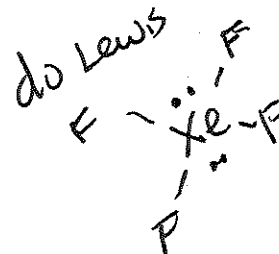


**Bonding multiple choice practice Standard #3**

pdf

E 1. (#3-3) Which distribution of electrons in hybrid orbitals is associated with the structure of the xenon tetra fluoride,  $\text{XeF}_4$ , molecule?

- a.  $sp$
- b.  $sp^2$
- c.  $sp^3$
- d.  $dsp^3$
- e.  $d^2sp^3$



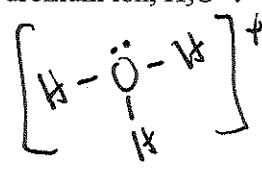
C 2. (#3-3) Has the largest bond-dissociation energy

- a.  $\text{Li}_2$
- b.  $\text{B}_2$
- c.  $\text{N}_2$
- d.  $\text{O}_2$
- e.  $\text{F}_2$

Triple Bond

d 3. (#3-3) What is the number of  $sp^3$  hybrid orbitals associated with the hydronium ion,  $\text{H}_3\text{O}^+$ ?

- a. none
- b. two
- c. three
- d. four
- e. six

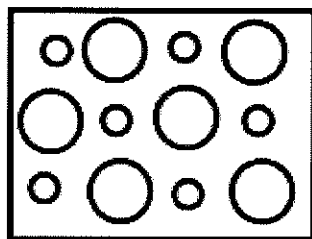


e 4. (#3-2) Contains 1 sigma ( $\sigma$ ) and 2 pi ( $\pi$ ) bonds

- a.  $\text{Li}_2$
- b.  $\text{B}_2$
- c.  $\text{F}_2$
- d.  $\text{O}_2$
- e.  $\text{N}_2$

Triple

a 5. (#3-1) Which of the following substances could be represented by the model below?



Small large  
a. NaI  
 b. NaF  
 small/small

~~c. CO~~ cov  
 d. HF  
 Ionic large/small  
 two anions or cations

- (A) hydrogen bonding  
 (B) Theory of Promotion  
 (C) ionic bonding  
 (D) resonance  
 (E) van der Waals forces (London dispersion forces)

- e 6. (#3-4) Is used to explain why iodine molecules are held together in the solid state  
 a. above  
 b. above  
 c. above  
 d. above  
 e. above *LDF*
- A 7. (#3-4) Is used to explain why the boiling point of HF is greater than the boiling point of HBr  
 a. above  
 b. above  
 c. above  
 d. above  
 e. above *H Bonds*

- d 8. (#3-3) Has a bond order of 2  
 a.  $\text{Li}_2$   
 b.  $\text{B}_2$   
 c.  $\text{N}_2$   
 d.  $\text{O}_2$   
 e.  $\text{F}_2$  *double*

- c 9.
- | Element | First Ionization energy | Atomic radius |
|---------|-------------------------|---------------|
| B       | 801                     | 85            |
| C       | 1086                    | 77            |
| N       | 1400                    | 75            |
| O       | 1314                    | 73            |
| F       | 1680                    | 72            |
| Ne      | 2080                    | 70            |

*Issue*

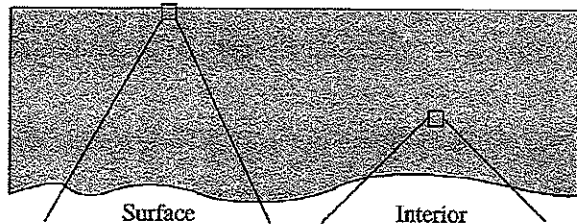
*weird Q  
 But only 1 option  
 Read Carefully*

(#2-3) The table above shows the first ionization energy and atomic radius of several elements. Which of the following best helps to explain the deviation of the first ionization energy of oxygen from the overall trend.

- a. The atomic radius of oxygen is greater than the atomic radius of fluorine.  
 b. The atomic radius of oxygen is less than the atomic radius of nitrogen.  
 c. There is repulsion between paired electrons in oxygen's 2 P orbitals.  
 d. There is attraction between paired electrons in oxygen's 2 P orbitals.

- d 10. (#3-1) Which of the following substances will have the highest Coulombic attraction?  
 a.  $\text{Al}^{3+}/\text{Pb}^{4+}$   
 b.  $\text{Mg}^{2+}/\text{I}^{-1}$   
 c.  $\text{P}^{-3}/\text{S}^{-2}$   
 d.  $\text{Mg}^{2+}/\text{F}^{-1}$

Steel is an alloy consisting of Fe with a small amount of C. Elemental Cr can be added to steel to make the steel less likely to rust; Cr atoms react with oxygen in the air to form a nonreactive layer of chromium oxide on the surface of the steel, preventing the oxidation of underlying Fe atoms. A sample of steel-chromium alloy contains 15 percent Cr by mass. Which of the following diagrams best shows a particle-level view of a surface section and an interior section of the alloy represented below at the left? (The atomic radii of the atoms involved are given in the table below at the right.)



