

Bonding multiple choice practice Standard #3

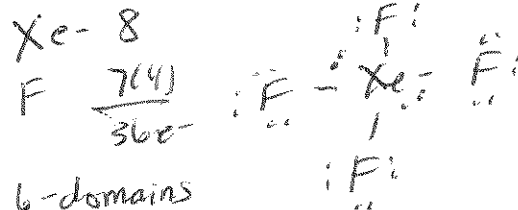
Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

_____ 1. (#3-3) Which distribution of electrons in hybrid orbitals is associated with the structure of the xenon tetra fluoride, XeF_4 , molecule?

- a. sp
- b. sp^2
- c. sp^3

- d. dsp^3
- e. d^2sp^3



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

- a. Li_2
- b. B_2

- d. O_2
- e. F_2

6 domains

$\text{N} \equiv \text{N}$
c. N_2

Triple Bond
 You may need to sketch these out

_____ 3. (#3-3) What is the number of sp^3 hybrid orbitals associated with the hydronium ion, H_3O^+ ?

- a. none
- b. two
- c. three

- d. four
- e. six



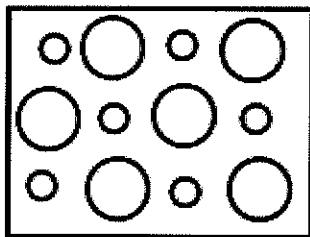
_____ 4. (#3-2) Contains 1 sigma (σ) and 2 pi (π) bonds

- a. Li_2
- b. B_2
- c. F_2

- d. O_2
- e. N_2

Triple Bond

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



- a. NaI
- b. NaF

1:1 Ratio
 + Size correct

- c. CO
- d. IF

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

- _____ 6. (#3-4) Is used to explain why iodine molecules are held together in the solid state
 a. above
 b. above *LDF*
 c. above
 d. above
 e. above
- _____ 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 *HBond*
 c. above
 d. above
 e. above
- _____ 8. (#3-3) Has a bond order of 2
 a. Li_2
 b. B_2 *double Bond*
 c. N_2
 d. O_2
 e. F_2 *$\text{O}=\text{O}$*

_____ 9.

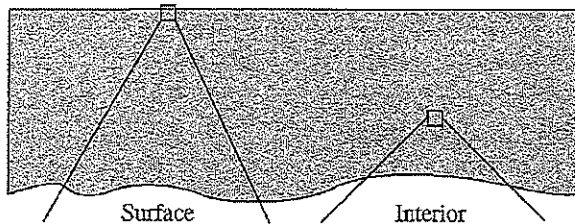
Element	First Ionization energy	Atomic radius
B	801	85
C	1086	77
N	1400	75
O	1314	73
F	1680	72
N	2080	70

— unexpected drop, which could explain the drop.

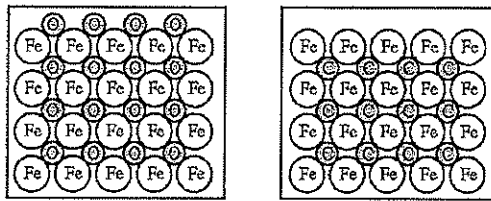
(#2-3) The table above shows the first ionization energy and atomic radius of several elements. Which of the following best helps to explain the deviation of the first ionization energy of oxygen from the overall trend?

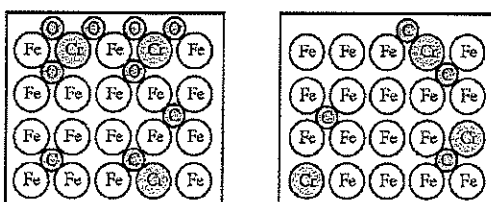
- a. The atomic radius of oxygen is greater than the atomic radius of fluorine.
 b. The atomic radius of oxygen is less than the atomic radius of nitrogen.
 c. There is repulsion between paired electrons in oxygen's 2 P orbitals.
 d. There is attraction between paired electrons in oxygen's 2 P orbitals.
- _____ 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. $\text{Mg}^{2+}/\text{F}^{-1}$

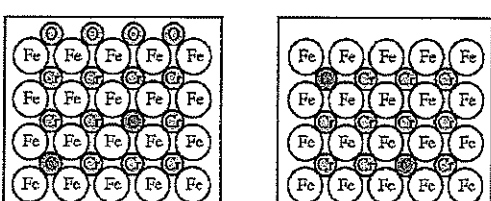
Steel is an alloy consisting of Fe with a small amount of C. Elemental Cr can be added to steel to make the steel less likely to rust; Cr atoms react with oxygen in the air to form a nonreactive layer of chromium oxide on the surface of the steel, preventing the oxidation of underlying Fe atoms. A sample 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.)

