I with List II

	List I		List II
A.	Zone refining	I.	Dressing of ZnS
B.	Froth floatation process	II.	Extraction of Au
C.	Cyanide process	III.	Extraction of Al
D.	Electrolytic reduction	IV.	Ultrapure Ge

Choose the correct answer from the options given below:

(1) A-III, B-I, C-II, D-IV

(2) A-IV, B-I, C-II, D-III

(3) A-I, B-II, C-III, D-IV

(4) A-IV, B-I, C-III, D-II

Answer (2)

Sol. A. Zone refining – Used for producing semiconductors and other metals of very high purity eg. Ge, Si, etc.

B. Froth floatation process – Concentration/dressing of sulphide ore eg. dressing of ZnS

C. Cyanide process – Leaching/cyanide process is used for extraction of gold and silver

D. Electrolytic reduction – Extraction of reactive metals by reduction of molten salts.

27. Match List I with List II

	List I		List II
A.	Buna-S	I.	Polyamide
B.	Nylon 6, 6	II.	Homopolymer
C.	Polythene	III.	Terepthalic acid, ethylene glycol
D.	Terylene	IV.	Copolymer

Choose the correct answer from the options given below:

(1) A-I, B-IV, C-II, D-III (2) A-III, B-I, C-II, D-IV

(3) A-IV, B-I, C-II, D-III (4) A-II, B-IV, C-I, D-III

Answer (3)

**Sol.** A. Buna-S – Formed by copolymerisation of Buta-1, 3- diene and styrene (Copolymer)

B. Nylon-6, 6 – Prepared by condensation polymerisation of hexamethylene diamine with adipic acid (Polyamide)

C. Polythene – Formed by addition polymerisation of ethene. (Homopolymer)

D. Terylene – Prepared by condensation polymerisation of terephthalic acid and ethylene glycol

28. Aqueous $CuSO_4$ solution gives green precipitate of (X) with aqueous KF. Correct formula of X is:

(1) $[CuF_6]^{3-}$ (2) $[CuF_4]^{2-}$

(3) $[CuF_2]^-$ (4) $[CuF_5]^{4-}$

Answer (2)

Sol. Aqueous copper sulphate solution exists as $[Cu(H_2O)_4]SO_4$. Ligand H_2O gets easily replaced by F^- ion if reacts with aqueous KF and forms green precipitate.
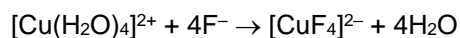
$$[Cu(H_2O)_4]^{2+} + 4F^- \rightarrow [CuF_4]^{2-} + 4H_2O$$
$$\text{Green ppt (X)}$$

So, correct formula of X is $[CuF_4]^{2-}$

29. Which of the following statements are correct?

A. Tertiary alcohols undergo oxidation reaction when heated with Cu at 573 K

B. Salicylic acid is 2-hydroxybenzoic acid

C. Ease of dehydration of alcohols is in the order primary > secondary > tertiary

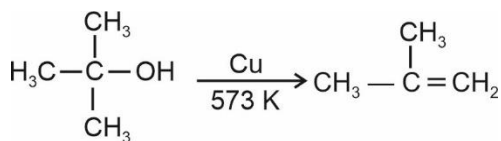D. Electrophile attacks at o- and p- position in anisole.

E. Aspirin is

Choose the correct answer from the options given below:
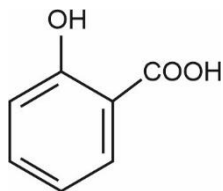
(1) B, D only   (2) A, B only

(3) D, E only   (4) B, E only

Answer (1)

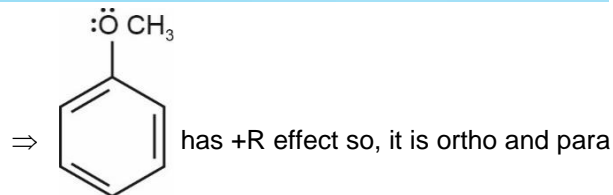**Sol.** Tertiary alcohols when heated with Cu at 573 K it undergoes dehydration not oxidation.

