

1. In  $\text{BrF}_3$  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  $\text{NH}_3$ ,  $\text{NH}_4^+$  and  $\text{NH}_2^-$  are in the order :
  1.  $\text{NH}_2^- > \text{NH}_3 > \text{NH}_4^+$
  2.  $\text{NH}_4^+ > \text{NH}_3 > \text{NH}_2^-$
  3.  $\text{NH}_3 > \text{NH}_2^- > \text{NH}_4^+$
  4.  $\text{NH}_3 > \text{NH}_4^+ > \text{NH}_2^-$
3. Which of the following compounds has the least tendency to form hydrogen bonds between molecules?
  1.  $\text{NH}_3$
  2.  $\text{H}_2\text{NOH}$
  3.  $\text{HF}$
  4.  $\text{CH}_3\text{F}$
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.  $\text{H}_2^-$
  2.  $\text{H}_2$
  3.  $\text{H}_2^+$
  4.  $\text{He}_2^+$
6. In which of the following molecules/ions all the bonds are unequal?
  1.  $\text{SF}_4$
  2.  $\text{SiF}_4$
  3.  $\text{XeF}_4$
  4.  $\text{BF}_4^-$
7. Using MO theory predict which of the following species has the shortest bond length?
  1.  $\text{O}_2^+$
  2.  $\text{O}_2^-$
  3.  $\text{O}_2^{2-}$
  4.  $\text{O}_2^{2+}$
8. In which of the following pairs, the two species are not isostructural?
  1.  $\text{PF}_5$  and  $\text{BrF}_5$
  2.  $\text{PCl}_4^+$  and  $\text{SiCl}_4$
  3.  $\text{CO}_3^{2-}$  and  $\text{NO}_3$
  4.  $\text{AlF}_6^{3-}$  and  $\text{SF}_6$

9.

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

1.  $[\text{NF}_3 \text{ and } \text{BF}_3]$
2.  $[\text{BF}_4^- \text{ and } \text{NH}_4^+]$
3.  $[\text{BCl}_3 \text{ and } \text{BrCl}_3]$
4.  $[\text{NH}_3 \text{ and } \text{NO}_3^-]$

10.

The types of hybrid orbitals of nitrogen in  $\text{NO}_2^+$ ,  $\text{NO}_3^-$  and  $\text{NH}_4^+$  respectively are expected to be

1.  $\text{sp}$ ,  $\text{sp}^3$ , and  $\text{sp}^2$
2.  $\text{sp}$ ,  $\text{sp}^2$ , and  $\text{sp}^3$
3.  $\text{sp}^2$ ,  $\text{sp}$ , and  $\text{sp}^3$
4.  $\text{sp}^2$ ,  $\text{sp}^3$ , and  $\text{sp}$

11.

Hydrogen bonds are formed in many compounds e.g.,  $\text{H}_2\text{O}$ ,  $\text{HF}$ ,  $\text{NH}_3$ . 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.  $\text{HF} > \text{H}_2\text{O} > \text{NH}_3$
2.  $\text{H}_2\text{O} > \text{HF} > \text{NH}_3$
3.  $\text{NH}_3 > \text{HF} > \text{H}_2\text{O}$
4.  $\text{NH}_3 > \text{H}_2\text{O} > \text{HF}$

12.

Which of the following species does not has tetrahedral geometry?

1.  $\text{BH}_4^-$
2.  $\text{NH}_2^-$
3.  $\text{CO}_3^{2-}$
4.  $\text{H}_3\text{O}^+$

13.

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

1.  $\text{N}_2^+$
2.  $\text{O}_2$
3.  $\text{O}_2^{2-}$
4.  $\text{B}_2$

14.

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

1.  $\text{XeF}_4$
2.  $\text{BF}_4^-$
3.  $\text{C}_2\text{H}_4$
4.  $\text{SiF}_4$

15.

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

1.  $\text{HCl}$
2.  $\text{H}_2\text{O}$
3.  $\text{HI}$
4.  $\text{H}_2\text{S}$

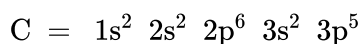
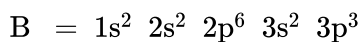
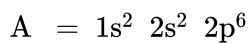
16.

Which of the following corresponds with  $\text{sp}^2$  hybridization?

1.  $90^\circ$
2.  $120^\circ$
3.  $180^\circ$
4.  $109^\circ$

17.

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

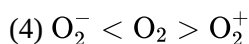
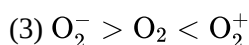
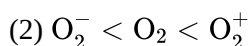
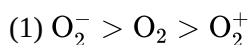


Stable form of C may be represented by the formula

1. C
2. C<sub>2</sub>
3. C<sub>3</sub>
4. C<sub>4</sub>

20.

Which of the following options represents the correct bond order?

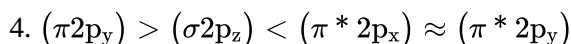
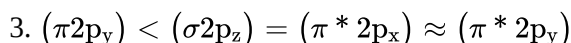
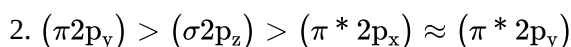
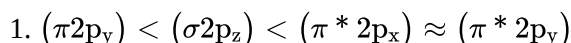


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18.

Which of the following order of energies of molecular orbitals of N<sub>2</sub> is correct?



19.

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

1. Be<sub>2</sub> is not a stable molecule
2. He<sub>2</sub> is not stable but He<sub>2</sub><sup>+</sup> is expected to exist.
3. Bond strength of N<sub>2</sub> is maximum amongst the homonuclear diatomic molecules belonging to the second period.
4. The order of energies of molecular orbitals in N<sub>2</sub> molecule is