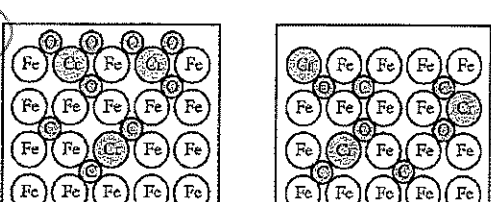


Element	Molar Mass (g/mol)	Atomic Radius (pm)
Fe	55.85	125
Cr	52.00	127
C	12.01	77
O	16.00	73

(A) 

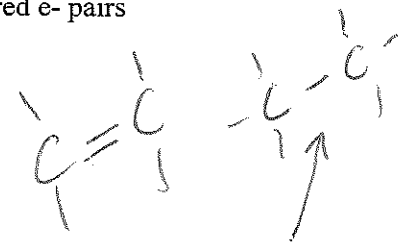
(B) 

(C) 

(D) 

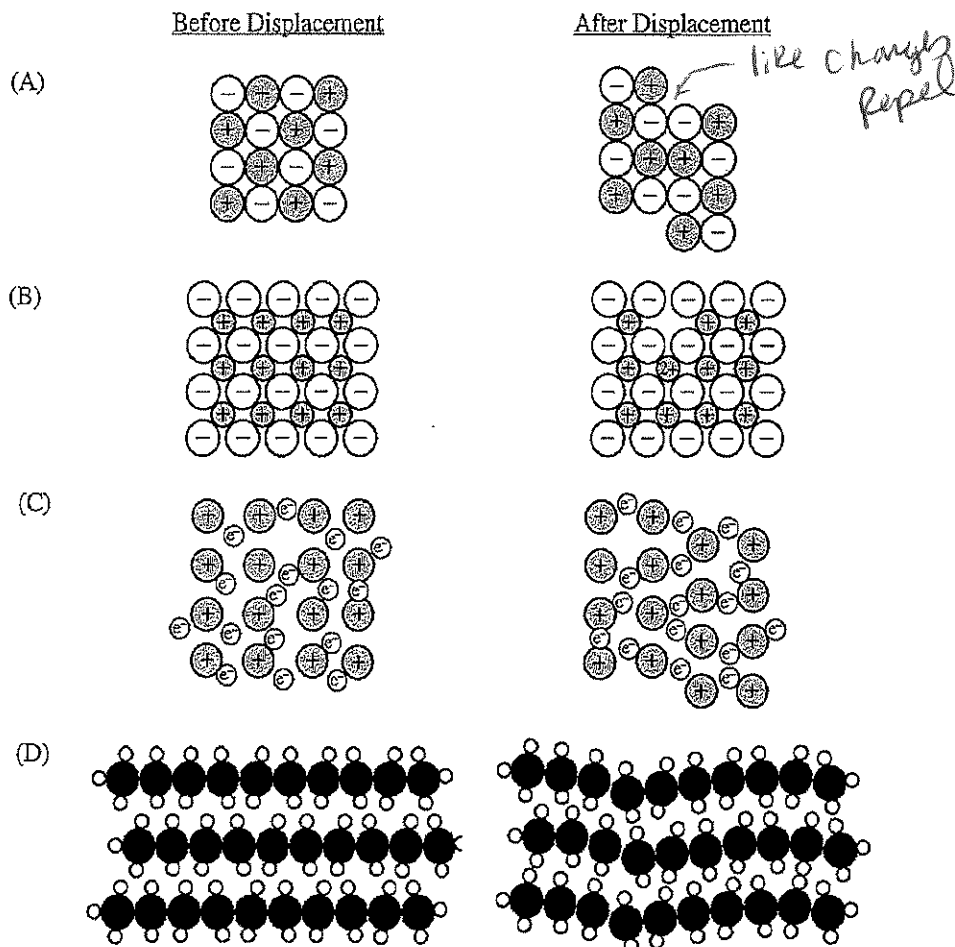
11. (#3-5) a. A b. B c. C d. D
12. (#3-3) Which gives the correct comparison of the carbon-carbon bond characteristics in C_2H_4 and C_2H_6 ? (Compared to C_2H_4 , the property listed for C_2H_6 is)

