CUET 2022 Chemistry Solutions

Question ID: 692641
Q. Among the following statements, choose the correct 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, 0 & E only

Solutions: The correct answer is: **A, C & D only**

Explanation:
A. In ionic solids, ions are indeed the constituent particles. Ionic solids are composed of positively charged cations and negatively charged anions held together by electrostatic forces.
B. Ionic solids are typically not soft. They tend to have high melting points and are often hard and brittle.
C. Ionic solids are electrical insulators in the solid state. The ions in an ionic solid are fixed in a lattice structure, and they are not free to move and conduct electricity.
D. Ionic solids can conduct electricity in the molten state or when dissolved in a suitable solvent. In these states, the ions become mobile and can carry electric charge.
E. Ionic solids generally have high melting and boiling points due to the strong electrostatic forces between the ions in the lattice.

Question ID: 692642

Q. Atoms of element B form help lattice and those of the element A occupy 2/3 rd 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

Solutions:

The correct formula of the compound formed by the elements A and B in this scenario is A4B3.

In a hcp (hexagonal close-packed) lattice, there are two tetrahedral voids per unit cell. Since the atoms of element A occupy 2/3 of the tetrahedral voids, we can assume that there are 2 atoms of A for every 3 atoms of B.

Therefore, the correct formula would be A4B3. Option **(b) A_4B_3** matches the correct formula.

Question ID: 692643

Q. Consider the 1M 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:

1) B < C < D < E < A
2) A < E < D < C < B
3) A < B < C < D < E
4) E < D < C < B < A

Solutions:
To determine the order of elevation in boiling points for the given compounds, we need to consider the nature of the solute and its effect on the boiling point of the solvent.

The elevation in boiling point is directly related to the concentration of the solute in the solution. The greater the concentration, the greater the elevation in boiling point.

Here are the given compounds and their corresponding concentrations in a 1M aqueous solution:

A. $C_6H_{12}O_6$ (glucose) - 1 M concentration
B. NaCl - 1 M concentration
C. $MgCl_2$ - 1M concentration
D. D. $AlCl_3$ - 1 M concentration
E. $Al_2(SO_4)_3$ - 1 M concentration

Among these compounds, the one that dissociates into the highest number of ions in solution will have the greatest effect on the boiling point elevation.

The dissociation of the compounds in water is as follows:

A. $C_6H_{12}O_6$ → Does not dissociate into ions
B. NaCl → Na+ + Cl-
C. $MgCl_2$ → Mg_2+ + 2Cl-
D. $AlCl_3$ → Al_3+ + $_3$Cl-
E. $Al_2(SO_4)_3$ → 2Al_3+ + 3SO_4^2-

As we can see, compound B (NaCl) dissociates into two ions (Na+ and Cl-), while compounds C ($MgCl_2$), D ($AlCl_3$), and E ($Al_2(SO_4)_3$) dissociate into three ions. Compound A ($C_6H_{12}O_6$) does not dissociate into ions.

Therefore, the order of elevation in boiling points from lowest to highest is:

A < B < C < D < E

Hence, the correct answer is:
(3) A < B < C < D < E

Question ID: 692645

Q. 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:

1) A, B and C only
2) B, C and D only
3) B, C and E only
4) **A, D and E only**

Solutions:

The correct answer is option 4) A, D, and E only.

A. Ionic conductance depends on the nature of electrolyte: This statement is correct. The nature of the electrolyte affects the mobility of ions, which in turn affects the ionic conductance.

B. Ionic conductance is due to the movements of electrons: This statement is incorrect. Ionic conductance is due to the movement of ions, not electrons. In ionic compounds, electrons are not mobile and do not contribute to ionic conductance.

C. Ionic conductance is also called electronic conductance: This statement is incorrect. Ionic conductance and electronic conductance are different concepts. Ionic conductance refers to the movement of ions, while electronic conductance refers to the movement of electrons.

