BYJU'S EXAM PREP

Important Questions on Inorganic Chemistry

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Important Questions on Inorganic Chemistry

1. Which of the following order is correct?
   A. Mg^{2+}(size) < Al^{3+} (size)
   B. S (E.A.) < O (E.A.)
   C. Hg (I.E) > Cd (I.E)
   D. S (I.E) > P (I.E)

2. The correct order of acidic strength is
   A. $XeF_6 > XeO_2F_4 > XeO_3F_2 > XeO_4$
   B. $XeF_6 > XeO_3F_2\ XeO_2F_4 > XeO_4$
   C. $XeO_4 > XeO_3F_2 > XeO_2F_4 > XeF_6$
   D. $XeO_4 > XeO_3F_2 > XeF_6 > XeO_2F_4$

3. The X formed in the given reaction is

   $NaNH_4HPO_4 \xrightarrow{\Delta} NH_3 + H_2O + X$

   A. $NaHPO_4$
   B. NaP_2O_7
   C. $Na_4P_2O_7$
   D. $NaHPO_2$

4. Which of the following compounds will form silicone having the highest molecular weight?
   A. $RSi(OH)_3$
   B. $R_2Si(OH)_2$
   C. $R_3Si(OH)$
   D. R_4Si

5. On reaction with NH_3, NH_4NO_3 and KNH_2 will act as
   A. Acid and acid
   B. acid and base
   C. Base and acid
   D. base and base

6. Which of the following is not correct about cytochrome P-450?
   A. Facilitates the cleavage of O_2.
   B. Absorbs at 450 nm with their CO complexes
   C. It contains a histidine ligand.
   D. Converts insoluble hydrocarbons to water soluble alcohols.

7. The order of stability of complexes of porphyrins with +2 metal ions is:
   A. $Zn^{2+} < Cu^{2+} > Ni^{2+} > Co^{2+} > Fe^{2+}$
   B. $Cu^{2+} < Zn^{2+} > Ni^{2+} > Co^{2+} > Fe^{2+}$
   C. $Ni^{2+} > Cu^{2+} > Co^{2+} > Fe^{2+} > Zn^{2+}$
   D. $Ni^{2+} < Zn^{2+} > Cu^{2+} > Co^{2+} > Fe^{2+}$

8. The term symbol for ground state of Ce^{3+} is
   A. $F_{3/2}$
   B. $2F_{3/2}$
   C. $2F_{5/2}$
   D. $F_{5/2}$

9. Determine the geometry of the complex $[HOs_5(CO)_{15}]^-$.
   A. Trigonal Prism
   B. Trigonal Bipyramidal
   C. Square pyramidal
   D. Pentagonal bipyramidal

10. The most suitable route to prepare cis isomer of $[Pt(C_2H_4)(NH_3)Cl_2]$
    A. $[PtCl_4]^{2-}$ with C_2H_4 followed by reaction with NH_3
    B. $[PtCl_4]^{2-}$ with NH_3 followed by reaction with C_2H_4
    C. $[Pt(NH_3)_4]^{2+}$ with Cl^- followed by reaction with C_2H_4
    D. $[Pt(NH_3)_4]^{2+}$ with C_2H_4 followed by reaction with Cl^-

Answer Key

1. C	2. A	3. C	4. A	5. B	6. C	7. C
8. C	9. B	10. B				

Solutions

Solution 1:

A. More the positive charge on cation smaller is the size of cation. Thus, the size of $Mg^{2+} > Al^{3+}$. Hence, this is incorrect.

B. O has more electronegativity than S. However, O is smaller than S, hence the charge density is more on anion of O than S. Because of more charge density, repulsion among the electrons increases in anion of O. However, charge density in anion of S is less. Hence this is incorrect.

C. Ionisation energy of Hg is more than Cd, because in Hg due to the presence of 4f it has poor shielding effect, which brings higher effective nuclear charge on the outermost valence shell in Hg. To pull electron from outer shell of Hg, more energy needs to be supplied. Hence this is true.

D. P has three unpaired electrons in 3 p orbital that means it has stable half-filled electronic configuration, whereas sulphur has four electrons in 3 p orbital i.e., does not have half-filled configuration. Therefore, it is easier to remove an electron from a sulphur atom as compared to phosphorus. Hence, the ionisation energy of S is less than P. Hence, this option is incorrect.

Solution 2:

Acidic strength of xenon fluorides and xenon oxyfluorides depends on the number of F atoms directly attached to Xe. As F is highly electronegative, it reduces the electron density on the central Xe atom and makes it more acidic.

$XeF_6 > XeO_2F_4 > XeO_3F_2 > XeO_4$

Thus, the correct answer is (A).

Solution 3:

$$NaNH_4HPO_4 \xrightarrow{\Delta} NH_3 + H_2O + Na_4P_2O_7$$

Therefore, X = $Na_4P_2O_7$

Solution 4:

A. $RSi(OH)_3$: It will result in the formation of branched polymers with removal of water molecules. Thus, this silicone will have the highest molecular weight.