Element	Molar Mass (g/mol)	Atomic Radius (pm)
Fe	55.85	125
Cr	52.00	127
C	12.01	77
O	16.00	73

(A)

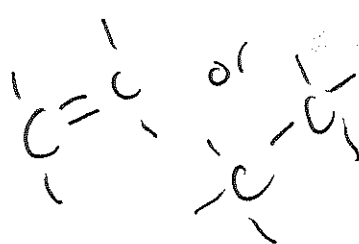
(B)

(C)

(D)

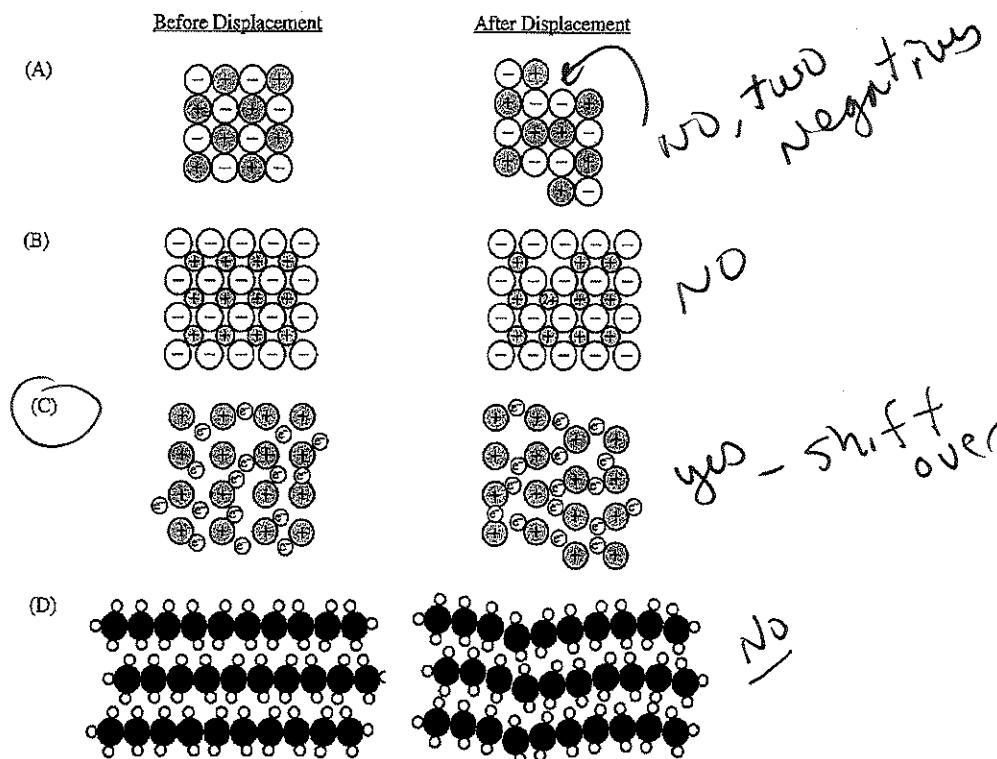
- d 11. (#3-5)  
 a. A                      b. B                      c. C                      d. D
- b 12. (#3-3) Which gives the correct comparison of the carbon-carbon bond characteristics in  $C_2H_4$  and  $C_2H_6$ ?  
 (Compared to  $C_2H_4$ , the property listed for  $C_2H_6$  is)

	Bond length	Bond Energy	number of shared e- pairs
a.	greater	smaller	greater
<u>b.</u>	greater	smaller	smaller
c.	smaller	smaller	smaller
d.	smaller	greater	greater
e.	greater	greater	greater



13. (#3-3) The  $\text{PF}_5$  molecule is known to have a trigonal bipyramidal shape. Explanation of its bonding includes all of the following EXCEPT
- Bond angles of  $120/90$  degrees
  - resonance structures *no double bonds*
  - expanded octet
  - $\text{dsp}^3$  hybridization of orbitals
  - electrons shared as single bonds
14. (#3-3) Which of the following would be associated with a non-polar substance.
- Dipole moment of zero *yes*
  - Symmetrical *yes*
- I only
  - II only
  - both I and II only *(c)*
  - Neither I or II

Which of the following diagrams best illustrates how a displacement in an ionic crystal results in cleavage and brittleness?



15. (#3-2)
- A
  - B
  - C
  - D
16. (#3-2) Identify the following substance,
- it has a melting point of  $2800\text{ C}$
  - Conducts electricity as it dissolves in water
  - Does not conduct electricity as a solid
- Pb
  - NaCl
  - MgO *(c)*
  - Carbon dioxide
17. (#3-3) Resonance helps to account for all the following properties EXCEPT
- The equal S-O bond energies in  $\text{SO}_2$
  - The charge of  $3+$  on the aluminum ion,  $\text{Al}^{3+}$  *(b)*
  - The equal bond strengths in the nitrate ion,  $\text{NO}_3^-$
  - The equal bond lengths in the carbonate ion,  $\text{CO}_3^{2-}$

18. (#2-3g) Silicon is being used in computers as a raw material for microchips. Based upon your knowledge of the periodic table, which element might have been substituted for Si?