D. Ionic conductance depends on temperature: This statement is correct. The conductance of ions in a solution generally increases with temperature due to the increase in molecular motion and ion mobility.

E. Ionic conductance also depends on the nature of the solvent: This statement is correct. The nature of the solvent can affect the solvation of ions and, consequently, their mobility and conductance.

Therefore, the correct answer is option A, D, and E only.

Question ID: 692648

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

1) $NaCl_2$
2) NaO_2
3) **H_2Cl_2**
4) H_2O_2

Solutions:

During the electrolysis of an aqueous NaCl (sodium chloride) solution, the following reactions occur at the cathode and the anode:

At the Cathode (Negative Electrode):
$2H_2O + 2e^- \rightarrow H_2 + 2OH^-$

Hydrogen gas (H_2) is produced at the cathode.

At the Anode (Positive Electrode):
$2Cl^- \rightarrow Cl_2 + 2e^-$

Chlorine gas (Cl_2) is produced at the anode.

Therefore, the correct products formed at the cathode and anode during the electrolysis of an aqueous NaCl solution are H_2 (hydrogen gas) and Cl_2 (chlorine gas), respectively.

Among the given options:
- $NaCl_2$is not formed.
- NaO_2 (sodium superoxide) is not formed.
- H_2Cl_2 (dichlorine gas) is not formed.
- H_2O_2 (hydrogen peroxide) is not formed.

So, the correct answer is:
The product formed at the cathode is H_2 (hydrogen gas).
The product formed at the anode is Cl_2 (chlorine gas).

Question ID: 692649
Q.The artificial sweetener used only for cold food is

1) Alitame
2) Sucralose
3) Aspartame
4) **Saccharin**

Solutions:

The artificial sweetener used only for cold food is Saccharin. Saccharin is a high-intensity sweetener that is commonly used in cold food and beverages. It has been approved for use as a food additive and is known for its intense sweetness. Alitame, Sucralose, and Aspartame are also artificial sweeteners but they can be used in both hot and cold food.

Question ID: 6926411
Q.The decomposition of NH_3 on the platinum surface is zero order reaction. If k = 2 .5 10^-4 mol L^-1 s^-1 the rate of production of H_2 is

1) **2.5 . 10^-4 mol L^-1 s^-1**
2) 7 .5 x 10^-4 molL^-1 s^-1
3) 5.0 x 10^-4 mol L^-1 s^-1
4) 10.0 x 10^-4 mol L^-1 s^-1

Solutions:
In a zero-order reaction, the rate of the reaction is independent of the concentration of the reactant. The rate equation for a zero-order reaction can be written as:

rate = k

Given that the rate constant (k) is 2.5 × 10^(-4) mol L^(-1)s^(-1), the rate of production of H2 in this reaction is also equal to the rate constant (k).

Therefore, the rate of production of H2 is 2.5 × 10^(-4) mol L^(-1)s^(-1).

So, the **correct answer is 2.5 × 10^(-4) mol L^(-1)s^(-1).**

Question ID: 6926412

Q.The molecularity of the following elementary reaction is NH_4NO_2, → N_2 + $2H_20$

1) Zero
2) **One**
3) Two
4) Three

Solutions:

The molecularity of a reaction refers to the number of molecules or species involved in an elementary reaction, and it is determined by the reaction's rate equation.

In the given elementary reaction: NH_4NO_2, → N_2 + $2H_20$

We can see that NH4NO2 decomposes to form N_2 and $2H_2O$ molecules. Since only one molecule (NH_4NO_2) is involved in the reaction, the molecularity of this elementary reaction is one.

Therefore, the correct answer is One.

Question ID: 6926413

Q.Which of the following is not the characteristic of physisorption?

1) It arises because of vander Waals forces.
2) It is not specific in nature.
3) **Enthalpy of adsorption is high.**
4) It results in multimolecular layers on adsorbent surfaces under high pressure.

Solutions:

The characteristic of physisorption that does not hold true is:

Enthalpy of adsorption is high.

