

$$P_1 = \chi_1 P_{\text{tot}}$$

$$\Delta E = 2.179 \times 10^{-18} \text{ J} \left(\frac{1}{n_i^2} - \frac{1}{n_f^2} \right)$$

$$\Delta H = \Delta E + P\Delta V$$

$$PV = nRT$$

$$R = 0.08206 \frac{\text{L atm}}{\text{°K mol}}$$

$$u_{\text{RMS}} = \sqrt{\frac{3RT}{M}}$$

$$\text{rate} \propto \frac{1}{\sqrt{M}}$$

$$R = 8.3143 \frac{\text{J}}{\text{°K mol}}$$

$$E = h\nu$$

$$h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$c = 3.00 \times 10^8 \text{ m/s}$$

1. (35) The following system involves hydrobromic acid and barium hydroxide.

- (8) Write the balanced chemical equation.
- (3) What do we call this type of reaction?
- (10) How many mL of .345 M hydrobromic acid solution are needed to neutralize 93.22 mL of .734 M barium hydroxide solution?

- (8) What is the mass % of Ba in barium hydroxide?
- (6) Write the electron configurations for Ba and Br.

2. (28) Suppose that I put 19.00 grams of Xenon gas into a 568mL container. Atmospheric pressure is recorded to be 783 mm Hg. $R = 0.08206 \text{ L atm/ K mol}$

- (10) Calculate the temperature, in deg C, of the xenon.
- (6) I add excess fluorine to the system, producing gaseous XeF_2 . Write the balanced chemical equation.
- (6) What is the electron domain geometry and molecular geometry of the product?
- (6) What is the proper name of the molecule formed in part b?

3. (17) Chlorine gas and solid sodium are put into a container and react.

- (6) Write a balanced chemical equation for the reaction.
- (3) What type of bond is formed between the chlorine and sodium?
- (4) Which orbital is the electron in the bond from the chlorine coming from?
- (4) Which orbital is the electron in the bond from the sodium coming from?

4. (20) All of these questions regard the unbalanced equation, $\text{Ca}_{(s)} + \text{HBr}_{(aq)} \rightarrow \text{H}_{2(g)} + \text{CaBr}_{2(aq)}$

- (6) Balance the equation.
- (8) If 8.92 g of calcium are added to 0.342 mol of HBr, how many g of H_2 can be produced?
- (6) Does calcium bromide have an overall dipole moment? Explain why or why not.

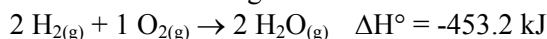
5. (12) Consider the two species O^{2-} and F^{-1} .

- (4) Which species has the larger atomic radius? Why?
- (4) Whose 2s orbital is smaller? Why?
- (4) Which has a lower ionization energy? Why?

6. [20] a.(6) In H, is energy emitted or absorbed when an e- goes from $n=3$ to $n=5$? Explain your answer

- (8) What is the frequency of this radiation?
- (6) What is the wavelength of this radiation?

7. (10) Consider the following reaction:



What is the ΔH associated with 4.312 g of $\text{H}_2\text{O}_{(g)}$ **decomposing into** $\text{H}_{2(g)}$ and $\text{O}_{2(g)}$ at constant pressure?

8. (8) Assume I mix the following pairs of solutions together. Will a precipitate form? If so, give the formula of the solid precipitate, otherwise simply state 'no precip' a. [$\text{PbNO}_{3(aq)}$, $\text{NH}_4\text{SO}_{4(aq)}$] b. [$\text{HBr}_{(aq)}$, $\text{NaCl}_{(aq)}$]