SUMMARY SHEET

- **What is a Mole?**
  - A mole is a measurement used to balance chemical reactions.
  - We use moles because it is an easy unit to use when talking about balanced chemical reactions.
- **What is a Gram?**
  - A metric unit that we use in lab (when weighing)
- **Avogadro's Number:**
  - The amount of a molecule ($6.02x10^{23}$) per 1 mole.
- **Molecular Weight:**
  - Molecular weight is the weight of an element in grams per mole. For example: The element N_2 has the molecular weight of 28.014g per 1 mole.
  - To calculate this, you look at the periodic table and find N which has the molecular weight of 14.007g/mole but since we have 2 N elements, we multiply that by 2. Ex: 2(14.007) = 28.014g/mole.

- Grams ➡ Grams **1$FeBr_{3(aq)}$ + 1$H_3PO_{4(aq)}$→1$FePO_{4(s)}$ + 3$HBr_{(aq)}$**
- ~ How many grams of $FePO_{4(s)}$ will be produced when 71.6 grams of $H_3PO_{4(aq)}$ is reacted?

- $\frac{71.6 \text{ grams } H_3PO_{4(aq)}}{} \chi \frac{1 \text{ mol } H_3PO_{4(aq)}}{97.9937g\ H_3PO_{4(aq)}} \chi \frac{1 mol FePO_{4(s)}}{1 \text{ mol } H_3PO_{4(aq)}} \chi \frac{150.82 grams FePO_{4(s)}}{1 \text{ mol } FePO_{4(s)}}$

- 71.6 × 1 × 1 × 150.82 ÷ 97.9937 ÷1 ÷1 = 110.

- ~ 110. Grams of $FePO_{4(s)}$ will be produced when 71.6 grams of $H_3PO_{4(aq)}$ is reacted because when figuring out grams to grams you start with the given grams in the scenario (71.6g $H_3PO_{4(aq)}$). Next you want to get rid of grams so you calculate the molecular weight of $H_3PO_{4(aq)}$ which is 97.9937g $H_3PO_{4(aq)}$ per 1 mole. Next, we want to get rid of moles of $H_3PO_{4(aq)}$ and find moles of $FePO_{4(s)}$. Lastly, we want to get rid of the moles of $FePO_{4(s)}$ and get to our final unit (what the question is asking for) grams of $FePO_{4(s)}$.We will need to put the molecular weight of $FePO_{4(s)}$ which is 150.82g per 1 mole. Multiply by tops, divide by the bottoms and round to proper significant figures.
- Mole ➡ Mole **1$FeBr_{3(aq)}$ + 1$H_3PO_{4(aq)}$→1$FePO_{4(s)}$ + 3$HBr_{(aq)}$**

- ~How many moles of $HBr_{(aq)}$ will be produced from 8.0 moles of $H_3PO_{4(aq)}$?

- $\frac{8.0 \text{ mols } H_3PO_{4(aq)}}{} \chi \frac{3 \text{ mols } HBr_{(aq)}}{1 \text{ mole } H_3PO_{4(aq)}}$
- 8.0 × 3 ÷ 1 = 24

- ~There will be 24 moles of $HBr_{(aq)}$ produced when 8 moles of $H_3PO_{4(aq)}$ is reacted because you take what is given in the problem to start with (8.0 moles $H_3PO_{4(aq)}$). Next you need to get rid of the moles $H_3PO_{4(aq)}$ on the top so we know for the next conversion step that Moles of $H_3PO_{4(aq)}$ has to be on the bottom (1 mole $H_3PO_{4(aq)}$)

which we get from our balanced equation. Then we have to look at what unit the question is asking and in this case, it is moles of $HBr_{(aq)}$. That is what goes on top and it is 3 moles of $HBr_{(aq)}$ also given to us from our balanced equation. The last step is to multiply the tops, divide by the bottom numbers and then round your answer according to significant figures.