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



- _____ 13. (#3-3) The PF_5 molecule is known to have a trigonal bipyramidal shape. Explanation of its bonding includes all of the following EXCEPT
- a. Bond angles of 90 degrees
 - b. resonance structures
 - c. expanded octet
 - d. dsp^3 hybridization of orbitals
 - e. electrons shared as single bonds
- _____ 14. (#3-3) Which correctly compares bonds with equal sharing of electrons to bonds with unequal sharing of electrons?
- I. Bonds with equal sharing are weaker *N*
 - II. Bonds with equal sharing have smaller bond energy. *N*
 - III. Bonds with equal sharing are associated with smaller electronegativity difference between atoms. *Y*
- a. I only
 - b. III only
 - c. I and II only
 - d. I and III only
 - e. I, II, III only
- _____ 15. (#3-3f) In a molecule in which the central atom exhibits sp^3d^2 hybrid orbitals, the electron pairs are directed toward the corners of
- a. a tetrahedron
 - b. a square-based pyramid
 - c. a trigonal bipyramidal
 - d. a square
 - e. an octahedron

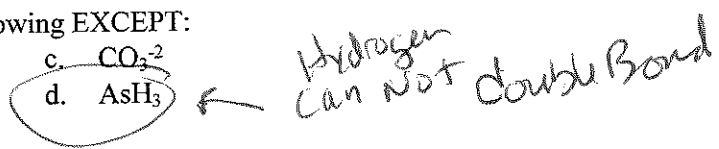
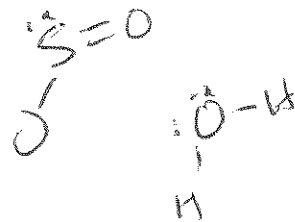
Which of the following diagrams best illustrates how a displacement in an ionic crystal results in cleavage and brittleness?



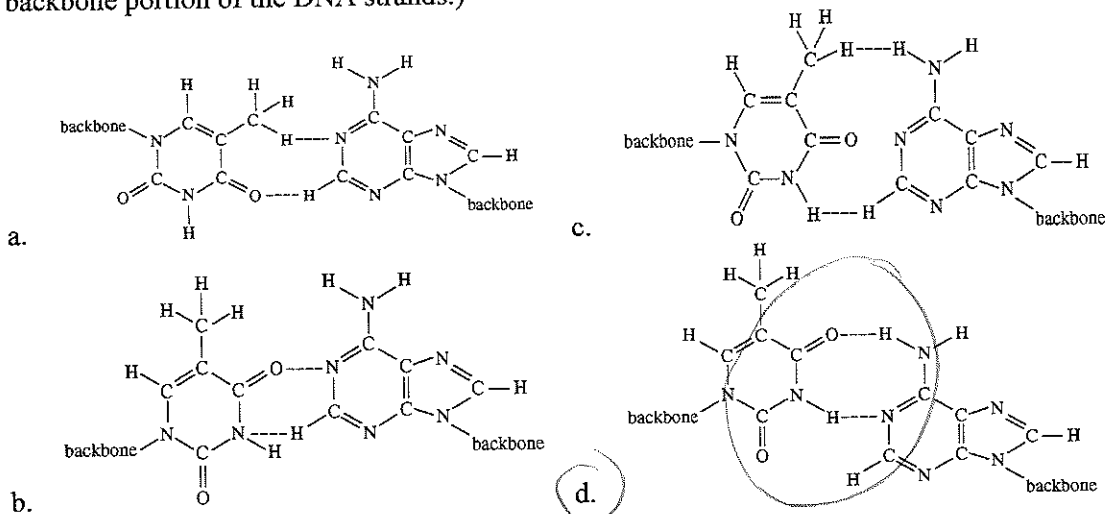
16. (#3-2)
- a. A b. B c. C d. D
17. (#3-2) Identify the following substance,
- it has a melting point of 2800 C
 - Conducts electricity as it dissolves in water
 - Does not conduct electricity as a solid
- a. Pb c. MgO
- b. NaCl d. Carbon dioxide
18. (#3-3) Resonance helps to account for all the following properties EXCEPT
- a. The equal S-O bond energies in SO_2
- b. Low reactivity of C in Benzene, C_6H_6
- c. The charge of $3+$ on the aluminum ion, Al^{3+} ← *Ionic*
- d. The equal bond strengths in the nitrate ion, NO_3^-
- e. The equal bond lengths in the carbonate ion, CO_3^{2-}
19. (#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 c. Ge
- b. P d. Ar

