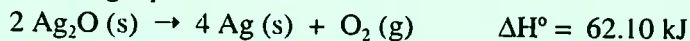
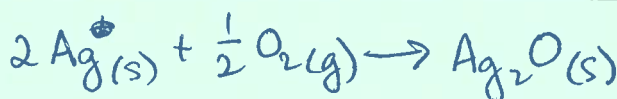


1. The following equation is balanced:



- a. [2 pts] What is the correct systematic name of Ag_2O ? silver oxide
- b. [2] Is the reaction above exothermic or endothermic? endothermic (ΔH is positive)
- c. [2] Which element is reduced in the reaction above? Ag ($\text{Ag}^+ \rightarrow \text{Ag}^0$)
- d. [3] What is the ΔH° value for the reaction below? other version: $4\text{Ag}(\text{s}) + \text{O}_2(\text{g}) \rightarrow 2\text{Ag}_2\text{O} \Delta H = -62$ (reverse of above)
(double of above rxn)
 $4 \text{Ag}_2\text{O} (\text{s}) \rightarrow 8 \text{Ag} (\text{s}) + 2 \text{O}_2 (\text{g}) \quad \Delta H^\circ = +124.20 \text{ kJ}$
- e. [10] In the box below, write the formation equation (the reaction corresponding to the ΔH_f°) for $\text{Ag}_2\text{O} (\text{s})$, and give the value of the ΔH_f° . For full credit, include appropriate phase labels on all species.

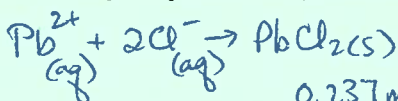


reverse and $\frac{1}{2}$ of rxn provided above
 $\Delta H_f^\circ = -31.05 \text{ kJ}$

2. [2 each] Three identical 5-L flasks each contain a sample of gas (He, Ne or Ar) at 273 K and 1 atm. For each of the following quantities or values, circle the best choice.

- a. greatest density: He Ne Ar all same
- b. greatest average kinetic energy: He Ne Ar all same
- c. greatest rate of effusion through a valve: He Ne Ar all same
- d. greatest average speed of atoms: He Ne Ar all same
- e. greatest number of atoms: He Ne Ar all same

3. [6] $\rightarrow 0.0410 \text{ L}$ 41.0 mL of a solution of $0.237 \text{ M Pb}(\text{NO}_3)_2$ are added to $\rightarrow 0.0600 \text{ L}$ 60.0 mL of a solution of $0.250 \text{ M NH}_4\text{Cl}$. How many grams of precipitate can be produced? **SHOW YOUR WORK** in the area below and write your answer in the space provided. (Molar mass of $\text{PbCl}_2 = 278.1$, $\text{NH}_4\text{NO}_3 = 80.05$)



$$0.0410 \text{ L} \times \frac{0.237 \text{ mol Pb}^{2+}}{\text{L}} \times \frac{1 \text{ mol PbCl}_2}{1 \text{ mol Pb}^{2+}} \times \frac{278.1 \text{ g PbCl}_2}{\text{mol}} = 2.70 \text{ g PbCl}_2$$

$$0.0600 \text{ L} \times \frac{0.250 \text{ mol Cl}^-}{\text{L}} \times \frac{1 \text{ mol PbCl}_2}{2 \text{ mol Cl}^-} \times \frac{278.1 \text{ g PbCl}_2}{\text{mol}} = \boxed{2.09 \text{ g PbCl}_2}$$

$\leftarrow \text{Cl}^-$ is limiting

4. [6] **A 15.4 L container holds a gas at 38 °C and 2.19 atm. The gas is transferred to a new container of 25.6 L and the new temperature is 87 °C. What is the new pressure (in atm) of the gas? **SHOW YOUR WORK** in the area below and write your answer, rounded appropriately, in the space provided.

$311\text{K} = T_1$
 $360\text{K} = T_2$

1.52 atm

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \Rightarrow P_2 = \frac{P_1 V_1 T_2}{T_1 V_2} = \frac{(2.19 \text{ atm})(15.4 \text{ L})(360 \text{ K})}{(311 \text{ K})(25.6 \text{ L})} = 1.52 \text{ atm}$$

(3 sig figs)

5. [4] **What is the energy (in J) of the $n = 2$ level of O^{7+} ? **SHOW YOUR WORK** in the area below and write your answer in the space provided.

$\rightarrow 8p^+, 1e^-$

-3.49×10^{-17} J

$$E = -2.18 \times 10^{-18} \text{ J} \left(\frac{8^2}{2^2} \right) = (-2.18 \times 10^{-18} \text{ J})(16) = -3.488 \times 10^{-17} \rightarrow 3 \text{ sig figs}$$

6. [2 each] **Clearly** assign each statement as TRUE or FALSE. If we can't tell which you mean, it's wrong.

True! We are being bombarded with electromagnetic radiation right now, from the lights in this room.

False A photon of red light has a ~~greater~~ ^{smaller} frequency than a photon of blue light. *greater λ , smaller ν*

False Humans can see ~~most~~ ^{very little} of the electromagnetic spectrum.

False Electrons in atoms can orbit at any distance and can have any energy. *Energy levels are quantized*

False The equation to the right can be used to calculate the energy of any electron in an atom. *only single- e^- species*

$$E = -2.18 \times 10^{-18} \text{ J} \left(\frac{Z^2}{n^2} \right)$$

True When an electron in an atom relaxes from $n=3$ to $n=2$, a photon is emitted.

False If the temperature of a gas sample rises from 20°C to 40°C, the average kinetic energy of the molecules is ~~doubled~~. *only increases by about 7% $\hookrightarrow 293\text{K} \hookrightarrow 313\text{K}$*

False At a given temperature, all the molecules in a sample of gas have the same kinetic energy. *molecules have a range of speeds and kinetic energy values*

False All diatomic elements are gases under standard conditions. *$\text{I}_2(\text{s}), \text{Br}_2(\text{l})$ (or $\text{s})$*

False At the same pressure, temperature and volume, all ideal gas samples have the same average molecular velocity. *same T, same KE, but the speeds of molecules depend on mass*

False Gases behave most ideally at ~~high~~ ^{low} pressures and high temperatures.

False At STP, one mole of ~~any substance~~ will occupy a volume of 22.4 L. *only works for gases behaving ideally*

True Breaking bonds is always an endothermic process.

False Combustion of any substance will yield CO_2 and H_2O as products. *only if C & H in reactants*

True For an element in its stable state, $\Delta H_f^\circ = 0$ and oxidation number = 0.

False When the temperature of a sample of gas increases, its density decreases. *$D \downarrow$ if $V \uparrow$, but if V is constant, D is constant.*