Solved Sample Paper

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

CUET UG (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 :

Question ID: 692641

Among the following statements, choose thecorrect statements.

A. In ionic solid, ions are the constituent particles.

B. Ionic solids are soft.

C. Ionic solid are electrical insulators in the solid state.

D. Ionic solid conduct electricity in molten state.

E. Ionic solid have low melting and boiling points.

Choose the correct answer from the options given below :

(A) A, C & D only (B) A, D & E only

(C) A, B & C only (D) A, C & E only

Answer (A)

Sol. Ions are the constituent particles of ionic solids. Such solids are formed by the three dimensional arrangements of cations and anions bound by strong coulombic (electrostatic) forces. These solids are hard and brittle in nature. They have high melting and boiling points. Since the ions are not free to move about, they are electrical insulators in the solid state. However, in the molten state or when dissolved in water, the ions become free to move about and they conduct electricity.

Question ID: 692642

Atoms of element B form hcp lattice and those of the element A occupy 2/3rd of tetrahedral voids. What is the formula of the compound formed by the elements A and B?

(A) A_3B_4 (B) A_4B_3

(C) A_2B_3 (D) A_3B_2

Answer (B)

Sol. Since B forms HCl number of B = 6

A at $\frac{2}{3}$rd of tetrahedral void.

Number of A = $\frac{2}{3} \times 12 = 8$

Formula : $A_8B_6 \Rightarrow A_4B_3$

Question ID: 692643

Consider the 1 M aqueous solution of the following compounds and arrange them in the increasing order of elevation in the boiling points.

A. $C_6H_{12}O_6$ B. NaCl

C. $MgCl_2$ D. $AlCl_3$

E. $Al_2(SO_4)_3$

Choose the correct answer from the options given below :

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

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

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

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

Answer (C)

Sol. Elevation in boiling point $\propto$ i × M

	Solute	i
A.	$C_6H_{12}O_6$	1
B.	NaCl	2
C.	$MgCl_2$	3
D.	$AlCl_3$	4
E.	$Al_2(SO_4)_3$	5

Order of elevation in boiling point

E > D > C > B > A

Question ID: 692644

Calculate the molarity of a solution containing 5 g of NaOH in 450 mL solution.

(A) 0.278×10^{-3} M

(B) 0.278 M

(C) 2.78×10^{-3} M

(D) 2.78 M

Answer (D)

Sol. Molarity M = $\frac{W \times 1000}{M \times V_{ml}}$

= $\frac{5 \times 1000}{40 \times 450}$

= 2.78 M

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Question ID: 692645

Among the following statements related to ionic conductance, choose the correct statements.

A. Ionic conductance depends on the nature of electrolyte

B. Ionic conductance is due to the movements of electrons

C. Ionic conductance is also called electronic conductance

D. Ionic conductance depends on temperature

E. Ionic conductance also depends on the nature of solvent

Choose the correct answer from the options given below :

(A) A, B and C only (B) B, C and D only

(C) B, C and E only (D) A, D and E only

Answer (D)

Sol. The conductance of electricity by ions present in the solutions is called electrolytic or ionic conductance. The conductivity of electrolytic (ionic) solutions depends on :

(i) the nature of the electrolyte added

(ii) size of the ions produced and their solvation

(iii) the nature of the solvent and its viscosity

(iv) concentration of the electrolyte

(v) temperature (it increases with the increase of temperature)

Question ID: 692646

Λ_m^o for NaCl, HCl and NaOAc are 126.4, 425.9 and 91.0 S cm^2 mol^{-1} respectively. Calculate $\Lambda°$ for HOAc

(A) 390.5 S cm^2 mol^{-1} (B) 643.3 S cm^2 mol^{-1}

(C) 461.3 S cm^2 mol^{-1} (D) 208.5 S cm^2 mol^{-1}

Answer (A)

Sol. $\Lambda^o_{m(HAc)} = \lambda^o_{H^+} + \lambda^o_{Ac^-}$

$= \lambda^o_{H^+} + \lambda^o_{Cl^-} + \lambda^o_{Ac^-} + \lambda^o_{Na^+} - \lambda^o_{Cl^-} - \lambda^o_{Na^+}$

$= \Lambda^o_{m(HCl)} + \Lambda^o_{m(NaAc)} - \Lambda^o_{m(NaCl)}$

Question ID:692647

How much charge is required for the reduction of 1 mole of MnO_4^- to Mn^{2+}?

