

AP Chem Chapters 8 and 9 Test

NAME KEY

email me if you catch a mistake!

C 1. The ability of an atom in a molecule to attract electrons is best quantified by the

- a) paramagnetism
- b) diamagnetism
- c) electronegativity
- d) electron charge-to-mass ratio
- e) first ionization potential

James look @ #13.

E 2. A nonpolar bond will form between two \_\_\_\_\_ atoms of \_\_\_\_\_ electronegativity.

- a) different, opposite
- b) identical, different
- c) different, different
- d) similar, different
- e) identical, equal

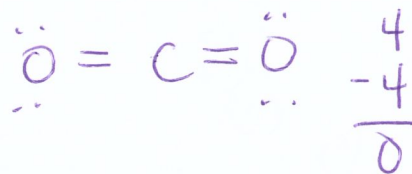
D 3. The ion  $\text{ICl}_4^-$  has \_\_\_\_\_ valence electrons.

- a) 34
- b) 35
- c) 36
- d) 28
- e) 8

$$7 + 4 \times 7 + 1 = 36$$

A 4. The formal charge on carbon in the carbon dioxide molecule is

- a) 0
- b) +1
- c) +2
- d) +3
- e) -1

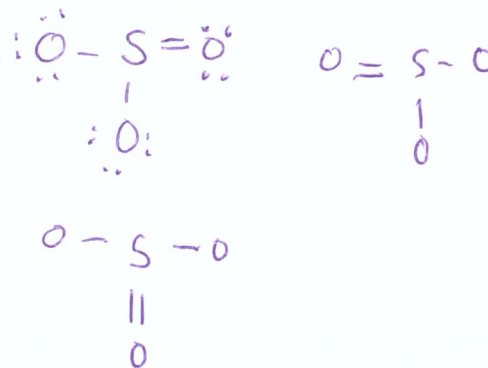


E 5. How many equivalent resonance structures can be drawn for the molecule  $\text{SO}_3$  without having to violate the octet rule?

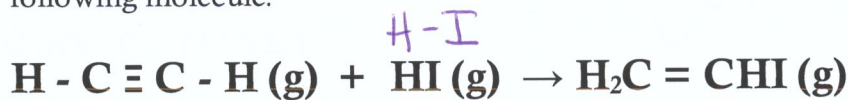
- a) 5
- b) 2
- c) 1
- d) 4
- e) 3

$$\begin{array}{r} 6 \\ +18 \\ \hline 24 \end{array}$$

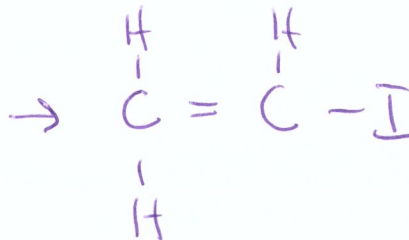
6)



C 6. Using the bond energies given, calculate the  $\Delta H$  for the reaction in kJ for the following molecule:



Bond	kJ/mol
$\text{C} \equiv \text{C}$	835
$\text{C} - \text{C}$	346
$\text{H} - \text{I}$	299
$\text{C} - \text{I}$	213
$\text{C} - \text{H}$	413
$\text{C} = \text{C}$	610



- a) +160  
 b) -160  
c) -102  
 d) -63  
 e) +63

$$= (835 + 299) - (610 + 213 + 413) = 1134 - 1236 = -102 \text{ kJ/mol}$$

7. Which of the following is an ionic substance:

- A. CO B. Na C. KI D. H<sub>2</sub>O
- ↑ cov.* *↑ met.* *↑ cov.*

A 8. Which of the following is nonpolar:

- A. Br<sub>2</sub> B. NH<sub>3</sub> C. H<sub>2</sub>O D. CHCl<sub>3</sub>
- polar*

E 9. Of the atoms below, \_\_\_\_\_ is the most electronegative.

- a) Si  
 b) Cl  
 c) Rb  
 d) Ca  
e) S

B 10. Which of the following has the bonds correctly arranged in order of increasing polarity?