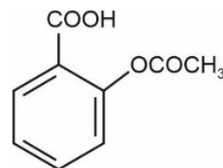⇒ Salicylic acid is 2-hydroxy benzoic acid

⇒ Relative ease of dehydration of alcohol

⇒ $3° > 2° > 1°$

⇒ has +R effect so, it is ortho and para directing
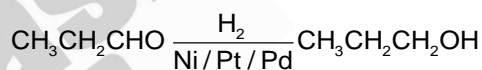
⇒ Aspirin is acetyl salicylic acid

30. The product obtained from catalytic reduction of propanal is:

(1) Propan-1-ol

(2) Propan-2-ol

(3) Propanone

(4) Propanoic acid

Answer (1)

Sol. Catalytic reduction of propanal results in the formation of propan-1-ol.

$$CH_3CH_2CHO \xrightarrow[Ni/Pt/Pd]{H_2} CH_3CH_2CH_2OH$$

31. For a non ideal solution exhibiting positive deviation:

(A) The vapour pressure is lower than that predicted by Raoult's law

(B) The vapour pressure is higher than that predicted by Raoult's law

(C) The interaction at the molecular level are weaker than in the pure state

(D) The interaction at the molecular level are stronger than in the pure state

(E) Mixture of chloroform and acetone is a suitable example

Choose the correct answer from the options given below:

(1) A, D, E only

(2) A, D only

(3) B, C, E only

(4) B, C only

Answer (4)

Sol. For solutions showing positive deviation from Raoult's Law :

A-B interactions are weaker than those between A-A or B-B, i.e., in this case the intermolecular attractive forces between the solute-solvent molecules are weaker than those between the solute-solute and solvent-solvent molecules. This means that in such solutions, molecules of A (or B) will find it easier to escape than in pure state. This will increase the vapour and observed vapour pressure will be more than that of predicted by Raoult's law.

Mixture of ethanol and water shows positive deviation while mixture of chloroform and acetone gives negative deviation.

32. Which of the following statements are correct about azeotropic mixtures?

(A) They have same composition in liquid and vapour phases

(B) They can be separated by fractional distillation

(C) They are formed at a specific composition

(D) Solutions which show positive deviation from Raoult's law form maximum boiling azeotrope

(E) The azeotrope of ethanol and water is formed by 80% ethanol and 20% water.

Choose the correct answer from the options given below:

(1) A, D and E only   (2) A and B only

(3) A and C only   (4) A, B and E only

Answer (3)

Sol. Some liquids on mixing, form **azeotropes** which are binary mixtures having the same composition in liquid and vapour phase and boil at a constant temperature. In such cases, it is not possible to separate the components by fractional distillation. There are two types of azeotropes called **minimum boiling azeotrope and maximum boiling azeotrope.** The solutions which show a large positive deviation from Raoult's law form minimum boiling azeotrope at a specific composition. For example, ethanol-water mixture (obtained by fermentation of sugars) on fractional distillation gives a solution containing approximately 95% by volume of ethanol. Once this composition, known as azeotrope composition, has been achieved, the liquid and vapour have the same composition, and no further separation occurs.

33. The unit of conductivity (K) is:

(1) Ω m   (2) Ω^{-1} m

(3) Ω^{-1} m^{-1} (4) Ω m^{-1}

Answer (3)

Sol. Conductivity $\kappa = \dfrac{1}{\text{Resistance}} \times \text{cell constant}$

$$= \dfrac{1}{R} \times \dfrac{l}{A}$$

Units = Ω^{-1} m^{-1}

34. Which of the following reactions are correct?

(A) $R-NO_2 \xrightarrow[\text{KOH}]{KMnO_4} RNH_2$

(B) $R-NO_2 \xrightarrow{Sn+HCl} RNH_2$

(C) $RCN \xrightarrow{H_2O/H^+} RCH_2NH_2$

(D) $RCN \xrightarrow{H_2/Pd} RCH_2NH_2$

(E) $RCONH_2 \xrightarrow[\text{(ii) } H_2O]{\text{(i) LiAlH}_4} RCH_2NH_2$

Choose the correct answer from the options given below:

(1) A, E, C only   (2) B, D, E only

(3) A, B, C only   (4) C, D, E only

Answer (2)

Sol. (A) $R-NO_2 \xrightarrow[\text{KOH}]{KMnO_4}$ no reaction

(B) $R-NO_2 \xrightarrow{Sn+HCl} R\,NH_2$

(C) $RCN \xrightarrow{H_2O/H^+} R-\overset{\overset{\displaystyle O}{\|}}{C}-NH_2$