(A) 1 F (B) 5 F

(C) 3 F (D) 6 F

Answer (B)

Sol. For redox change

$MnO_4^- \rightarrow Mn^{2+}$

n-factor = 5

$n_{eq} = n_{mol} \times$ n-factor

$= 1 \times 5$

$= 5$

Charge required in Faraday = Number of n_{eq}

= 5 F

Question ID:692648

The products formed at cathode and anode by electrolysis of aqueous NaCl solution respectively are

(A) Na, Cl_2 (B) Na, O_2

(C) H_2, Cl_2 (D) H_2, O_2

Answer (C)

Sol. On electrolysis of aq. NaCl

$$NaCl(aq) \xrightarrow{H_2O} Na^+(aq) + Cl^-(aq)$$

Cathode: $H_2O(l) + e^- \rightarrow \frac{1}{2}H_2(g) + OH^-(aq)$

Anode: $Cl^-(aq) \rightarrow \frac{1}{2}Cl_2(g) + e^-$

Net reaction :

$$NaCl(aq) + H_2O(l) \rightarrow Na^+(aq) + OH^-(aq) + \frac{1}{2}H_2(g) + \frac{1}{2}Cl_2(g)$$

Question ID:692649

The artificial sweetner used only for cold food is

$= (425.9 + 91.0 – 126.4)\ S\ cm^2\ mol^{-1}$

$= 390.5\ S\ cm^2\ mol^{-1}$

(A) Alitame (B) Sucralose

(C) Aspartame (D) Saccharin

Answer (C)

Sol. Aspartame is unstable at cooking temperature therefore limited to cold foods and soft drink only.

Question ID:6926410

Rate constant 'k' for a certain reaction is $k = 2.3 \times 10^{-5}$ L mol^{-1} s^{-1}. Order of the reaction is

(A) 0 (B) 1

(C) 2 (D) 3

Answer (C)

Sol. $K = 2.3 \times 10^{-5}$ L mol^{-1} s^{-1}

For order of reaction,

$$\text{The unit of rate constant} = \frac{\text{mol L}^{-1}}{\text{s}} \times \frac{1}{(\text{mol L}^{-1})^n}$$

The unit 'L mol^{-1} s^{-1}' corresponds to the 2nd order reaction.

Question ID:6926411

The decomposition of NH_3 on platinum surface is zero order reaction. If $k = 2.5 \times 10^{-4}$ mol L^{-1} s^{-1} the rate of production of H_2 is

(A) 2.5×10^{-4} mol L^{-1} s^{-1}

(B) 7.5×10^{-4} mol L^{-1} s^{-1}

(C) 5.0×10^{-4} mol L^{-1} s^{-1}

(D) 10.0×10^{-4} mol L^{-1} s^{-1}

Answer (B)

Sol. $2NH_3 \xrightarrow{Pt} N_2 + 3H_2$

As reaction is zero order

Rate = $k[NH_3]^0$

Rate = k

$$\text{Rate} = \frac{-1}{2}\frac{\Delta[NH_3]}{\Delta t} = \frac{1}{3}\frac{\Delta[H_2]}{\Delta t} = k$$

$$\frac{\Delta H}{\Delta t} = 3k$$

$= 3 \times 2.5 \times 10^{-4}$

$= 7.5 \times 10^{-4}$ mol L^{-1} s^{-1}

(A) Zero (B) One

(C) Two (D) Three

Answer (B)

Sol. Only one reacting species is involved, therefore it is a unimolecular reaction.

Question ID 6926413

Which of the following is not the Characteristic of Physisorption?

(A) It arises because of vander Waals forces.

(B) It is not specific in nature

(C) Enthalpy of adsorption is high

(D) It results into multi molecular layers on adsorbent surface under high pressure

Answer (C)

Sol. In physisorption enthalpy of adsorption is low (20-40 kJ mol^{-1}) whereas in case of chemisorption enthalpy of adsorption is high (80 – 240 $kJmol^{-1}$)

Question ID 6926414

Which one of the following is an emulsion?