B. $R_2Si(OH)_2$: It will form a linear chain polymer.

C. $R_3Si(OH)$: It will only form dimeric compounds.

D. It is tetra alkyl silane and exists in monomeric form.

Solution 5:

As ammonia undergoes autoionization.

$$2\,NH_3 \rightleftarrows NH_4^+ + NH_2^-$$

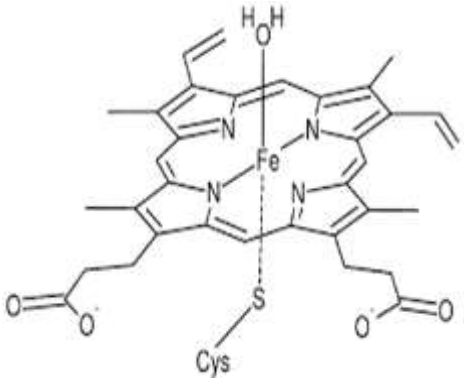
So, the species which increases the concentration of NH_4^+ (cation) acts as acid and the specie which increases the concentration of NH_2^- (anion) acts as base.

$$NH_4NO_3 \rightarrow NH_4^+ + NO_3^-$$

$$KNH_2 \rightarrow^{K^+} + NH_2^-$$

Therefore, the correct answer is B.

Solution 6:
Statement C is incorrect because it contains cystine ligand and not histidine.
The structure of cytochrome P-450 is given below:



Solution 7:
The order of stability of complexes is in accordance with the Irving William Series
$Fe^{2+} < Co^{2+} < Ni^{2+} < Cu^{2+} > Zn^{2+}$
But here Ni^{2+} is most stable because of the formation of a square planar complex followed by the Cu^{2+}, Co^{2+}& Fe^{2+} and Zn is least stable because it has filled d-orbital.

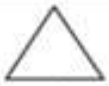
Solution 8:
The term symbol is an abbreviated description of the total angular quantum numbers in a multi-electron atom. Each of the arrangements obtained by combining the resultant L and S terms. Corresponds to an electronic arrangement sometimes called a spectroscopic state which is expressed by the full-term symbol.
Electronic configuration of Ce^{3+}=[Xe] ^{4f1}

1						

f-subshell has 7orbitals have
For f-orbital; L=3 +3 +2 +1 0 -1 -2 -3
Spin of single electron is S= ½
Spin multiplicity (s) =2S+1= 2(1/2) +1=2 →S=2
J= L-S (because orbitals are not half-filled)
J= 3-1/2= 5/2
Therefore, ground state term symbol for Ce^{3+} is $^{(2s+1)}L_J = {}^2F_{5/2}$

Solution 9:
Determination of structure for Geometry: -
Step I → Calculate TVE (Total Valence e- count.)
Step II → Add the value of the valence electron of interstitial atoms.
E.g., H → 1 e-
H_2 → 2 e-
Carbon family → 4 e-
Nitrogen family → 5 e-
Step II → Compare with table of geometries.
$[HOs_5(CO)_{15}]^-$
Electronic configuration of Os = $5d^6 6s^2$
Hence, electronic configuration by Os= 8 e^-
TVE = (8 X 5) + 1 + (15 X 2) + 1
= 40 + 1 + 30 +1
= 72

Compare TVE with table as:

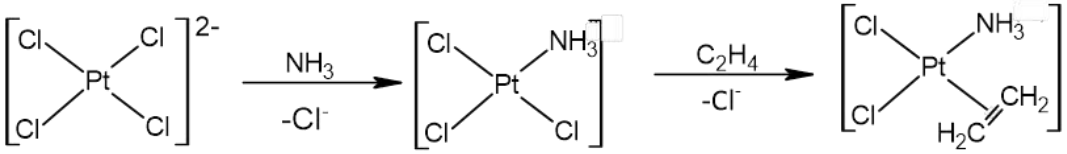
Cluster framework	Diagrammatic representation of the cage	Valence electron count
Triangle		48
Tetrahedron		60
Butterfly, or planar raft of four atoms		62
Square		64
Trigonal bipyramid		72
Square-based pyramid		74
Octahedron		86
Trigonal prism		90

It is Trigonal Bipyramidal in shape.

Solution 10:

The preparation of cis isomer of $[Pt(C_2H_4)(NH_3)Cl_2]$ is based on the trans directing ability of the ligand present. The order of trans-directing ability is $C_2H_4 > Cl^- > NH_3$

cis - $[Pt(C_2H_4)(NH_3)Cl_2]$ is formed by heating $[PtCl_4]^{2-}$ with NH_3 followed by C_2H_4



cis-$[Pt(C_2H_4)(NH_3)Cl_2]$

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