Physisorption, also known as physical adsorption, is characterized by weak intermolecular forces such as van der Waals forces. These forces are relatively weak, resulting in a low enthalpy of adsorption compared to chemisorption. Chemisorption involves stronger chemical bonds and exhibits higher enthalpies of adsorption.

Therefore, the characteristic that does not apply to physisorption is that the enthalpy of adsorption is high.

Question ID: 6926414

Q.Which one of the following is an emulsion?

1) Smoke
2) **Hair cream**
3) Paint
4) Cheese

Solutions:

Among the options provided, the one that is an emulsion is Hair cream.

An emulsion is a mixture of two immiscible liquids, typically one being water-based and the other being oil-based, stabilized by an emulsifying agent. In the case of hair cream, it is typically a mixture of water and oils or fats along with other ingredients such as conditioning agents, fragrances, and preservatives. These ingredients form an emulsion to create a smooth and creamy consistency for application to the hair.

Smoke, paint, and cheese are not examples of emulsions. Smoke consists of small particles suspended in air and does not involve the mixing of immiscible liquids. Paint is a dispersion of pigment particles in a liquid binder, but it is not typically classified as an emulsion. Cheese is a product made by coagulating milk proteins and does not involve the formation of an emulsion.

Therefore, among the options provided, hair cream is the example of an emulsion.

Question ID: 6926415

Q.Caprolactam is the starting material for

1) Nylon 6,6
2) **Nylon 6**
3) Nylon 2,6
4) Dacron

Solutions:
Caprolactam is the starting material for Nylon 6.

Nylon 6 is a synthetic polyamide that is produced by the polymerization of caprolactam. Caprolactam undergoes a ring-opening polymerization reaction to form the polymer chain of Nylon 6. Nylon 6 has a structure consisting of a single type of monomer unit, which is caprolactam.

Nylon 6,6, on the other hand, is made from two monomers: adipic acid and hexamethylenediamine. It is called Nylon 6,6 because both monomers have six carbon atoms in their structure.

Nylon 2,6 and Dacron are different types of synthetic fibers but are not directly derived from caprolactam.

Therefore, **caprolactam is the starting material specifically for Nylon 6.**

Question ID: 6926416
Q.Which of the following is a positively charged Sol?

1) Starch
2) Gum
3) **Gold Sol**
4) Blood

Solutions:

The **positively charged sol among the options provided is Gold Sol.**

Gold Sol, also known as colloidal gold, is a sol where gold nanoparticles are dispersed in a liquid medium. In certain conditions, gold nanoparticles can acquire a positive

charge, resulting in a positively charged sol. The charge on the gold nanoparticles can be controlled by adjusting the pH and the presence of stabilizing agents.

Starch, gum, and blood are not typically associated with having a positive charge. Starch is a polysaccharide, gum is a hydrocolloid, and blood is a complex mixture of cells, proteins, and other components.

Therefore, among the options given, Gold Sol is the positively charged sol.

Question ID: 6926417
Q.Match list I with list II

List I - A.) Siderite B.) Malachite C.) Calamine D.)Bauxite

List II - I.) Aluminium II.) Iron III.) Copper IV.) Zinc

Choose the correct answer from the options given below:

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

Solutions:

The correct matching of List I with List II is as follows:

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

Therefore, the correct answer is:

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

Question ID: 6926418

Q.The metal refined by Van Arkel method is

1) Ni
2) **Zr**
3) Cu
4) Sn

Solution:

The metal refined by the Van Arkel method is Zirconium (Zr).

The Van Arkel method, also known as the iodide process, is a technique used for the purification and isolation of certain metals, particularly reactive and high-melting-point metals. In this method, the metal is converted into a volatile metal iodide compound, which can then be decomposed to obtain pure metal.

Zirconium (Zr) is one of the metals that can be refined using the Van Arkel method. It involves the formation of zirconium tetraiodide (ZrI4) as a volatile compound, which is then decomposed to obtain pure zirconium metal.