(D) $RCN \xrightarrow{H_2/Pd} RCH_2NH_2$

(E) $RCONH_2 \xrightarrow[\text{(ii) } H_2O]{\text{(i) LiAlH}_4} RCH_2NH_2 + H_2O$

35. Which of the following organic compound will have the maximum boiling point?

(1) $CH_3-CH_2-\underset{\underset{\displaystyle Br}{|}}{CH}-CH_3$

(2) $CH_3-CH_2-CH_2-CH_3$

(3) $CH_3-CH_2-CH_2-CH_2-Br$

(4) $CH_3-\underset{\underset{\displaystyle CH_3}{|}}{\overset{\overset{\displaystyle CH_3}{|}}{C}}-Br$

Answer (3)

Sol. • Alkyl halide has more boiling point than alkane with similar number of carbon atoms.

• For isomeric alkyl halides order of B.P. 1° > 2° > 3°

$$CH_3CH_2CH_2CH_2Br > CH_3CH_2\underset{\underset{\displaystyle Br}{|}}{CH}CH_3 > H_3C-\underset{\underset{\displaystyle Br}{|}}{\overset{\overset{\displaystyle CH_3}{|}}{C}}-CH_3$$

b.p./K   375   364   346
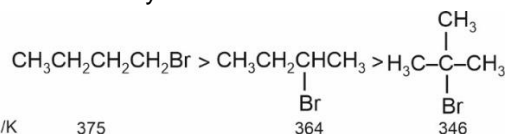
36. If limiting molar conductance of NaCl, K_3PO_4 and KCl are 110.2, 98.8 and 134.6 Ω^{-1} cm^2 mol^{-1} respectively, the limiting molar conductance of Na_3PO_4 will be: (Ω^{-1} cm^2 mol^{-1})

(1) 110.2   (2) 294.8

(3) 220.4   (4) 25.6

Answer (4)

Sol. $\Lambda^o_{NaCl} = \Lambda^o_{Na^+} + \Lambda^o_{Cl^-}$

$\Lambda^o_{K_3PO_4} = 3\Lambda^o_{K^+} + \Lambda^o_{PO_4^{3-}}$

$\Lambda^o_{KCl} = \Lambda^o_{K^+} + \Lambda^o_{Cl^-}$

$\Lambda^o_{Na_3PO_4} = 3\Lambda^o_{Na^+} + \Lambda^o_{PO_4^{3-}}$

$= 3\Lambda^o_{NaCl} + \Lambda^o_{K_3PO_4} - 3\Lambda^o_{KCl}$

$= 330.6 + 98.8 - 403.8$

$= 25.6 \; \Omega^{-1} cm^2 mol^{-1}$

37. The standard electrode potential of copper is positive. Which of the following statements is <u>not</u> true?

(1) H$^+$ ions get reduced more easily than Cu^{2+} ions

(2) Cu does not dissolve in HCl

(3) Cu is oxidised by nitrate ion in nitric acid

(4) H$^+$ ions cannot oxidise copper

Answer (1)

Sol. Since SRP of Cu^{2+} > SRP of H$^+$/H$_2$

* Cu^{2+} will get reduced more easily than H$^+$.

* Cu cannot replace H$^+$ from HCl hence does not get dissolved.

* Cu gets oxidised by nitrate ion.

* H$^+$ cannot oxidise Cu.

38. Which of the following metals cannot be used to absorb H$_2$ gas on its surface?

(1) Iron   (2) Platinum

(3) Palladium   (4) Nickel

Answer (1)

Sol. Group 7, 8, 9 is hydride gap that is metal from these group cannot form hydride.

Hence Fe, being a group 8 members will not adsorb hydrogen.

39. In the given complexes, the heteroleptic complexes is/are:

A. $[Co(NH_3)_6]^{3+}$

B. $[Cr(H_2O)_6]^{3+}$

C. $[Ni(Cl_2)(PPh_3)_2]$

D. $[Co(NH_3)_4Cl_2]^+$

Choose the correct answer from the options given below:

(1) A and B only   (2) C and D only

(3) A and C only   (4) B and D only

Answer (2)

Sol. Complexes in which a metal is bound to only one kind of donor groups, *e.g.*, $[Co[NH_3]_6]^{3+}$, are known as homoleptic. Complexes in which a metal is bound to more than one kind of donor groups, *e.g.*, $[Co(NH_3)_4Cl_2]^+$ and $[NiCl_2(PPh_3)_2]$ are known as heteroleptic.