- a. Al                      b. P                      c. Ge                      d. Ar

19. (#3-3) Pi bonding is found in all of the following EXCEPT:

- a. N<sub>2</sub>                      c. CO<sub>3</sub><sup>2-</sup>  
b. SCN<sup>-</sup>                      d. AsH<sub>3</sub>

*Handwritten note: - It, only single bonds*

20.

(#3-4) There are only 2 ways to get a dipole moment of zero. Benzene (C<sub>6</sub>H<sub>6</sub>) happens to have dipole moment of zero. Which of the following justifies this fact?

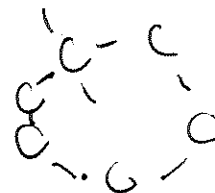
- I. The electronegativity of C and N are equal.  
II. This molecule is symmetrical.

a. I only

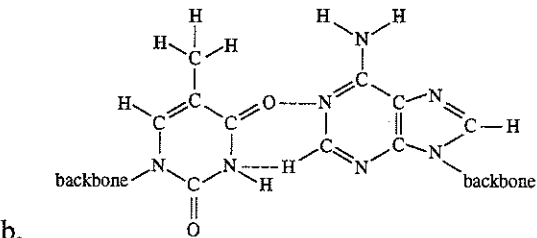
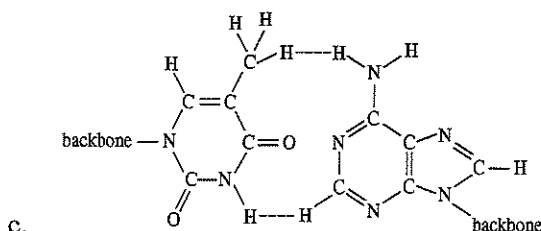
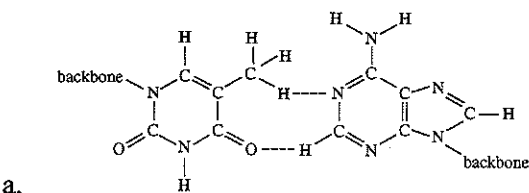
b. II only

*Handwritten note: Both I and II*

d. Neither I or II

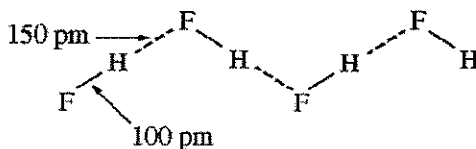


21. (#3-4) Thymine and adenine form a base pair in the DNA molecule. These two bases can form a connection between two strands of DNA via two hydrogen bonds. Which of the following diagrams shows the correct representation of the hydrogen bonding (denoted by dashed lines) between thymine and adenine base pairs (In each diagram, thymine is shown at the left and adenine is shown at the right. The bases are attached to the backbone portion of the DNA strands.)



d.

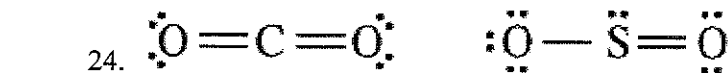
22.




(#3-4) The figure above shows that in solid hydrogen fluoride there are two different distances between H atoms and F atoms. Which of the following best accounts for the two different distances?

- a. Accommodation of the necessary bond angles in the formation of the solid      c. Different isotopes of fluorine present in the samples  
b. Difference in strength between covalent bonds and intermolecular attractions      d. Uneven repulsions among non-bonding electron pairs

- \_\_\_\_\_ 23. (#3-2) In general, the melting points of ionic solids are higher than the melting points of molecular solids. Which accounts for this difference?
- Attractions between particles with opposite charge are stronger than covalent bonds
  - Repulsions between ions with the same charge are negligibly small
  - Delocalized electron clouds in molecular solids are produced by the formation of pi bonds.
  - Attractions between ions with opposite charge are stronger than intermolecular forces.
  - The distance between oppositely charged ions is less than the corresponding distance between bonded atoms.



(#3-4) Lewis electron-dot diagrams for CO<sub>2</sub> and SO<sub>2</sub> are given above. The molecular geometry and polarity of the two substances are

- the same because the molecular formulas are similar
  - the same because C and S have similar electronegativity values
  - different because the lone pair of electrons on the C atom make it the negative end of a dipole
  - different because S has a greater number of electron domains (regions of electron density) surrounding it than C has 
- \_\_\_\_\_ 25. (#3-4) In a sample of solid NH<sub>3</sub>, what types of bonds would need to be disrupted in order to make it melt?
- Hydrogen bond *ys*
  - Covalent bond *ys*
  - London Dispersion Forces. *ys*
- I only
  - I and II only
  - I and III only
  - I, II and III