(A) Smoke

(B) Hair cream

(C) Paint

(D) Cheese

Answer (B)

Sol.

Example	Type of Emulsion
Smoke	Aerosol
Hair Cream	Emulsion
Paint	Sol
Cheese	Gel

Question ID 6926415

Question ID:6926412

The molecularity of the following elementary reaction is

$NH_4NO_2 \rightarrow N_2 + 2H_2O$

Caprolactam is the starting material for

(A) Nylon 6, 6

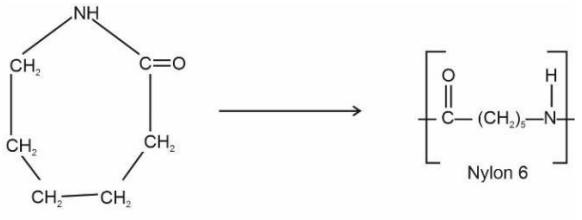
(B) Nylon 6

(C) Nylon 2, 6

(D) Dacron

Answer (B)

Sol.



Caprolactam

Question ID 6926416

Which of the following is a positively charged sol?

(A) Starch (B) Gum

(C) Gold sol (D) Blood

Answer (D)

Sol. Blood is a positively charged colloid whereas sols of starch, gum & gold are negatively charged.

Question ID 6926417

Match list I with list II

List I		List II	
A.	Siderite	(I)	Aluminium
B.	Malachite	(II)	Iron
C.	Calamine	(III)	Copper
D.	Bauxite	(IV)	Zinc

Choose the correct answer from the options given below

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

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

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

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

Answer (B)

Sol. Correct Match of ore & its composition is :

Ore	Compositions
Siderite	$FeCO_3$
Malachite	$CuCO_3.Cu(OH)_2$
Calamine	$ZnCO_3$
Bauxite	$AlO_x(OH)_{3-2x}$
	Where $0 < x < 1$

So, correct Answer is

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

Question ID 6926418

The metal refined by Van Arkel method is

(A) Ni (B) Zr

(C) Cu (D) Sn

Answer (B)

Sol. Zirconium (Zr) or Titanium (Ti) is refined using van Arkel method. This method is very useful for

removing all the oxygen and nitrogen present in the form of impurity in metals like Zr and Ti.

Question ID: 6926419

Arrange the following hydrides in increasing order of thermal stability.

A. H_2O

B. H_2Se

C. H_2Po

D. H_2Te

E. H_2S

Choose the correct answer from the options given below:

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

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

Answer (B)

Sol. Thermal stability of group-16 hydrides decreases from H_2O to H_2Po due to decrease in bond dissociation energy.

So, correct order of thermal stability is:

$H_2O > H_2S > H_2Se > H_2Te > H_2Po$

Question ID: 6926420

Match list I with list II

List I	List II
A. Ammonia	I. Ostwald's process
B. Chlorine	II. Contact process
C. Sulphuric Acid	III. Deacon process
D. Nitric Acid	IV. Haber's process

Choose the correct answer from the options given below:

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

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

Answer (A)

Sol. On a large scale, ammonia (NH_3) is manufactured by Haber's process.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

While, HNO_3 is prepared using Ostwald's method. Sulphuric acid is manufactured by contact process and Cl_2 is manufactured by Deacon's process

Question ID: 6926421

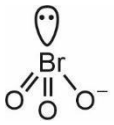
The formula of a noble gas species which is isostructural with BrO_3^- is:

(A) $XeOF_4$ (B) XeF_2

(C) XeO_3 (D) XeF_4

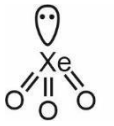
Answer (C)

Sol. In BrO_3^- ion, Br has sp^3 hybridisation



Trigonal pyramidal

In XeO_3, Xe has sp^3 hybridisation.



Trigonal pyramidal

Question ID: 6926422

Match list I with list II

List I (Transition Metals)	List II (Maximum Oxidation State)
A. Ti	I. 7
B. V	II. 4
C. Mn	III. 5
D. Cu	IV. 2

Choose the correct answer from the options given below:

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

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

Answer (A)

Sol. Outer electron configuration of Ti = $3d^2 4s^2$

So, Maximum O.S. of Mn = +7

Outer E.C. of Cu = $3d^{10}4s^1$

So, Maximum O.S. of Cu = +2

So, correct option is : A-II, B-III, C-I, D-IV

Question ID: 6926423

The metal from first transition series having positive $E^o_{M^{2+}/M}$ value :

(A) Cr (B) V

(C) Cu (D) Ni

Answer (C)

Sol. Cu has positive $E^{o\ Cu^{2+}/Cu}$ value in 3*d* series.