Therefore, the correct answer is Zr (Zirconium).

Question ID: 6926419

Q.Arrange the following hydrides in increasing order of thermal stability.

A.) H_2 0
B.) H_2Se
C.) H_2Po
D.) H_2Te
E.) H_2S

Choose the correct answer from the options given below:

1) A<B<C<D<E
2) C<D<B<E<A
3) **C<D<E<B<A**
4) A<E<B<D<C

Solution:

The increasing order of thermal stability among the given hydrides is:

C.) H2Po
D.) H2Te
E.) H2S
B.) H2Se
A.) H2O

Therefore, the correct answer is C < D < E < B < A.

H2Po (Hydrogen Polonium) is the most thermally stable hydride among the options given.
H2Te (Hydrogen Telluride) is less thermally stable than H2Po.
H2S (Hydrogen Sulfide) is less thermally stable than H2Te.
H2Se (Hydrogen Selenide) is less thermally stable than H2S.
H2O (Water) is the least thermally stable among the options given.

So, the correct answer is C < D < E < B < A.

Question ID: 6926420
Q.Match list I with list II

List I - A.) Ammonia B.) Chlorine C.) Sulphuric Acid D.) Nitric Acid

List II - I.) Ostwald's process II.) Contact process III.) Deacon process IV.) Haber's process

Choose the correct answer from the options given below:

1) **A-IV, B-III, C-II,D-I**
2) A-IV, B-I, C-II,D-III
3) A-IV, B-III, C-I,D-II
4) A-IV, B-I, C-III,D-II

Solution:

The correct match between List I and List II is:

A-IV (Ammonia) matches with Haber's process (I)
B-III (Chlorine) matches with Deacon process (II)
C-II (Sulphuric Acid) matches with Contact process (III)
D-I (Nitric Acid) matches with Ostwald's process (IV)

Therefore, the correct answer is:
A-IV, B-III, C-II, D-I

Question ID: 6926421
Q.The formula of a noble gas species which is isostructural with BrO_3^- is :

1) $XeOF_4$
2) XeF_2,
3) **XeO_3**
4) XeF_4

Solution:

The formula of a noble gas species which is isostructural with BrO3- is **XeO_3**.

Question ID: 6926422
Q.Match list I with list II

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

Choose the correct answer from the options given below:

1) **A- II, B-III, C-I, D-IV**
2) A-I, B -II, C-III, D-IV
3) A-III, B-I, C-II, D-IV
4) A-II, B-I, C-III. D-IV

Solution:
The maximum oxidation state of the elements are

Ti - +4
V - +5
Mn - +7
Cu - +2

Therefore, the correct answer is: **A- II, B-III, C-I, D-IV**

Question ID: 6926424
Q.Magnetic moment of a divalent ion in aqueous solution of an element with atomic number 25 is :

1) 2.84 BM
2) 3.87 BM
3) 4.90 BM
4) **5.92 BM**

Solution:

The atomic number 25 corresponds to the element Manganese (Mn).

The magnetic moment of a divalent ion in an aqueous solution can be calculated using the formula:

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

Where:
μ = magnetic moment
n = number of unpaired electrons

For a divalent ion of Mn^{2+} (Manganese in the +2 oxidation state), we need to determine the number of unpaired electrons.

In the case of Mn^{2+}, it has a d^5 electron configuration, which means there are 5 electrons in the d orbital. Following Hund's rule, we can distribute these electrons in the d orbitals in such a way that maximizes the number of unpaired electrons. Therefore, Mn^{2+} has 5 unpaired electrons.

Substituting the value of n = 5 into the formula, we have:

μ = √5(5+2) BM
μ = √35 BM
μ ≈ 5.92 BM

Therefore, the correct answer is 5.92 BM.

Question ID: 6926425
Q.Which one of the following transition metal ion is colorless?

