BYJU'S EXAM PREP

Important Questions on Inorganic Chemistry-Part II

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Important Questions on Inorganic Chemistry-Part II

1. For boranes, the correct order of acidity is given by:
   A. Closo > Nido > Arachno
   B. Arachno > Nido > Closo
   C. Closo > Arachno > Nido
   D. Arachno > Closo > Nido

2. For Cubane-ferredoxin,
   $(Rs)_4\ Fe_4S_n + mH^+ \rightarrow (Rs)_4\ Fe_4^{p+} + gas$
   The value of n, m and p respectively are?
   A. 4,8,4
   B. 4,4,4
   C. 4,8,8
   D. 2,4,4

3. What will be the symmetry of the anti-bonding molecular which is formed by a linear combination of the p_x or p_y atomic orbitals in a homonuclear diatomic molecule?
   A. σ_u
   B. σ_g
   C. π_g
   D. π_u

4. Give the order for bond energy for the following-
   A. NH-NH > F-F > O-O
   B. NH-NH > O-O > F-F
   C. O-O > F-F > NH-NH
   D. F-F < O-O < NH-NH

5. The lowest energy term for low spin d^5 is:
   A. ^6S
   B. ^2I
   C. ^2H
   D. ^6F

6. Which one of the following is coloured in aqueous medium?
   A. La^{3+}
   B. Lu^{3+}
   C. Gd^{3+}
   D. Eu^{3+}

7. Which of the following statements is incorrect about Mossbauer spectroscopy?
   A. It is also known as NGR.
   B. It is used to estimate oxidation state of metal.
   C. This does not give any information about the symmetry of molecules.
   D. This spectroscopy is applicable to Au, Sn, Fe.

8. The correct sequence for reactivity of interhalogens is:
   A. ClF < BrF
   B. BrF > IF
   C. $BrF_5 > ClF_3$
   D. $IF_5 > IF_7$

9. Calculate the Bonding molecular orbital of the following cage structure $[Fe_4(CO)_{12}C]^{2-}$.
   A. 35
   B. 32
   C. 41
   D. 31

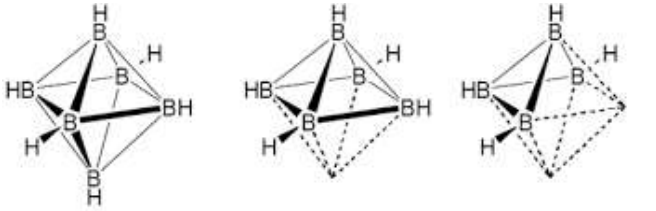
10. Arrange the following metal with respect to the increase in melting point Cr, Mo, and W.
   A. W< Mo > Cr
   B. W< Mo <Cr
   C. W> Mo > Cr
   D. W> Cr > Mo

Answer Key

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

Solutions

Solution 1.



In case of arachno, two apexes are missing, whereas in case of Nido, one apex is missing. And Closo is a polyhedron. Thus, arachno can easily accept electrons as compared to both nido and closo. Hence, the correct answer is (B).

Solution 2. General formula of cubane-ferredoxin is Fe_4S_4 which contains 4 labile Sulphur atoms. So, n=4

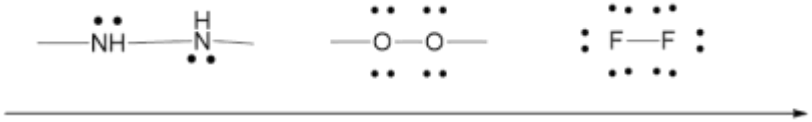
Labile Sulphur atoms are removed by the addition of acid such that one S^{2-} requires $2H^+$ to combine and form H_2S. So, m=8

Removal of one S^{2-} ion will leave +2 charge of Fe. So, 4 such labile sulphur will form +8 charge on Fe. So, p=8

Therefore, n=4; m=8; p=8

Solution 3. The p_x and p_y atomic orbitals are perpendicular to the internuclear axis in a diatomic molecule. In these orbitals, π symmetry is present. For this molecular orbital, the sign of the wave function will not get changed on inversion. The anti-bonding $\pi-$ orbitals must therefore be of g inversion symmetry making it π_g overall.

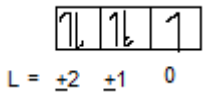
Solution 4.



More the number of lone pairs, more will be the interelectronic repulsion and less will be the bond energy. Hence, order becomes:

F-F < O-O < NH-NH

Solution 5.



Low spin d^5:

$\sum m_L = 6$, L=I

m_l	0	1	2	3	4	5	6
L	S	P	D	F	G	H	I

Unpaired electron (n)=1 (s=1/2)

spin= 2s+1= 2(1/2) +1 =2

Therefore, the lowest energy term of low spin d^5 is ^{2}I.

Solution 6. f-block elements having half filled, zero or fully filled orbitals are not coloured in aqueous medium whereas those which are partially filled are coloured in aqueous medium.
La^{3+}: $4f^0$
Lu^{3+}: $4f^{14}$
Gd^{3+}: $4f^7$
Eu^{3+}: $4f^6$

Solution 7. Mossbauer spectroscopy is also known as NGR (nuclear gamma resonance) since this spectroscopy uses gamma radiations. It also helps to determine the oxidation state, as more the oxidation state, less will be electron density then this will affect the isomer shift (can have inverse or direct relation, depending on molecule). This gives information about the symmetry of molecules. If the symmetry (electronic and ligand both) of molecule is spherical, then electric field gradient is zero and quadrupole splitting will be absent, whereas if symmetry is non spherical, then electric field gradient is nonzero and quadrupole splitting will be present. This spectroscopy is applicable to Au, Sn, Fe.

Solution 8. For interhalogen, the reactivity depends on the electronegativity of the halogen bonded. More the electronegativity difference less will be the reactivity. If an interhalogen contains the same halogen atom, out of which one is F, then it also depends on the number of F atoms attached. More the number of F atoms, more will be the reactivity. Thus, the correct option is (B) as the electronegativity difference between Br and F is smaller as compared to I and F.

Solution 9. Determination of Bonding molecular orbital: -
Step I → Calculate TVE (Total Valence e- count.)
Step II → Add the value of the valence electron of interstitial atoms.
Eg. H → 1 e-
H_2 → 2 e-
Carbon family → 4 e-
Nitrogen family → 5 e-
Step III →Calculate Bonding molecular orbital
BMO = (TVE)/2
Calculate T.V.E as:
C = 4 e^- Contribution because it is encapsulated atom
Os = $3d^6 4s^2$ = 8 e^- contribution
= 4+(8 x 4) + (12 x 2) +2
= 62 e^-
BMO = Total valence electron /2
=62/2
= 31

Solution 10. This is because the d- block elements have a high number of unpaired electrons which contributes to a greater number of electrons in the crystal lattice thereby increasing the strength of the metallic bond between the atoms. Therefore, the Melting and Boiling points are high. And on moving down the period, the density of metal increases due to lanthanide contraction. Hence, the order of melting point of given metals are:
W> Mo > Cr

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