40. Which is not true for non-ideal solutions?

(1) $\Delta_{mixing} H \neq 0$

(2) $\Delta_{mixing} V \neq 0$

(3) do not obey Raoult's law

(4) obey Raoult's law

Answer (4)

Sol. When a solution does not obey Raoult's law over the entire range of concentration, then it is called non-ideal solution. The vapour pressure of such a solution is either higher or lower than that predicted by Raoult's law. If it is higher, the solution exhibits positive deviation and if it is lower, it exhibits negative deviation from Raoult's law; Hence for non ideal solution

$\Delta_{min}H \neq 0$ $\Delta_{min}V \neq 0$

**(Q41 to Q45) Answer the questions on the basis of passage given below :**

Elements of group-15, 16 and 17 form compounds with hydrogen with general formula MH$_3$, H$_2$M and HX (called hydrogen halides). Stability of these hydrides, along with M-H bond strength and basic nature decreases down the group. Boiling point of these hydrides mainly depends on the strength of their inter molecular forces.

41. Which of the following is most basic among the following hydrides of group 16?

(1) H$_2$Te   (2) H$_2$Se

(3) H$_2$S   (4) H$_2$O

Answer (4)

Sol. Most basic hydrides of group 16 is H_2O.

as   lone pair is present in hybridised orbital
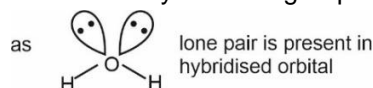
In other hydrides lone pair is present in pure orbital, which will be difficult to donate.

42. Bond angle (HMH) among hydrides of group-16 decrease down the group because:

(1) Electronegativity of the central atom decreases down the group

(2) Size of central atom decreases down the group

(3) Bond pair-bond pair repulsion decreases down the group with the decrease in difference of electronegativity between hydrogen and central atom

(4) Lone-pair bond pair repulsion increases down the group

Answer (3)

Sol. Bond angle (HMH) among hydrides of group 16 decreases down the group because bond pair-bond pair repulsion decreases down the group with the decrease in difference of electronegativity between hydrogen and central atom.

43. Which of the following is strongest reducing agent?

(1) NH_3 (2) PH_3

(3) AsH_3 (4) BiH_3

Answer (4)

Sol. The stability of hydrides decreases from NH_3 to BiH_3 consequently, the reducing character of the hydrides increases. So,

BiH_3 is the strongest reducing agent amongst all the hydrides.

44. Decreasing order of boiling point of group 15 hydrides is:

A. NH_3

B. PH_3

C. AsH_3

D. SbH_3

E. BiH_3

Choose the correct answer from the options given below:

(1) $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$

(2) $BiH_3 > SbH_3 > AsH_3 > PH_3 > NH_3$

(3) $NH_3 > BiH_3 > SbH_3 > AsH_3 > PH_3$

(4) $BiH_3 > SbH_3 > NH_3 > AsH_3 > PH_3$

Answer (4)

Sol. The correct order of boiling point of group 15 hydrides is.

$BiH_3 > SbH_3 > NH_3 > AsH_3 > PH_3$

- As the molecular mass increases, boiling point increases.

- Anomalous behaviour of NH_3 is due to intramolecular hydrogen bonding.

45. Which of the following is liquid at 20°C?

A. HCl

B. HI

C. HF

D. NH_3

E. HBr

Choose the correct answer from the options given below:

(1) HCl, HI only

(2) NH_3 only

(3) HF only

(4) HBr only

Answer (3)

Sol. Hydrogen fluoride is a liquid (b.p. 293 K) due to strong hydrogen bonding. Other hydrogen halides are gases.
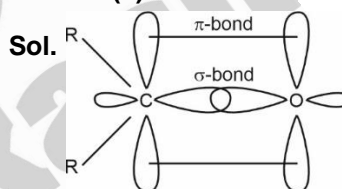
Paragraph for Question Numbers Q. 46 to Q. 50

In aldehydes, the carbonyl group is bonded to a carbon and hydrogen while in ketones it is bonded to two carbon atoms. The carbonyl compounds in which carbonyl group is bonded to oxygen are known as carboxylic acid and their derivatives.