1) **Sc^3+**
2) V^2+
3) Mn^2+
4) Co^3+

Solution:

The transition metal ion that is colorless among the options given is Sc^3+ (Scandium in the +3 oxidation state).

Scandium (Sc) is known to have a colorless ion in its +3 oxidation state. Transition metal ions often exhibit colors due to the presence of partially filled d orbitals, which can absorb certain wavelengths of light and give rise to colored compounds. However, Scandium has an electron configuration of [Ar] 3d^0, meaning it does not have any partially filled d orbitals in its +3 oxidation state. As a result, Sc^3+ ions do not exhibit any characteristic color and appear colorless.

Therefore, the correct answer is Sc^3+.

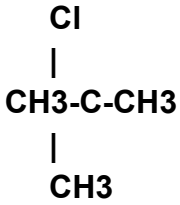
Question ID: 6926427
Q.IUPAC name of neopentyl chloride is

1) **1-Chloro-2, 2-dimethylpropane**
2) 2-Chloro-1, 2-dimethylpropane
3) 2-Chloro-2-Methylbutane
4) 2-Chloro-2-Methylpentane

Solution:

The IUPAC name of neopentyl chloride is 2-Chloro-2,2-dimethylpropane.

The structure of neopentyl chloride is:



According to the IUPAC nomenclature rules, we start numbering from the end closest to the functional group, which in this case is the chlorine atom. The chlorine atom is attached to the carbon atom at the second position. The longest carbon chain in the compound is 3 carbons, and it is a propane.

Therefore, the correct IUPAC name for neopentyl chloride is **2-Chloro-2,2-dimethylpropane.**

Question ID: 6926429

Q. Among the following statements, choose the correct 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:

1) **A, D and E only**
2) A, B and C only
3) B, C and D only
4) C, D and E only

Solution:

The correct answer is:

A, D, and E only.

Explanation:
A. Boiling point of alcohols increases with an increase in the number of carbon atoms. This is generally true as the increase in carbon chain length increases the London dispersion forces, leading to higher boiling points.
D. Boiling points of alcohols are higher in comparison to hydrocarbons of comparable molecular mass. This is due to the presence of intermolecular hydrogen bonding in alcohols, which increases the attractive forces between molecules and raises the boiling point.
E. The high boiling points of alcohols are mainly due to the presence of intramolecular hydrogen bonding. The presence of hydrogen bonding within the alcohol molecule itself contributes to the higher boiling points.

Option B and C are incorrect as the statement B is not always true (branching can affect boiling points differently depending on the specific structure) and the statement C is not true as the boiling points of alcohols are generally higher than those of haloalkanes.
Question ID: 6926430
Q. 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:

1) A < B < C < D < E
2) C < B < D < E < A
3) A < B < C < D < E
4) **A < E < D < B < C**

Solution:

The correct answer is:

A < E < D < B < C

Therefore, the correct order of increasing acid strength is **A < E < D < B < C**

Question ID: 6926433
Q.Amino acid in zwitter ionic form show

1) Acid Behaviour
2) Basic Behaviour
3) **Amphoteric Behaviour**
4) Neutral Behavior

Solution:

Amino acids in the zwitterionic form exhibit amphoteric behavior.

Explanation:
In the zwitterionic form, amino acids possess both an acidic functional group (carboxyl group -COOH) and a basic functional group (amino group -NH2). This allows them to react both as acids and bases, depending on the pH of the solution. At low pH, the carboxyl group can donate a proton, acting as an acid. At high pH, the amino group can accept a proton, acting as a base. As a result, amino acids can exhibit both acidic and basic behavior, making them amphoteric.

Question ID: 6926439
Q.Among the following polymers, which one is the copolymer?

1) Polypropene
2) Polystyrene
3) Polyvinyl chloride
4) **Glyptal**

Solution:

The copolymer among the given options is Glyptal.

Question ID: 6926440

Q.Among the following, which one is a disaccharide?