$E^o_{Cu^{2+}/Cu} = 0.34$ V

$E^o_{Cr^{2+}/Cr} = -0.90$ V

$E^o_{V^{2+}/V} = -1.18$ V

$E^o_{Ni^{2+}/Ni} = -0.25$ V

Question ID: 6926424

Magnetic moment of a divalent ion in aqueous solution of an element with atomic number 25 is:

(A) 2.84 BM (B) 3.87 BM

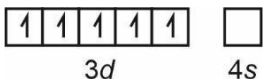
(C) 4.90 BM (D) 5.92 BM

Answer (D)

Sol. Atomic number (z = 25) belongs to Mn atom

E.C. of Mn = $[Ar]3d^5 4s^2$

E.C. of Mn^{2+} ion = $[Ar]3d^5 4s^\circ$



$\mu = \sqrt{n(n+2)}$ BM,

So, Maximum O.S. of Ti = +4

Outer E.C. of V = $3d^3 4s^2$

So, Maximum O.S. of V = +5

Outer E.C. of Mn = $3d^5 4s^2$

Number of unpaired electrons = 5

$\mu =$ $=$ BM $\sqrt{5(5+2)}$ $\sqrt{35}$

$\boxed{\mu = 5.92 \text{ BM}}$

Question ID: 6926425

Which one of the following transition metal ion iscolourless?

(A) Sc^{3+} (B) V^{2+}

(C) Mn^{2+} (D) Co^{3+}

Answer (A)

Sol. In general species having no unpaired electron is colourless. So Sc^{3+} has electronic configuration [Ar] $3d^0 4s^0$

So, it is colourless ion.

Question ID: 6926426

Among the following statements, choose thecorrect statements.

A. SN^2 reaction proceeds with stereo chemical inversion.

B. The process of conversion of Racemic mixture into enantiomer is known as Racemisation

C. A mixture containing 2 enantiomers in equal proportions is known as Racemic mixture.

D. The stereoisomers related to each other as superimposable mirror image are called enantiomers.

E. The objects which are non-superimposable on their mirror image are said to be chiral and this properly is known as chirality.

Choose the correct answer from the options given below :

(A) A, B and C only

(B) A, C and E only

(C) B, C and E only

(D) C, D and E only

Answer (B)

Sol. S_N2 reaction proceeds with stereo chemical inversion.

The process of conversion of enantiomer into Racemic mixture is known as Racemisation. A mixture containing 2 enantiomers in equal proportions is known as Racemic mixture.

The stereoisomers related to each other as superimposable mirror image are identical with each other.

The object which are non-superimposable on their mirror image are said to be chiral and this property to known as chirality.

So, only A, C & E are correct statement.

Question ID: 6926427

IUPAC name of neopentyl chloride is

(A) 1-Chloro – 2, 2-dimethylpropane

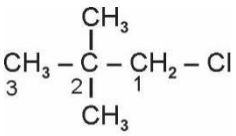
(B) 2-Chloro – 1, 2-dimethylpropane

(C) 2-Chloro – 2 – Methylbutane

(D) 2-Chloro – 2 – Methylpentane

Answer (A)

Sol.

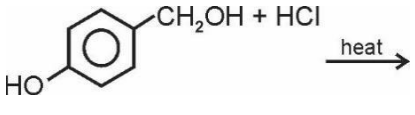


(neopentyl chloride)

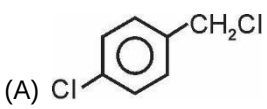
1-chloro-2, 2-dimethylpropane

Question ID: 6926428

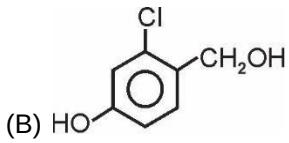
The structure of major monohalo product in the following reaction is _____



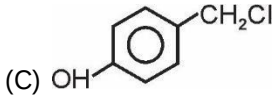
(A)



