

1. (8 pts.) Draw Lewis structures for the following elements and ions.

a. O

b. Cl^-

c. P

d. Si

2. (16 pts.) Draw Lewis structures for the following molecules and ions (it is not necessary to calculate formal charges).

a. CH_2Cl_2

b. NH_4^+

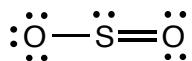
c. CO

c. CH_3SH

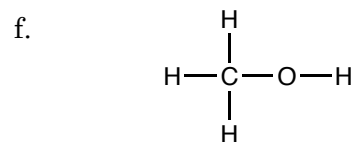
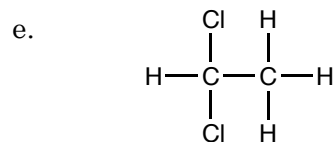
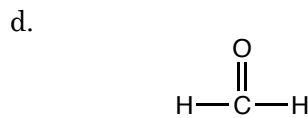
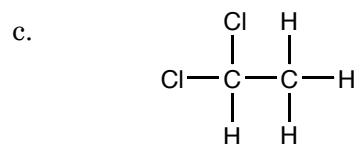
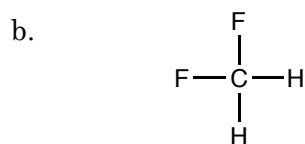
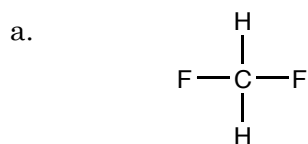
3. A Lewis structure for SO_2 is drawn below.

a. (4 pts.) Determine the formal charges for all of the elements. Label the neutral elements with a 0.

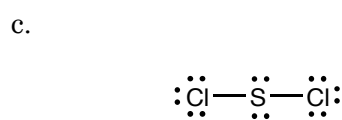
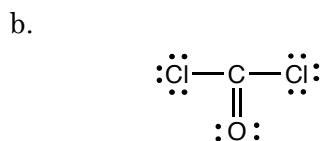
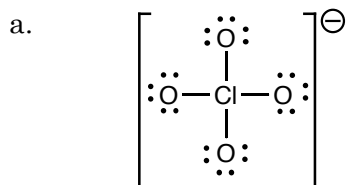
b. (4 pts.) Draw the two other resonance forms for SO_2 .



4. (9 pts.) Determine which of the following molecules is(are) polar. Kekulé structures (Lewis structures missing the lone pairs) are provided.

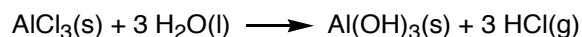


5. (9 pts.) Draw wedge and dashed bond shapes for the following molecules. Alternatively, you may name the shape and provide approximate bond angles.



6. (10 pts.) A 35.0-g sample of water that was initially at 95.0 °C released 1,334 J of energy. Considering that the heat capacity of water is 4.184 J·g⁻¹·K⁻¹, determine the final temperature of the water.

7. (10 pts.) If $\Delta H_{\text{combustion}} = -2598.8 \text{ kJ} \cdot \text{mol}^{-1}$ for C_2H_2 . Determine the mass, in grams, of C_2H_2 required to produce 1,755 kJ of heat.
8. (10 pts.) Considering that ΔH_f° for $\text{AlCl}_3(\text{s})$ is -704 kJ , ΔH_f° for $\text{H}_2\text{O}(\text{l})$ is -286 kJ , ΔH_f° for $\text{H}_2\text{O}(\text{g})$ is -242 kJ , ΔH_f° for $\text{HCl}(\text{g})$ is -92 kJ , and ΔH_f° for $\text{Al}(\text{OH})_3(\text{s})$ is -1276 kJ , determine $\Delta H^\circ_{\text{reaction}}$ for the following reaction.



9. A sample of metal released 367 J of energy, and all of the energy was transferred to a sample of water
- a. (5 pts.) Determine q_{metal} .
- b. (5 pts.) Determine q_{water} .
10. (5 pts.) An exothermic reaction is a reaction that absorbs or releases energy?

(5 pts.) The sign of q for an exothermic reaction is positive or negative?