1) Glucose
2) Glycogen
3) **Maltose**
4) Starch

Solution:

Among the options given, **Maltose** is a disaccharide. Glucose, Glycogen, and Starch are polysaccharides.

Question ID: 6926441

Q.The reaction of amines with mineral acids to form ammonium salt shows that these are basic in nature. Amines have an unshared pair of electron on nitrogen atom due to which they behave as lewis base. Basicity of amines is related to their structure. Basic character of an amine depends upon the ease of formation of cation by accepting a proton from the acid. The more stable the cation is relative to the amine, more basic is the amine. Structure of ammonium salt when ethylamine reacts with one mole of HCl?:

1) **C2H5 - NH3+Cl-**
2) (C2H5)2 - NH2+Cl-
3) (C2H5)3 - NH+Cl-
4) (C2H5)4 - N+Cl -

Solution:

The structure of the ammonium salt formed when ethylamine (C2H5NH2) reacts with one mole of HCl is:

C2H5NH3+Cl-

Question ID: 6926442

Q. The reaction of amines with mineral acids to form ammonium salt shows that these are basic in nature. Amines have an unshared pair of electron on nitrogen atom due to which they behave as Lewis base. Basicity of amines is related to their structure. Basic character of an amine depends upon the ease of formation of cation by accepting a proton from the acid. The more stable the cation is relative to the amine. more basic is the amine.

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

1) **NH3**
2) C2H5NH2
3) (C2H5)2NH
4) (C2H5)3N

Solution:

Among the given options, the amine that is most basic in aqueous solution is NH3 (ammonia). NH3 has a lone pair of electrons on the nitrogen atom, which can easily accept a proton from water, resulting in the formation of NH4+ (ammonium ion). The stability of the ammonium ion makes NH3 the most basic amine in aqueous solution.

Question ID: 6926443

Q. The reaction of amines with mineral acids to form ammonium salt shows that these are basic in nature. Amines have an unshared pair of electron on nitrogen atom due to which they behave as Lewis base. Basicity of amines is related to their structure. Basic character of an amine depends upon the ease of formation of cation by accepting a proton from the acid. The more stable the cation is relative to the amine. more basic is the amine.

The correct order of basicity of amines in gas phase:

1) 1° < 3° < 2°
2) 3° < 1° < 2°
3) 2° < 3° < 1°

4) **1° < 2° < 3°**

Solution:

The correct order of basicity of amines in the gas phase is:

1° < 2° < 3°

In general, the basicity of amines increases with the degree of substitution on the nitrogen atom. Primary amines (1°) have one alkyl group attached to the nitrogen atom, secondary amines (2°) have two alkyl groups, and tertiary amines (3°) have three alkyl groups. The presence of more alkyl groups increases electron density on the nitrogen atom, making it more capable of accepting a proton and hence increasing its basicity. Therefore, tertiary amines (3°) are more basic than secondary amines (2°), and secondary amines are more basic than primary amines.

Question ID: 6926444

Q. The reaction of amines with mineral acids to form ammonium salt shows that these are basic in nature. Amines have an unshared pair of electron on nitrogen atom due to which they behave as Lewis base. Basicity of amines is related to their structure. Basic character of an amine depends upon the ease of formation of cation by accepting a proton from the acid. The more stable the cation is relative to the amine. more basic is the amine. Among the following. which one has the highest pKb value?

1) C2H5NH2
2) C6H5NHCH3
3) (C2H5)2NH
4) **C6H5NH2**

Solution:

Among the given options, the amine with the highest pKb value is C6H5NH2 (aniline).

In general, pKb is a measure of the basicity of an amine. A higher pKb value indicates a stronger base and a higher tendency to accept a proton. In this case, aniline (C6H5NH2) has the highest pKb value compared to the other options (C6H5NHCH3 and C2H5NH2).

The presence of an electron-withdrawing group (such as a methyl group) attached to the amino group (NH2) decreases the basicity of the amine. Therefore, C6H5NHCH3 (methyl aniline) would have a lower pKb value compared to C6H5NH2.

