Chemical Bonding Practice Items

1. Covalent bonds

A. are a kind of Van der Waals force.
B. involve the sharing of electrons between atoms.
C. consist of the electrostatic attraction between ions.
D. concentrate the greatest electron density outside the internuclear axis.

2. Ionic bonding occurs in the following pair of elements:

A. C and Cl
B. Cu and I
C. Mg and Cl
D. C and S

3. Isoelectric species have the same electron configuration. Which of the following does not belong in the same group of isolectric species with the others?

A. O^{2-}
B. F^{-}
C. Na^{+}
D. Ar

4. Sulfur can form a transargononic compound with fluorine, SF_6, in which the atomic orbitals of sulfur hybridize to form six sp^3d^2 orbitals. What is the shape of the molecule?

A. trigonal bipyramidal
B. tetrahedral
C. octahedral
D. planar

5. Two Lewis structures may be drawn for SO_2 that obey the octet rule. Bond lengths and bond energies in SO_2

A. correspond to a sulfur-oxygen single bond and a sulfur-oxygen double bond.
B. lie between those expected for sulfur-oxygen double and triple bonds.
C. demonstrate periodic fluctuation between single and double bonds.
D. are identical for the two sulfur-oxygen bonds.

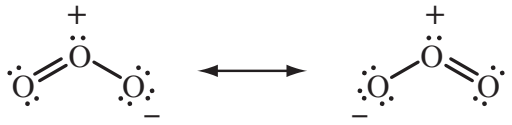
6. The H–O–H bond angle in water equals

A. 104.5°
B. 109.5°
C. 120°
D. 180°

7. Which of the following molecules is linear?

A. H_2O
B. NO_2
C. SO_2
D. CO_2

8. Bonding in ozone (O_3) can be expressed as a resonance hybrid.



The angle formed by the three oxygens in ozone is nearest to

A. 109°
B. 117°
C. 120°
D. 180°

9. Which of the following reactions at standard temperature and 0.01 atm between atomic species would be most exothermic?

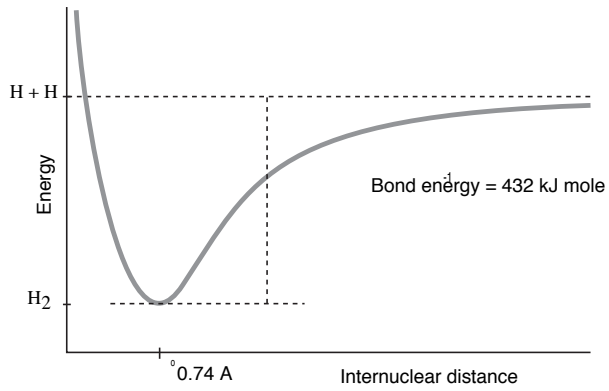
A. $H(g) + F(g) \longrightarrow HF(g)$

B. $H(g) + Cl(g) \longrightarrow HCl(g)$

C. $H(g) + Br(g) \longrightarrow HBr(g)$

D. $H(g) + I(g) \longrightarrow HI(g)$

The energy diagram for the formation of H_2 below pertains to questions 10 and 11.



10. From the diagram we can conclude that

A. at distances less than 0.74Å the repulsion between the electrons increases sharply.

B. breaking the bonds of hydrogen molecules releases 432 kJ/mole of energy.

C. 0.74Å is the H_2 bond distance.

D. when two hydrogens share a pair of electrons, the spins of the electrons become paired.

11. Suppose that instead of H_2 formation the diagram showed formation of N_2.

A. The internuclear distance at the curve minimum would be lower.

B. The depth of the energy well would be greater.

C. There would be three minima.

D. The energy would be greatest for large values of internuclear distance.

12. Determine the kind of hybrid orbitals used by sulfur in SF_4

A. sp^2

B. sp^3

C. sp^3d

D. sp^3d^2

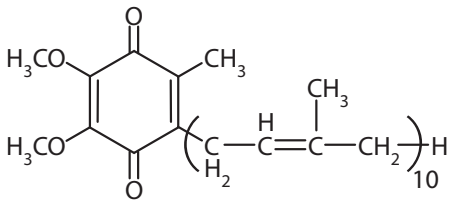
13. How many carbons in ubiquinone, pictured below, are sp^2 hybridized?

A. 6

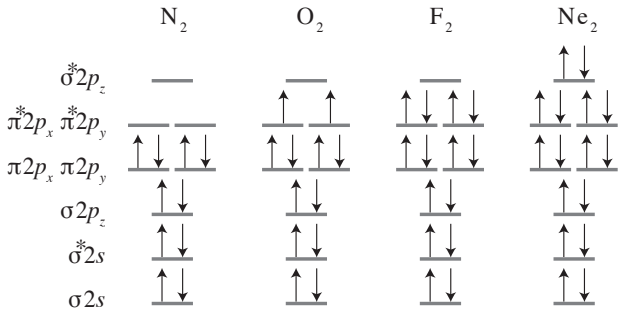
B. 8

C. 26

D. 28



The following molecular orbital electron configurations pertain to questions 14 - 16:



14. Which molecule is shown by its molecular orbital electron configuration to have a bond order of 1?

A. N_2
B. O_2
C. F_2
D. Ne_2

15. Which molecule is shown by its molecular orbital electron to be unstable?

A. N_2
B. O_2
C. F_2
D. Ne_2

16. Which molecule is shown by its molecular orbital electron configuration to be paramagnetic?

A. N_2
B. O_2
C. F_2
D. Ne_2