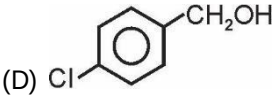
(B)



(C)

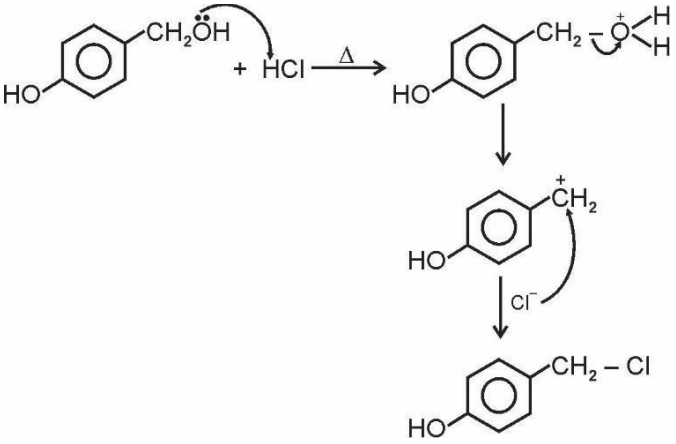


(D)



Answer (C)

Sol.



- sp^3 hybridized carbon atom show fast nucleophilic substitution reaction than sp^2 hybridized carbon atom.

Question ID: 6926429

Among the following statements, choose thecorrect statements.

A. Boiling point of alcohols increases with increase in the number of carbon atoms.

B. In alcohols, boiling points increases with increase of branching in carbon chain.

C. Boiling points of alcohols are lesser in comparison to haloalkanes of comparable molecular mass.

D. Boiling points of alcohols are higher in comparison to hydrocarbons of comparable molecular mass.

E. The high boiling points of alcohols are mainly due to the presence of intramolecular hydrogen bonding.

Choose the correct answer from the options given below

(A) A, D and E only

(B) A, B and C only

(C) B, C and D only

(D) C, D and E only

Answer (A)

Sol.

- The boiling points of alcohols increase with increase in the number of carbon atoms (increase in van der Waals forces). In alcohols, the boiling points decrease with increase of branching in carbon chain (because of decrease in van der Waals forces with decrease in surface area)
- Boiling point of alcohols is more in comparison to hydrocarbons of comparable molecularmass due to intermolecular hydrogen bonding.
- Boiling point of alcohols are higher in comparison to other classes of compounds, namely hydrocarbons, ether, haloalkanes and haloarenes of comparable molecular masses.

Note : In statement E, we have to consider inter molecular hydrogen bonding instead of intramolecular hydrogen bonding.

Question ID: 6926430

Arrange the following compounds in increasing order of their acid strength :

A. Propan-1-ol

B. 3-nitrophenol

C. 3, 5-dinitrophenol

D. Phenol

E. 4-Methylphenol

Choose the correct answer from the options given below :

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

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

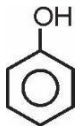
(C) A < B < C < D < E

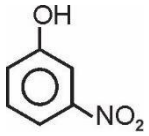
(D) A < E < D < B < C

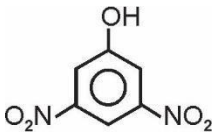
Answer (D)

Sol.

- More electron withdrawing group attached with alcohols or phenols, more will be the acidity

A. $CH_3–CH_2–CH_2–OH$ D. 

B.  E. 

C. 

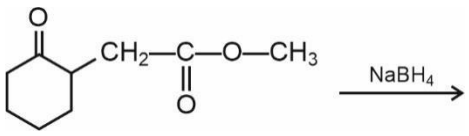
- Alkyl groups show +I effect and $–NO_2$ group show –M effect

Order of acids strength

C > B > D > E > A

Question ID:6926431

The structure of the product of the following reaction is:



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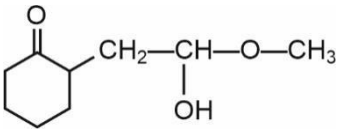
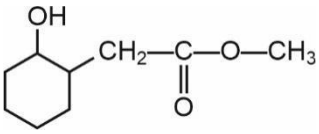
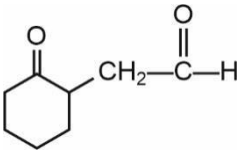
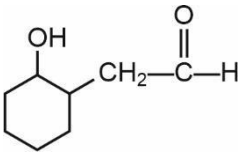
(A) 