Hence, among the given options, C6H5NH2 has the highest pKb value.

Question ID: 6926445

Q.The reaction of amines with mineral acids to form ammonium salt shows that these are basic in nature. Amines have an unshared pair of electron on nitrogen atom due to which they behave as Lewis base. Basicity of amines is related to their structure. Basic character of an amine depends upon the ease of formation of cation by accepting a proton from the acid. The more stable the cation is relative to the amine. more basic is the amine. Among the following. which one has the highest pKb value?

1) **C2H5NH2**
2) C6H5NHCH3
3) C2H5)2NH
4) C6H5NH2

Solution:

To determine the amine with the highest Kb value among the given options, we need to assess their basicity. Higher basicity corresponds to a stronger base and a higher Kb value.

The basicity of an amine can be influenced by various factors, including the presence of electron-withdrawing or electron-donating groups attached to the nitrogen atom.

Among the given options:
1. C2H5NH2 (ethylamine): This is a primary amine without any substituents attached to the nitrogen atom.
2. C6H5NHCH3 (methyl aniline): This is an aniline derivative with a methyl group attached to the amino group.
3. (C2H5)2NH (diethylamine): This is a secondary amine with two ethyl groups attached to the nitrogen atom.
4. C6H5NH2 (aniline): This is a primary aromatic amine without any substituents attached to the amino group.

Generally, primary amines tend to have higher basicity compared to secondary amines. Also, aromatic amines (such as aniline) are typically less basic than aliphatic amines.

Based on these considerations, among the given options, C2H5NH2 (ethylamine) is expected to have the highest Kb value.

Therefore, **C2H5NH2 has the highest Kb value among the given options.**

Question ID: 6926446

Q.According to the valence bond theory, the metal atom or ion under the influence of ligands can use its (11-1)d, ns, np, nd orbitals for hybridisation to yield a set of equivalent orbitals of definite geometry. These hybridized 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 behavior on the basis of the valence bond theory. Consider the formation of [Co (NH3)5 Cl]Cl2, and answer the following question:
The IUPAC name of the above coordination entity is

1) Chloridopentaamminecobaltate (II) chloride
2) Chloridopentaamminecobaltate (II) dichloride
3) Pentaamminechloridocobaltate (III) chloride
4) **Pentaamminechloridocobalt (III) dichloride**

Solution:

The IUPAC name of the coordination entity [Co(NH3)5Cl]Cl2 is:

Chloridopentaamminecobalt(III) chloride

Explanation:
In the complex, there is one chloride ligand coordinated to the central cobalt atom, so the complex is named as "chlorido." The ammonia ligands are named as "ammine." The Roman numeral (III) indicates the oxidation state of the cobalt ion.

Therefore, the correct IUPAC name is **"Chloridopentaamminecobalt(III) chloride."**

Question ID: 6926447

Q.According to the valence bond theory. the metal atom or ion under the influence of ligands can use its (11-1)d. ns. np. nd orbitals for hybridisation to yield a set of equivalent orbitals of definite geometry. These hybridized 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 behavior on the basis of the valence bond theory. Consider the formation of [Co (NH3)5C1] Cl, and answer the following question:

The spin only magnetic moment of the complex [Co(NH3)5C1] C12 in BM is

1) 1.7
2) 0.0
3) **3.8**
4) 4.9

Solution:

To determine the spin-only magnetic moment of the complex [Co(NH3)5Cl]Cl2, we need to consider the number of unpaired electrons on the central cobalt ion.

In the given complex, cobalt (Co) is in its +3 oxidation state, which means it has three fewer electrons than its neutral state. Cobalt has the electronic configuration [Ar] 3d7. The five ammonia (NH3) ligands are neutral and do not contribute any electrons for bonding.

To determine the number of unpaired electrons, we subtract the ligand electrons from the valence electrons of the metal ion. In this case, cobalt has three unpaired electrons.

