

a) At 25.0°C the concentration of  $\text{Cl}^-$  in a saturated solution of  $\text{PbCl}_2$  is found to be  $3.24 \times 10^{-2} \text{ M}$ .

I. Write the balanced chemical equation for the dissociation of  $\text{PbCl}_2$ .

II. Calculate the molar solubility of lead (II) chloride in water at this temperature.

III. Calculate the value of the solubility product constant for  $\text{PbCl}_2$  at this temperature.

b) Suppose 150 mL of  $4.82 \times 10^{-4} \text{ M Ni(NO}_3)_2$  is mixed with 190 mL of  $3.77 \times 10^{-4} \text{ M Na}_2\text{CO}_3$  at 25°C.  $K_{\text{sp}}$  for  $\text{NiCO}_3$  is  $1.3 \times 10^{-7}$  at 25°C.

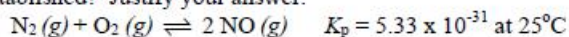
I. Find the initial concentrations of  $\text{Ni}^{2+}(\text{aq})$  and  $\text{CO}_3^{2-}(\text{aq})$ , assuming the volumes are additive.

II. Will a precipitate of  $\text{Ni(CO}_3)$  form in this mixture? Justify your answer with calculations.

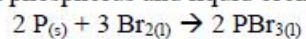
c) A 0.020 mol sample of pure  $\text{NO(g)}$  is put in an evacuated 1.0 L container at 25°C.

I. Calculate the initial pressure in the container when the  $\text{NO(g)}$  is first introduced.

II. What is the total pressure in the container when the following equilibrium is established? Justify your answer.



- a) The reaction between phosphorus and liquid bromine is outlined below.



- I. Identify the limiting reactant when 2.78 g of phosphorus react with 2.99 g of liquid bromine. Justify your answer.
  
  
  
  
  
  
  
  
  
  
- II. Based on your answer from part (I), determine the maximum mass of  $\text{PBr}_3$  that can be produced in this reaction.
  
  
  
  
  
  
  
  
  
  
- III. If the actual yield of  $\text{PBr}_3$  is found to be 2.29g, find the percent yield in this reaction.