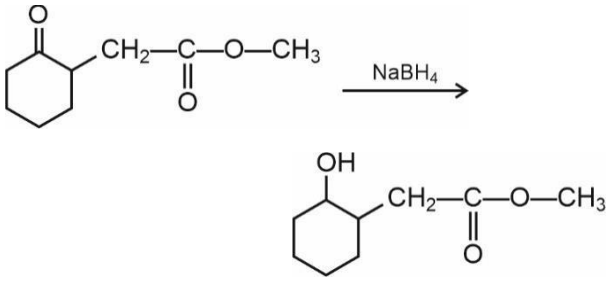
(B) 

(C) 

(D) 

Answer (B)

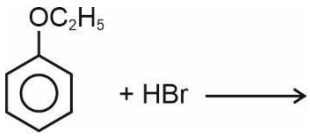
Sol.

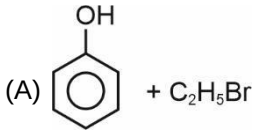
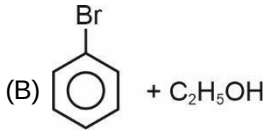


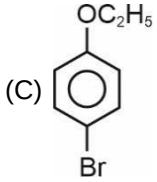
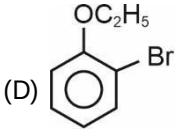
$NaBH_4$ can reduce aldehyde and ketone functional groups into primary and secondary alcohol respectively.

Question ID:6926432

The Product of the following reaction is:

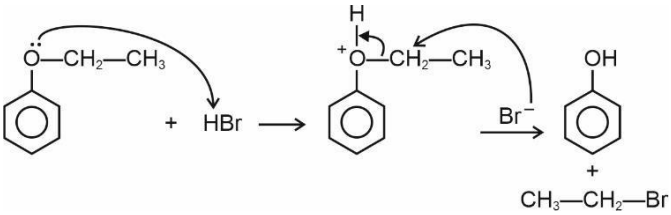


(A)  (B) 

(C)  (D) 

Answer (A)

Sol.



Question ID:6926433

Amino acid in Zwitter ionic form show

(A) Acid Behaviour

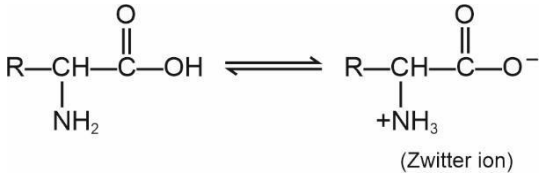
(B) Basic Behaviour

(C) Amphoteric Behaviour

(D) Neutral Behaviour

Answer (C)

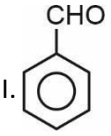
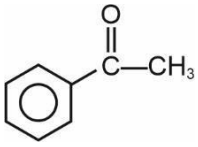
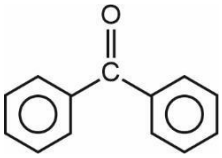
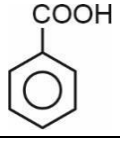
Sol. In Zwitter ionic form, amino acids show amphoteric behaviour as they react both with acids and bases.



(Zwitter ion)

Question ID:6926434

Match List-I with List-II

List-I (Nomenclature)	List-II (Structure)
1. Acetophenone	I. 
2. Benzaldehyde	II. 
3. Benzoic acid	III. 
4. Benzophenone	IV. 

Choose the correct answer from the options given below:

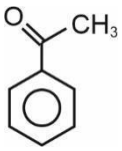
(A) 1 – III, 2 – I, 3 – II, 4 – IV

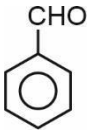
(B) 1 – II, 2 – I, 3 – IV, 4 – III

(C) 1 – I, 2 – II, 3 – III, 4 – IV

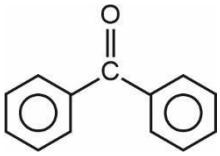
(D) 1 – IV, 2 – III, 3 – II, 4 – I

Answer (B)

Sol. 1. Acetophenone 

2. Benzaldehyde 

3. Benzoic acid 

4. Benzophenone 

Question ID:6926435

Which simple chemical test is used to distinguish between ethanal and propanal?