46. The hybridisation of the C in the carbonyl group is:

(1) sp (2) sp^2

(3) sp^3 (4) sp^3d

Answer (2)

Sol.

- Only σ – bonds and lone pair participate in hybridisation

- Number of hybridised orbital = number of σ bonds = 3
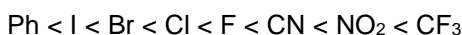
Hybridisation $\rightarrow sp^2$

**47.** Which series represents compounds in increasing order of acidity?

(1) $NO_2CH_2COOH > CF_3COOH > ClCH_2COOH > CH_3COOH$

(2) $NO_2CH_2COOH > ClCH_2COOH > CF_3COOH > CH_3COOH$

(3) $CH_3COOH > CF_3COOH > NO_2CH_2COOH > ClCH_2COOH$

(4) $CF_3COOH > NO_2CH_2COOH > ClCH_2COOH > CH_3COOH$

Answer (4)

Sol. The effect of following groups in increasing acidity orders is

$Ph < I < Br < Cl < F < CN < NO_2 < CF_3$

So order of acidity will be

$CF_3COOH > NO_2CH_2COOH > ClCH_2COOH > CH_3COOH$
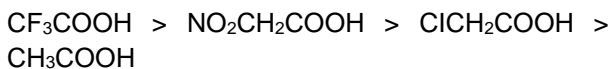
48. Arrange the following steps of Aldol condensation in the correct order of their occurrence.
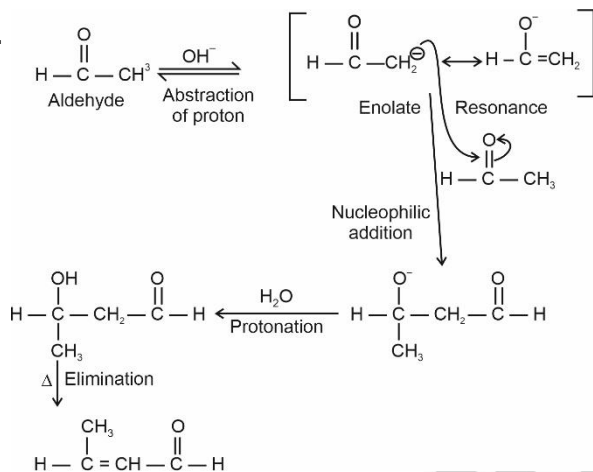
A. Abstraction of proton

B. Protonation

C. Formation of Enolate

D. Nucleophilic Addition

E. Elimination

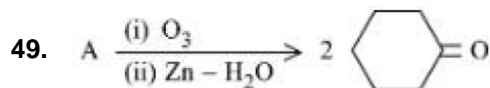Choose the correct answer from the options given below:

(1) ACDBE (2) ABCDE

(3) EACDB (4) ACBDE

Answer (1)

Sol.

So, correct order is ACDBE

49.

(1)

(2)

(3)

(4)
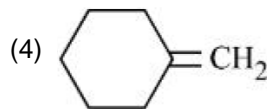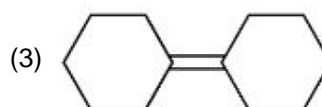
Answer (3)

Sol.
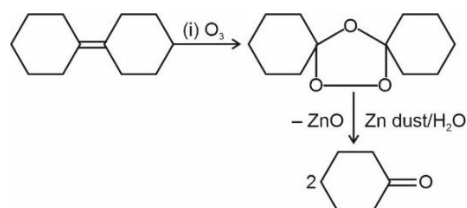
50. 1, 3-Diphenylprop-2-en-1-one is produced by the following.

(1) C_6H_5CHO and $C_6H_5COCH_3$: Cross Aldol condensation

(2) C_6H_5COOH and $C_6H_5COCH_3$: Cross Aldol condensation

(3) C_6H_5CHO : Self Aldol condensation

(4) $C_6H_5COCH_3$: Self Aldol condensation

Answer (1)

Sol.

1, 3-Diphenylprop-2-en-1-one.

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