- Grams ➡ Mole **$\underline{1}FeBr_{3(aq)} + \underline{1}H_3PO_{4(aq)} \rightarrow \underline{1}FePO_{4(s)} + \underline{3}HBr_{(aq)}$**
- ~30 grams of $FeBr_{3(aq)}$ is reacted to produce how many moles of $HBr_{(aq)}$?

- $\frac{30 \text{ Grams } FeBr_{3(aq)}}{} \chi \frac{1 \text{ mol } FeBr_{3(aq)}}{295.55g\ FeBr_{3(aq)}} \chi \frac{3 \text{ mols } HBr_{(aq)}}{1 \text{ mol } FeBr_{3(aq)}}$

- $30 \times 1 \times 3 \div 295.55 \div 1 = 0.3$

- ~ There will be 0.3 moles of $HBr_{(aq)}$ produced when 30 grams of $FeBr_{3(aq)}$ is reacted. This problem is like grams to grams, you will start with 30 grams of $FeBr_{3(aq)}$ and cancel it out with the molecular weight of $FeBr_{3(aq)}$ which is 295.55g per 1 mole. Lastly, we want to get moles of $HBr_{(aq)}$ and we must get rid of the moles of $FeBr_{3(aq)}$. To find the moles of $FeBr_{3(aq)}$, and HBr, you can find them in the balanced equation. The last step is to multiply the tops, divide by the bottom numbers and then round your answer according to significant figures.

- Grams ➡ Moles ➡ Molecules **$\underline{1}FeBr_{3(aq)} + \underline{1}H_3PO_{4(aq)} \rightarrow \underline{1}FePO_{4(s)} + \underline{3}HBr_{(aq)}$**
- ~Convert 56.0 Grams of $FeBr_{3(aq)}$ to Molecules
- $\frac{56.0 \text{ Grams } FeBr_{3(aq)}}{} \chi \frac{1 \text{ mol } FeBr_{3(aq)}}{295.55g\ FeBr_{3(aq)}} \chi \frac{6.02x10^{23} \text{ molecules}}{1 \text{ mol } FeBr_{3(aq)}}$
- $56 \times 1 \times 6.02x10^{23} \div 295.55 \div 1 = 1.14x10^{23}$
- ~There is $1.14x10^{23}$ molecules in 56.0 grams of $FeBr_{3(aq)}$. To convert 56.0g $FeBr_{3(aq)}$ to molecules, start with the given from the scenario 56.0g $FeBr_{3(aq)}$ cross out g of $FeBr_{3(aq)}$ using molecular weight which is 295.55g $FeBr_{3(aq)}$ per one mole. Next, we want to cross out moles and get to molecules. We know that 1 mole is $6.02x10^{23}$ molecules. The last step is to multiply the tops, divide by the bottom numbers and then round your answer according to significant figures.

- Grams ➡ Moles ➡ Atoms **$\underline{1}FeBr_{3(aq)} + \underline{1}H_3PO_{4(aq)} \rightarrow \underline{1}FePO_{4(s)} + \underline{3}HBr_{(aq)}$**
- ~How many atoms of Oxygen of $FePO_{4(s)}$ are in 42.3 grams of $FePO_{4(s)}$?
- $\frac{42.3 \text{Grams}}{} \chi \frac{1 \text{ Mole } FePO_{4(s)}}{150.82g\ FePO_{4(s)}} \chi \frac{6.02x10^{23} \text{ Molecule}}{1 \text{ mole } FePO_{4(s)}} \chi \frac{4 \text{ atoms O}}{1 \text{ Molecule } FePO_{4(s)}}$
- $42.3 \times 1 \times 6.02x10^{23} \times 4 \div 150.82 \div 1 \div 1 = 6.75x10^{23}$
- ~ There are $6.75x10^{23}$ oxygen atoms in 42.3 grams of $FePO_{4(s)}$. To figure out how to get from grams to atoms, it is a lot like getting from grams to molecules. Except once you get to molecules per mole you will need to cross out molecules, putting that configuration on the bottom and atoms of Oxygen on the top. In $FePO4_{(s)}$ there are 4 atoms of oxygen. The last step is to multiply the tops, divide by the bottom numbers and then round your answer according to significant figures.