(A) Iodoform test (B) Tollen's test

(C) Fehling's test (D) Lucas test

Answer (A)

Sol. $CH_3CHO \xrightarrow[NaOH]{I_2} \underset{\text{Yellow Precipitate}}{CHI_3} + HCOONa^{\oplus}$

$CH_3CH_2CHO \xrightarrow[NaOH]{I_2}$ No characteristic change

Ethanal gives positive iodoform test.

Question ID: 6926436

Which of the following compound would undergo Aldol condensation?

(A) Methanal (B) Benzaldehyde

(C) 2, 2-Dimethylbutanal (D) Phenylacetaldehyde

Answer (D)

Sol. Aldehydes which contain at least 2α hydrogen atoms, undergo Aldol condensation reaction Phenylacetaldehyde contains 2α hydrogen atoms and undergoes Aldol condensation reaction in presence of dilute alkali.

$$\underset{\text{Phenylacetaldehyde}}{Ph-CH_2-CHO} \xrightarrow[\Delta]{\text{dil. NaOH}} PhCH_2CH=C(CHO)(Ph)$$

Question ID: 6926437

Among the following statements choose the correct statements.

A. Analgesics reduce or abolish pain without causing impairment of consciousness, mental confusion.

B. Tranquilizers are neurological inactive drugs.

C. Morphine is the example of non-narcotic analgesics.

D. Disinfectants are applied to inanimate objects whereas antiseptics are applied to the living tissues.

E. Same substance can act as an antiseptic as well as disinfectant by varying theconcentration

Choose the correct answer from the options given below:

(A) A, D and E only

(B) B, C and D only

(C) A, C and E only

(D) B, C and E only

Answer (A)

Sol. Tranquilizers are neurologically active drugs.

Morphine is an example of narcotic analgesic.

Question ID: 6926438

Out of the following artificial sweetening agents, which one has highest sweetness value in comparison to cane sugar?

(A) Saccharin (B) Alitame

(C) Sucralose (D) Aspartame

Answer (B)

Sol.

Artificial Sweetener	Sweetness value in comparison to cane sugar
Saccharin	550
Alitame	2000
Sucralose	600
Aspartame	100

Question ID: 6926439

Among the following polymers, which one is the copolymer?

(A) Polypropene

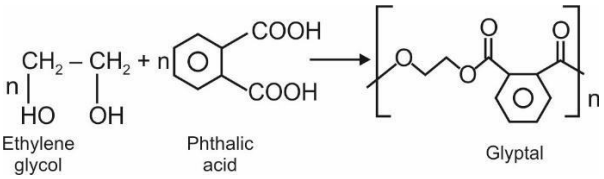
(B) Polystyrene

(C) Polyvinyl chloride

(D) Glyptal

Answer (D)

Sol. A copolymer is formed by the polymerisation reaction in which a mixture of more than one monomeric species is allowed to polymerise.



Question ID: 6926440

Among the following, which one is a disaccharide?

(A) Glucose

(B) Glycogen

(C) Maltose

(D) Starch

Answer (C)

Sol. Disaccharides are formed by the glycosidic linkage of two monosaccharide units.

Maltose is a disaccharide which is composed of two a-D-glucose units.

Question ID:6926441

Structure of ammonium salt when ethylamine reacts with one mole of HCl:

(A) $C_2H_5 - NH_3^+Cl^-$ (B) $(C_2H_5)_2 - NH_2^+Cl^-$

(C) $(C_2H_5)_3 - NH^+Cl^-$ (D) $(C_2H_5)_4 - N^+Cl^-$

Answer (A)

Sol. $CH_3CH_2 - NH_2 + HCl \longrightarrow CH_3CH_2\overset{\oplus}{N}H_3\overset{\ominus}{Cl}$

Question ID:6926442

Among the following amines, which one is most basic (in aqueous solution)?

(A) NH_3 (B) $C_2H_5NH_2$

Sol. Based on inductive effect, solvation effect, and steric hindrance of the alkyl group in aqueous medium the basic strength order of the amines is:

$(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2 > NH_3$

Question ID:6926443

The correct order of basicity of amines in gas phase

(A) 1° < 3° < 2° (B) 3° < 1° < 2°

(C) 2° < 3° < 1° (D) 1° < 2° < 3°

Answer (D)

Sol. More is the substitution in amine, more is +I effect hence more will be the basic strength. The correct order of basic strength: 3° > 2° > 1°

Question ID:6926444

Among the following, which one has the highest pK_b value?