Name: _____

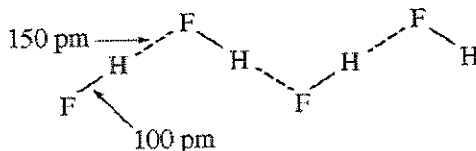
20. (#3-3f) Which of the following molecules might you expect a 109° bond angle? SO₂ and OH₂ have similar formulas. How do their bonding patterns compare?
- Same hybridization of sp³
 - Both have a bent shape.
 - OH₂ has a smaller bond angle than SO₂
- a. I only
b. III only
c. I and II only
d. II and III only
e. I, II, and III
21. (#3-3) Pi bonding is found in all of the following EXCEPT:
- N₂
 - SCN⁻
 - CO₃²⁻
 - AsH₃
22. (#3-4) There are only 2 ways to get a dipole moment of zero. Benzene (C₆H₆) happens to have a dipole moment of zero. Which of the following justifies this fact?
- The electronegativity of C and H are equal. N
 - This molecule is symmetrical. Y
 - It is not a covalent substance, it is a network covalent substance. N
- a. I only
b. II only
c. I and II only
d. III only
23. (#3-3) In the sulfur dioxide molecule, SO₂, the O-S-O bond angle is slightly less than 120 degrees. Which hybridization of orbitals around the central atom, sulfur, provides the best explanation for this bond angle?
- sp
 - sp²
 - sp³
 - dsp³
 - d²sp³



24. (#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.)

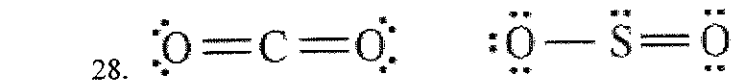


- 25.



(#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
- b. Difference in strength between covalent bonds and intermolecular attractions
- c. Different isotopes of fluorine present in the samples
- d. Uneven repulsions among non-bonding electron pairs
26. (#3-2) In general, the melting points of ionic solids are higher than the melting points of molecular solids. Which accounts for this difference?
- a. Attractions between particles with opposite charge are stronger than covalent bonds
- b. Repulsions between ions with the same charge are negligibly small
- c. Delocalized electron clouds in molecular solids are produced by the formation of pi bonds.
- d. Attractions between ions with opposite charge are stronger than intermolecular forces.
- e. The distance between oppositely charged ions is less than the corresponding distance between bonded atoms.
27. (#3-3) Water has an electronic/molecular shape as follows.
- a. linear/bent
- b. bent/bent
- c. tetrahedral/bent
- d. tetrahedral/tetrahedral



(#3-4) Lewis electron-dot diagrams for CO₂ and SO₂ are given above. The molecular geometry and polarity of the two substances are

- a. the same because the molecular formulas are similar c. different because the lone pair of electrons on the C atom make it the negative end of a dipole
- b. the same because C and S have similar electronegativity values d. different because S has a greater number of electron domains (regions of electron density) surrounding it than C has

___ 29. (#3-4) In a sample of solid NH₃ what types of bonds would need to be disrupted in order to make it melt?

- I. Hydrogen bond
II. Covalent bond
III. London Dispersion Forces.

- a. I only
b. I and II only

- c. I and III only
d. I, II and III