1.

In BrF_3 molecule, the lone pairs occupy equatorial positions to minimize:

1. Lone pair-bond pair repulsion

2. Bond pair-bond pair repulsion

3. Lone pair-lone pair repulsion and lone pair-bond pair repulsion

4. Lone pair-lone pair repulsion

2.

The bond angles of NH_3, NH_4^+ and NH_2^- are in the order :

1. $NH_2^- > NH_3 > NH_4^+$

2. $NH_4^+ > NH_3 > NH_2^-$

3. $NH_3 > NH_2^- > NH_4^+$

4. $NH_3 > NH_4^+ > NH_2^-$

3.

Which of the following compounds has the least tendency to form hydrogen bonds between molecules?

1. NH_3

2. H_2NOH

3. HF

4. CH_3F

4.

Which of the following combination of atoms A and B forms an anti-bonding molecular orbital?

1. $\frac{\Psi_A^2}{\Psi_B^2}$

2. $\Psi_A^2 \times \Psi_B^2$

3. $\Psi_A + \Psi_B$

4. $\Psi_A - \Psi_B$

5.

Which one of the following species is diamagnetic in nature?

1. H_2^-

2. H_2

3. H_2^+

4. He_2^+

6.

ln which of the following molecules/ions all the bonds are unequal?

1. SF_4

2. SiF_4

3. XeF_4

4. BF_4^-

7.

Using MO theory predict which of the following species has the shortest bond length?

1.O_2^+

2. O_2^-

3. O_2^{2-}

4. O_2^{2+}

8.

In which of the following pairs, the two species are not isostructural?

1. PF_5 and BrF_5

2. PCl_4^+ and $SiCl_4$

3. CO_3^{2-} and NO_3

4. AlF_6^{3-} and SF_6

9.

Isostructural species are those which have the same shape and hybridization. Among the given species identify the isostructural pairs.

1. $[NF_3 \text{ and } BF_3]$
2. $[BF_4^- \text{ and } NH_4^+]$
3. $[BCl_3 \text{ and } BrCl_3]$
4. $[NH_3 \text{ and } NO_3^-]$

10.

The types of hybrid orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ respectively are expected to be

1. sp, sp^3, and sp^2
2. sp, sp^2, and sp^3
3. sp^2, sp, and sp^3
4. sp^2, sp^3, and sp

11.

Hydrogen bonds are formed in many compounds e.g., H_2O, HF, NH_3. The boiling point of such compounds depends to an extent on the strength of the hydrogen bond and the number of hydrogen bonds. The correct decreasing order of the boiling points above compounds is

1. HF>H_2O>NH_3
2. H_2O>HF>NH_3
3. NH_3>HF>H_2O
4. NH_3>H_2O>HF

12.

Which of the following species does not has tetrahedral geometry?

1. BH_4^-
2. NH_2^-
3. CO_3^{2-}
4. H_3O^+

13.

Which molecule/ion out of the following does not contain unpaired electrons?

1. N_2^+
2. O_2
3. O_2^{2-}
4. B_2

14.

In which of the following molecule/ion all the bonds are not equal?

1. XeF_4
2. BF_4^-
3. C_2H_4
4. SiF_4

15.

In which of the following substances will hydrogen bond be strongest?

1. HCl
2. H_2O
3. HI
4. H_2S

16.

Which of the following corresponds with sp^2 hybridization?

1. 90°
2. 120°
3. 180°
4. 109°

17.

The electronic configurations of the elements A, B, and C are given below.

$A = 1s^2\ 2s^2\ 2p^6$

$B = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$

$C = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

Stable form of C may be represented by the formula

1. C
2. C_2
3. C_3
4. C_4

18.

Which of the following order of energies of molecular orbitals of N_2 is correct?

1. $(\pi 2p_y) < (\sigma 2p_z) < (\pi^* 2p_x) \approx (\pi^* 2p_y)$
2. $(\pi 2p_y) > (\sigma 2p_z) > (\pi^* 2p_x) \approx (\pi^* 2p_y)$
3. $(\pi 2p_y) < (\sigma 2p_z) = (\pi^* 2p_x) \approx (\pi^* 2p_y)$
4. $(\pi 2p_y) > (\sigma 2p_z) < (\pi^* 2p_x) \approx (\pi^* 2p_y)$

19.

Which of the following statement is not correct from the viewpoint of molecular orbital theory?

1. Be_2 is not a stable molecule
2. He_2 is not stable but He_2^+ is expected to exist.
3. Bond strength of N_2 is maximum amongst the homonuclear diatomic molecules belonging to the second period.
4. The order of energies of molecular orbitals in N_2 molecule is

$\sigma 2s < \sigma^* 2s < \sigma 2p_z < (\pi 2p_x \approx \pi 2p_y) < (\pi^* 2p_x \approx \pi^* 2p_y) < \sigma^* 2p_z$

20.

Which of the following options represents the correct bond order?

(1) $O_2^- > O_2 > O_2^+$

(2) $O_2^- < O_2 < O_2^+$

(3) $O_2^- > O_2 < O_2^+$

(4) $O_2^- < O_2 > O_2^+$

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