

1. In which one of the following species is the octet rule NOT followed?

- A. NH_3 B. NH_4^+ C. I_2 D. BH_4^- E. NO_2

2. What is the total number of non-bonding pairs of electrons in the SF_3^+ cation?

- A. 1 B. 6 C. 4 D. 10 E. 5

3. Triiodomethane, CHI_3 , is a yellow solid with a normal melting point of 120°C . Which of the listed intermolecular forces is/are at work in this substance?

- (i) Ion-dipole attraction
(ii) Hydrogen bonding
(iii) Dipole-dipole attraction
(iv) London dispersion forces

- A. all of them B. ii, iii, & iv only C. ii & iii only D. iii & iv only E. iv only

4. Which of the following molecules is square planar in molecular shape?

- A. SF_4 B. XeF_4 C. SiCl_4 D. BF_4^- E. SnCl_3^-

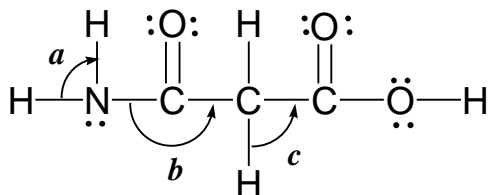
5. Which of the following has a trigonal bipyramidal electron domain geometry?

- A. SF_4 B. XeF_4 C. SiCl_4 D. BF_4^- E. SnCl_3^-

6. Three monosulfur fluorides are observed: SF_2 , SF_4 and SF_6 . Of these, _____ is/are polar.

- A. SF_2 only B. SF_2 and SF_4 only C. SF_4 only
D. SF_6 only E. SF_2 , SF_4 and SF_6

7. To a close approximation, the bond angles marked *a*, *b*, *c* in the molecule below are _____, _____, and _____ respectively.



- A. 90° , 180° , 90° B. 109.5° , 120° , 109.5° C. 120° , 120° , 109.5°
D. 120° , 120° , 90° E. 109.5° , 90° , 120°

8. The molecule in **question 7** has _____ sigma (σ) and _____ pi (π) bonds, respectively.

A. 11, 2

B. 9, 2

C. 11, 0

D. 9, 0

E. 5, 4

9. Which of these statements about benzene is FALSE?

A. The C-C bond lengths are all the same.

B. Benzene exhibits delocalized bonding.

C. The C-C bonds have a bond order of 1.5.

D. Three resonance structures are required to fully describe the bonding in benzene.

E. Each carbon atom contributes one electron to the π bonding in benzene.

10. Which of the following numbers of electron domains can give rise to a linear molecule?

A. 2

B. 3

C. 4

D. 5

E. 2 and 5

11. Mercury is a liquid. Using your knowledge of metallic bonding, choose the best reason for this property.

A. Mercury has the configuration $6s^2 5d^{10}$, so it melts in a sea of electrons.

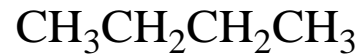
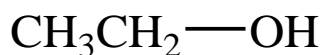
B. Mercury has no electrons in the bonding part of the d band, so the forces between atoms are weak.

C. Mercury has a large band gap, so has some of the properties of an insulator.

D. Mercury has as many antibonding electrons as bonding electrons, so the forces between atoms are weak.

E. Mercury has a large ionization energy, so will not form an ionic lattice.

12. Consider the intermolecular forces involved, and then arrange the following molecules in increasing order of boiling point (*i.e.* lowest b.p. first, highest b.p. last).



A. $\text{HOCH}_2\text{CH}_2\text{OH} < \text{CH}_3\text{CH}_2\text{OH} < \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3 < \text{CF}_4$

B. $\text{CF}_4 < \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3 < \text{HOCH}_2\text{CH}_2\text{OH} < \text{CH}_3\text{CH}_2\text{OH}$

C. $\text{HOCH}_2\text{CH}_2\text{OH} < \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3 < \text{CH}_3\text{CH}_2\text{OH} < \text{CF}_4$

D. $\text{CF}_4 < \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3 < \text{CH}_3\text{CH}_2\text{OH} < \text{HOCH}_2\text{CH}_2\text{OH}$

E. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3 < \text{CH}_3\text{CH}_2\text{OH} < \text{CF}_4 < \text{HOCH}_2\text{CH}_2\text{OH}$