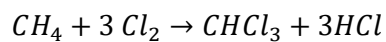


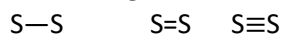
November 10, 2024 6-8pm

Chapter 9

1. Calculate the standard enthalpy of formation for the following reaction. The bond enthalpies are as follows. C—H= 413kJ/mol, Cl—Cl= 243kJ/mol, C—Cl = -339 kJ/mol, H—Cl= -427kJ/mol



- a. -4401 kJ/mol
b. 936 kJ/mol
c. 4401 kJ/mol
d. -936 kJ/mol
2. Place the following bonds in order of increasing bond strength



- a. $S-S < S=S < S\equiv S$
b. $S\equiv S < S=S < S-S$
c. $S=S < S-S < S\equiv S$
d. $S-S < S\equiv S < S=S$

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1 H Hydrogen Nonmetal																	2 He Helium Noble Gas	
3 Li Lithium Alkali Metal	4 Be Beryllium Alkaline Earth Metal																	10 Ne Neon Noble Gas
11 Na Sodium Alkali Metal	12 Mg Magnesium Alkaline Earth Metal																	18 Ar Argon Noble Gas
19 K Potassium Alkali Metal	20 Ca Calcium Alkaline Earth Metal	21 Sc Scandium Transition Metal	22 Ti Titanium Transition Metal	23 V Vanadium Transition Metal	24 Cr Chromium Transition Metal	25 Mn Manganese Transition Metal	26 Fe Iron Transition Metal	27 Co Cobalt Transition Metal	28 Ni Nickel Transition Metal	29 Cu Copper Transition Metal	30 Zn Zinc Transition Metal	31 Ga Gallium Post-Transition Metal	32 Ge Germanium Metalloid	33 As Arsenic Metalloid	34 Se Selenium Nonmetal	35 Br Bromine Halogen	36 Kr Krypton Noble Gas	
37 Rb Rubidium Alkali Metal	38 Sr Strontium Alkaline Earth Metal	39 Y Yttrium Transition Metal	40 Zr Zirconium Transition Metal	41 Nb Niobium Transition Metal	42 Mo Molybdenum Transition Metal	43 Tc Technetium Transition Metal	44 Ru Ruthenium Transition Metal	45 Rh Rhodium Transition Metal	46 Pd Palladium Transition Metal	47 Ag Silver Transition Metal	48 Cd Cadmium Transition Metal	49 In Indium Post-Transition Metal	50 Sn Tin Post-Transition Metal	51 Sb Antimony Metalloid	52 Te Tellurium Metalloid	53 I Iodine Halogen	54 Xe Xenon Noble Gas	
55 Cs Cesium Alkali Metal	56 Ba Barium Alkaline Earth Metal		72 Hf Hafnium Transition Metal	73 Ta Tantalum Transition Metal	74 W Tungsten Transition Metal	75 Re Rhenium Transition Metal	76 Os Osmium Transition Metal	77 Ir Iridium Transition Metal	78 Pt Platinum Transition Metal	79 Au Gold Transition Metal	80 Hg Mercury Transition Metal	81 Tl Thallium Post-Transition Metal	82 Pb Lead Post-Transition Metal	83 Bi Bismuth Post-Transition Metal	84 Po Polonium Metalloid	85 At Astatine Halogen	86 Rn Radon Noble Gas	
87 Fr Francium Alkali Metal	88 Ra Radium Alkaline Earth Metal		104 Rf Rutherfordium Transition Metal	105 Db Dubnium Transition Metal	106 Sg Seaborgium Transition Metal	107 Bh Bohrium Transition Metal	108 Hs Hassium Transition Metal	109 Mt Meitnerium Transition Metal	110 Ds Darmstadtium Transition Metal	111 Rg Roentgenium Transition Metal	112 Cn Copernicium Transition Metal	113 Nh Nihonium Post-Transition Metal	114 Fl Flerovium Post-Transition Metal	115 Mc Moscovium Post-Transition Metal	116 Lv Livermorium Post-Transition Metal	117 Ts Tennessine Halogen	118 Og Oganesson Noble Gas	
			57 La Lanthanum Lanthanide	58 Ce Cerium Lanthanide	59 Pr Praseodymium Lanthanide	60 Nd Neodymium Lanthanide	61 Pm Promethium Lanthanide	62 Sm Samarium Lanthanide	63 Eu Europium Lanthanide	64 Gd Gadolinium Lanthanide	65 Tb Terbium Lanthanide	66 Dy Dysprosium Lanthanide	67 Ho Holmium Lanthanide	68 Er Erbium Lanthanide	69 Tm Thulium Lanthanide	70 Yb Ytterbium Lanthanide	71 Lu Lutetium Lanthanide	
			89 Ac Actinium Actinide	90 Th Thorium Actinide	91 Pa Protactinium Actinide	92 U Uranium Actinide	93 Np Neptunium Actinide	94 Pu Plutonium Actinide	95 Am Americium Actinide	96 Cm Curium Actinide	97 Bk Berkelium Actinide	98 Cf Californium Actinide	99 Es Einsteinium Actinide	100 Fm Fermium Actinide	101 Md Mendelevium Actinide	102 No Nobelium Actinide	103 Lr Lawrencium Actinide	