(A) $C_2H_5NH_2$

(B) $C_6H_5NHCH_3$

(C) $(C_2H_5)_2NH$

(D) $C_6H_5NH_2$

Answer (D)

Sol. Higher is the value of pK_b, weaker is the basic strength. Lone pair of electron of nitrogen in amine (aniline) is involved in delocalization and hence its availability for protonation is minimum. It is least basic among the given options hence its pK_b is highest.

Question ID:6926445

Among the following, which one has the highest K_b value?

(A) $C_2H_5NH_2$ (B) $C_6H_5N(CH_3)_2$

(C) $(C_2H_5)_2NH$ (D) CH_3NH_2

Answer (C)

$_5)_2NH$ (D) $(C_2H_5)_3N$

(

Answer (C)

)

(

C

2

H

Sol.

ue.

- More the basic nature of amine, more will be the K_b value.
- Basic nature

$(C_2H_5)_2NH > C_2H_5NH_2 > CH_3NH_2 > C_6H_5N(CH_3)_2$

K_b : 10^{-3} $10^{-3.29}$ $10^{-3.38}$ $10^{-8.92}$

Passage:

According to the valence bond theory, the metal atom or ion under the influence of ligands can use its (n-1)d, ns, np, nd orbitals for hybridisation to yield a set of equivalent orbitals of definite geometry. These hybridised orbitals are allowed to overlap with ligand orbitals that can donate electron pairs for bonding. It is usually possible to predict the geometry of a complex from the knowledge of its magnetic behaviour on the basis of the valence bond theory. Consider the formation of $[Co(NH_3)_5Cl]Cl_2$ and answer the following question:

Questions ID : 6926446

The IUPAC name of the above coordination entity is

(A) Chloridopentaamminecobaltate(II) chloride

(B) Chloridopentaamminecobaltate(II) dichloride

(C) Pentaamminechloridocobalt (III) chloride

(D) Pentaamminechloridocobalt (III) dichloride

Answer (C)

Sol. $[Co(NH_3)_5Cl]Cl_2$: Pentaamminechloridocobalt (III) chloride

Questions ID : 6926447

The spin only magnetic moment of the complex $[Co(NH_3)_5Cl]Cl_2$ in BM is

(A) 1.7 (B) 0.0

(C) 3.8 (D) 4.9

Answer (B)

Sol. Due to high charge density on Co^{3+} and presence of strong field ligand (NH_3), electrons in *d*-orbitals will pair up so unpaired electron (n) will be zero.

$\therefore$ Spin only magnetic moment = $\sqrt{n(n+2)}$ BM

= 0

Questions ID : 6926448

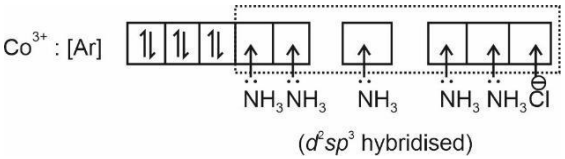
The hybridization of cobalt in the above coordination entity is

(A) sp^3d^2 (B) d^2sp^3

(C) sp^3d (D) dsp^3

Answer (B)

Sol. $[Co(NH_3)_5Cl]Cl_2 \Rightarrow Co^{3+} : [Ar]3d^6 4s^0 4p^0$



Questions ID : 6926449

The coordination number of cobalt in the above coordination entity is

(A) 2 (B) 4

(C) 5 (D) 6

Answer (D)

Sol. $[Co(NH_3)_5Cl]Cl_2$

Coordination number = total number of donating sites = 5 + 1 = 6

Questions ID : 6926450

The primary valence of Co in above coordination entity is

(A) 1 (B) 2

(C) 3 (D) 4

Answer (C)

Sol. $[Co(NH_3)_5Cl]Cl_2 : x + 5(0) + 3(-1) = 0$

$\Rightarrow x = +3 \Rightarrow Co^{3+}$

Primary valence = oxidation state of central metal

= + 3