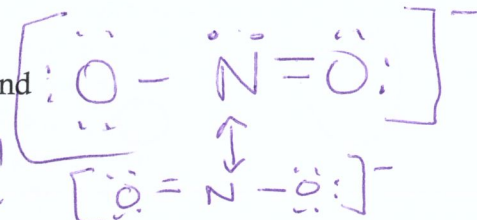
- a) Be - F, Mg - F, N - F, O - F  
b) O - F, N - F, Be - F, Mg - F  
 c) O - F, Be - F, Mg - F, N - F  
 d) N - F, Be - F, Mg - F, O - F  
 e) Mg - F, Be - F, N - F, O - F

*in order of increasing electronegativity difference!*

D 11. In the nitrite ion ( $\text{NO}_2^-$ ), \_\_\_\_\_

- a) both are single bonds
- b) both bonds are double bonds
- c) one bond is a double bond and the other is a single bond
- d) both bonds are the same
- e) there are 20 valence electrons

$$5 + 2 \times 1 = 18$$

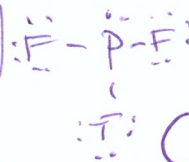
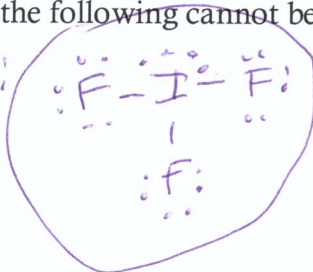
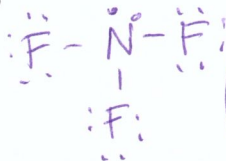


HAS RESONANCE!

B

12. A valid Lewis structure of which of the following cannot be drawn without violating the octet rule?

- a)  $\text{NF}_3$
- b)  $\text{IF}_3$
- c)  $\text{PF}_3$
- d)  $\text{SbF}_3$
- e)  $\text{SO}_4^{2-}$



A

13. Bond enthalpy is \_\_\_\_\_.

- a) always positive
- b) always negative
- c) sometimes positive, sometimes negative
- d) always zero
- e) unpredictable

It takes energy to break bonds

Bond formation is (-) releases energy

Overall sometimes (-); sometimes (+)

D

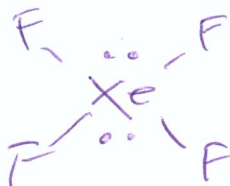
14. Of the bonds  $\text{C}-\text{N}$ ,  $\text{C}=\text{N}$ ,  $\text{C}\equiv\text{N}$ , the  $\text{C}-\text{N}$  is \_\_\_\_\_

- a) strongest / shortest
- b) strongest / longest
- c) weakest / shortest
- d) weakest / longest
- e) intermediate in both strength and length

B

15. The molecular geometry of \_\_\_\_\_ is square planar.

- a)  $\text{CCl}_4$
- b)  $\text{XeF}_4$
- c)  $\text{PH}_3$
- d)  $\text{XeF}_2$
- e)  $\text{ICl}_3$



C

16. According to VSEPR theory, if there are four electron domains (sites) in the valence shell of an atom, they will be arranged in a(n) \_\_\_\_\_ geometry.

- a) octahedral
- b) linear
- c) tetrahedral
- d) trigonal planar
- e) trigonal bipyramidal

17. The electron-domain (sites) geometry and the molecular shape of iodine trichloride are \_\_\_\_\_ and \_\_\_\_\_ respectively.

- C
- a) trigonal bipyramidal, trigonal planar
  - b) tetrahedral, trigonal pyramidal
  - c) trigonal bipyramidal, T-shaped
  - d) octahedral, trigonal planar
  - e) T-shaped, trigonal planar



18. The molecular geometry of the  $\text{PF}_4^+$  ion is \_\_\_\_\_

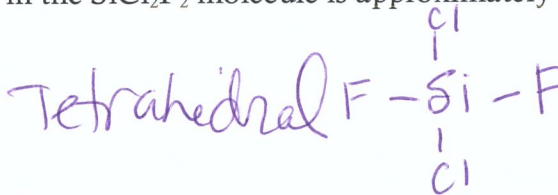
- B
- a) octahedral
  - b) tetrahedral
  - c) trigonal pyramidal
  - d) trigonal planar
  - e) trigonal bipyramidal