3. Place the following bonds in order of increasing bond length



- H—F < H—Cl < H—I < H—H
- H—H < H—I < H—Cl < H—F
- H—H < H—F < H—Cl < H—I
- H—I < H—Cl < H—F < H—H

4. Order the following salts in order of increasing lattice energy: Calcium chloride, sodium chloride, potassium chloride, barium chloride

- Calcium chloride < sodium chloride < potassium chloride < barium chloride
- Sodium chloride < potassium chloride < barium chloride < calcium chloride
- Potassium chloride < sodium chloride < calcium chloride < barium chloride
- Potassium chloride < sodium chloride < barium chloride < calcium chloride

5. Draw the Lewis Structure(s) for SO_4^{2-}

6. Which of the following are exceptions to the octet rule in the central atom?

I PCl_5 II. BeCl_2 III. BF_3 IV. NH_3 V. H_2O

- a. I, II, III
- b. I, II, IV
- c. II, IV
- d. I, II, V
- e. II, III, IV

7. Which of the following molecules is polar?

- a. CH_2Cl_2
- b. PCl_5
- c. BF_3
- d. XeF_2

8. Name the electron geometry, molecular geometry, and bond angles for each of the following bonds.

a. BrF_3

b. HCN

c. CO_3^{2-}

9. Which of the following solutions is matched with its correct intermolecular force between solute and solvent?

A) CH_2F_2 and CH_2O : dispersion

B) Cl_2 and PH_3 : dipole-induced dipole

C) HF and NH_3 : dipole-dipole

D) PH_3 and H_2O : dispersion

10. Which of the following has sp^2 hybridization?

a. BF_3

b. I_3^-

c. CO_2

d. NH_3

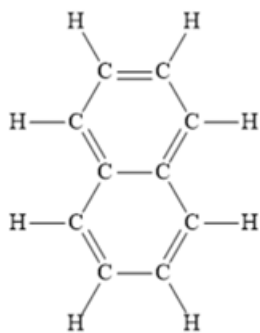
11. According to MO theory, which of the following is paramagnetic? MO order: $\sigma_{2s} < \sigma^*_{2s} < \sigma_{2px} < \pi_{2py} = \pi_{2pz} < \pi^*_{2py} = \pi^*_{2pz} < \sigma^*_{2px}$

- a. O_2
- b. O_2^+
- c. O_2^-
- d. All of the above

12. 19. According to MO theory, which of the following dicarbon species is expected to have the shortest bond length. Use the following valence MO order: $\sigma_{2s} < \sigma^*_{2s} < \pi_{2py} = \pi_{2pz} < \sigma_{2px} < \pi^*_{2py} = \pi^*_{2pz} < \sigma^*_{2px}$

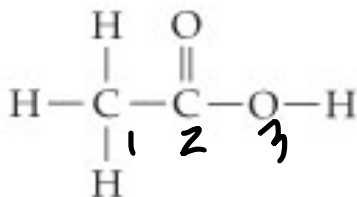
- a) C_2^{2+}
- b) C_2
- c) C_2^{2-}
- d) C_2^-
- e) They all have the same length

13. How many sigma and pi bonds are in the molecule below?



- a. 16 sigma, 5 pi
- b. 19 sigma, 5 pi
- c. 14 sigma, 10 pi
- d. 20 sigma, 10 pi

14. What are the hybridizations of the three labeled atoms in the following molecule?



- a. 1 sp^3 2. sp^2 3. sp^3
- b. 1. sp^3 2. sp^2 3. sp^3d
- c. 1. sp^3 2. sp^2 3. sp
- d. 1. sp^3d 2. sp^3 3. sp^3

15. Rank the following in order of increasing boiling point.

I. CH_2Br_2 II. $\text{CH}_3\text{CH}_2\text{OH}$ III. F_2 IV. CH_4

- a. $\text{IV} < \text{III} < \text{II} < \text{I}$
- b. $\text{IV} < \text{III} < \text{I} < \text{II}$
- c. $\text{I} < \text{II} < \text{IV} < \text{III}$
- d. $\text{III} < \text{I} < \text{II} < \text{IV}$

16. Which of the following has the lowest vapor pressure?

- a. CH_4
- b. H_2O
- c. CH_2Cl_2
- d. NH_3

17. Which of the following molecules is predicted to have the highest viscosity?

- a. BF_3
- b. CH_2I_2
- c. NH_3
- d. CH_4

18. Which of the following statements is true?

- a. As temperature increases, viscosity increases.
- b. Vapor pressure increases with increasing intermolecular forces
- c. The stronger intermolecular force, the stronger the surface tension.
- d. Surface tension increases with increasing temperature.

19. Calculate the heat needed to convert 10.0 g of solid bromine from -7.2°C to 70.0°C . Which of the following steps requires the most heat energy: melting the solid bromine, heating the liquid bromine from its melting point to its boiling point, boiling the bromine, or heating the gaseous bromine from its boiling point to 110.0°C ? Melting point for bromine -7.2°C , heat of fusion for bromine = 66.15 J/g ; specific heat of liquid bromine = $0.474 \text{ J/g}^\circ\text{C}$; boiling point for bromine = 58.7°C , heat of vaporization for bromine = 193.21 J/g , specific heat of gaseous bromine = $0.225 \text{ J/g}^\circ\text{C}$.