The spin-only magnetic moment (μs) can be calculated using the formula:

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

where n is the number of unpaired electrons.

Plugging in n = 3 into the formula:

$\mu s = \sqrt{(3(3+2))} = \sqrt{(15)} \approx 3.87$ BM

Therefore, **the spin-only magnetic moment of the complex [Co(NH3)5Cl]Cl2 is approximately 3.87 BM.**

Question ID: 6926448

Q.According to the valence bond theory. the metal atom or ion under the influence of ' ligands can use its (n-1)d. as. np. nd orbitals for hybridisation to yield a set of equivalent orbitals of definite geometry. These hybridized 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 behavior on the basis of the valence bond theory. Consider the formation of [Co (NH3)5C1] Cl, and answer the following question:

The hybridization of cobalt in the above coordination entity is

1) sp3d2
2) d2sp3
3) sp3d
4) **dsp3**

Solution:

The hybridization of cobalt in the coordination entity [Co(NH3)5Cl]Cl is dsp3.

In the complex, cobalt (Co) is surrounded by five ammonia (NH3) ligands and one chloride (Cl) ligand. The coordination number of cobalt is 6, indicating that it forms six bonds with its ligands.

To determine the hybridization of cobalt, we can count the number of ligands and lone pairs around the central metal ion. In this case, there are six ligands (five NH3 and one Cl) and no lone pairs.

The dsp3 hybridization involves the promotion of one electron from the 3d orbital to the 4s orbital, followed by hybridization of the 4s, 4p, and 3d orbitals. This results in the formation of five hybrid orbitals, which are used for bonding with the ligands.

Therefore, the hybridization of cobalt in [Co(NH3)5Cl]Cl is dsp3.

Question ID: 6926449

Q.According to the valence bond theory. the metal atom or ion under the influence of ligands can use its (n-1)d. as. np. nd orbitals for hybridisation to yield a set of equivalent orbitals of definite geometry. These hybridized 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 behavior on the basis of the

valence bond theory. Consider the formation of [Co (NH3)5C1] Cl, and answer the following question:

The coordination number of cobalt in the above coordination entity is

1) 2
2) 4
3) 5
4) 6

Solution:

The coordination number of cobalt in the coordination entity [Co(NH3)5Cl]Cl is 6.

The coordination number represents the number of ligands attached to the central metal ion. In this case, there are five ammonia (NH3) ligands and one chloride (Cl) ligand bonded to the cobalt ion.

Hence, the coordination number of cobalt in [Co(NH3)5Cl]Cl is 6.

Question ID: 6926450

Q.According to the valence bond theory. the metal atom or ion under the influence of ligands can use its (n-1)d. as. np. nd orbitals for hybridisation to yield a set of equivalent orbitals of definite geometry. These hybridized 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 behavior on the basis of the valence bond theory. Consider the formation of [Co (NH3)5C1] Cl, and answer the following question:
The primary valence of Co in above coordination entity is

1) 1
2) 2
3) 3
4) 4

Solution:

The primary valence of Co in the coordination entity [Co(NH3)5Cl]Cl is 3.

The primary valence is the oxidation state or the charge of the central metal ion. In this case, the cobalt ion is coordinated with five ammonia (NH3) ligands and one chloride (Cl) ligand. The oxidation state of cobalt can be determined by considering the charges on the ligands and the overall charge of the complex.

The ammonia ligands are neutral, so they do not contribute to the oxidation state. The chloride ligand carries a -1 charge, and there is one chloride ion in the complex, which carries a -1 charge as well. Therefore, the total charge contributed by the ligands is -2.

Since the complex is neutral, the oxidation state of cobalt must be +2 to balance the charges. Therefore, the primary valence of cobalt in [Co(NH3)5Cl]Cl is 3.

It's worth noting that the primary valence is different from the coordination number, which represents the number of ligands bonded to the central metal ion.