5+28-1=32

19. The Cl - Si - Cl bond angle in the  $\text{SiCl}_2\text{F}_2$  molecule is approximately \_\_\_\_\_.

- B
- a)  $90^\circ$
  - b)  $109.5^\circ$
  - c)  $120^\circ$
  - d)  $180^\circ$
  - e)  $60^\circ$



20. The hybridization of orbitals on the central atom in a molecule is sp. The geometry around this atom is \_\_\_\_\_

- B
- a) octahedral
  - b) linear
  - c) trigonal planar
  - d) trigonal bipyramidal
  - e) tetrahedral

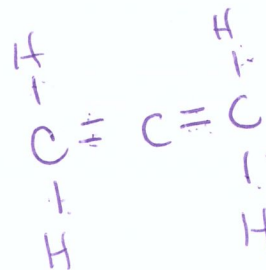
21. The geometry of a sulfur-centered compound is trigonal bipyramidal. The hybridization of the central atom is \_\_\_\_\_

- D
- a) sp
  - b)  $\text{sp}^2$
  - c)  $\text{sp}^3$
  - d)  $\text{sp}^3\text{d}$
  - e)  $\text{sp}^3\text{d}^2$

5

22. There are \_\_\_\_\_  $\sigma$  bonds and \_\_\_\_\_  $\pi$  bonds in the  $\text{H}_2\text{C}=\text{C}=\text{CH}_2$  molecule.

- E
- a) 4, 2
  - b) 6, 4
  - c) 2, 2
  - d) 2, 6
  - e) 6, 2



23. The basis of the VSEPR model of molecular bonding is \_\_\_\_\_
- a) regions of electron density on an atom will organize themselves so as to maximize s-character
  - b) regions of electron density in the valence shell of an atom will arrange themselves so as to maximize overlap
  - c) atomic orbitals of the bonding atoms must overlap for a bond to form
  - d) electron domains in the valence shell of an atom will arrange themselves so as to minimize repulsions
  - e) hybrid orbitals will form as necessary to, as closely as possible, achieve spherical symmetry

24. Three monosulfur fluorides are observed: SF<sub>2</sub>, SF<sub>4</sub>, and SF<sub>6</sub>. Of these, \_\_\_\_\_ is/are polar.

- a) SF<sub>2</sub> only
- b) SF<sub>2</sub> and SF<sub>4</sub>
- c) SF<sub>4</sub> only
- d) SF<sub>6</sub> only
- e) all three are polar

25. A typical double bond \_\_\_\_\_

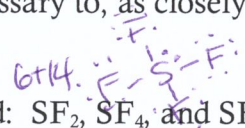
- a) is stronger and shorter than a single bond
- b) consists of one  $\sigma$  bond and one  $\pi$  bond
- c) imparts rigidity to a molecule
- d) consists of two shared electron pairs
- e) All of the above are correct

26. The formal charge on nitrogen in the NO<sub>3</sub><sup>-</sup> ion is \_\_\_\_\_

- a) -1
- b) 0
- c) +1
- d) +2
- e) -2

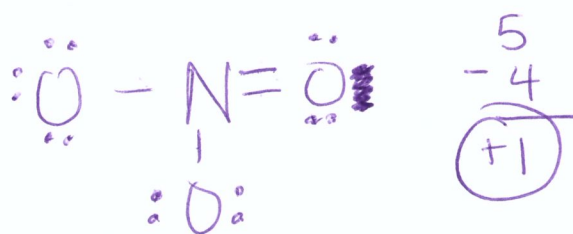
27. Lattice energy is \_\_\_\_\_

- a) the energy required to convert one mole of ionic solid into its constituent ions in the gas phase
- b) the energy given off when gaseous ions combine to form one mole of an ionic solid
- c) the energy required to produce one mole of an ionic compound from its constituent elements in their standard state
- d) the sum of ionization energies of the components of an ionic solid
- e) the sum of electron affinities of the components of an ionic solid



SF<sub>6</sub> is non polar octahedral

5 + 18 + 1 = 24



D

B

E

C

A

