What do students see when they do a lab?

In class if all we are showing them are reactions such as $\text{H}_2\text{O} \rightarrow \text{H}_2 + \text{O}_2$, how will they bridge the gap of what they see in lab and what we are talking about in class?
In class, you can:

a) print out these sheets (and edit if you want)

b) put them in pieces on a slide in a presentation

c) Talk about them during the demo and have them draw on whiteboards.

Types of Reactions - Whoosh

Combustion

1) Write a balanced equation for when C₆H₅OH reacts with oxygen

\[ 2C₆H₅OH + 6O₂ \rightarrow 4CO₂ + 6H₂O \]

2) Draw a particulate drawing of the reactants and the products of the reaction between C₆H₅OH and oxygen. Draw 1 of C₆H₅OH and 3 oxygen and as many products as you can make from those reactants.
Types of Reactions - Whoosh

What gas is given off and how would you test for it?

CO₂ - insert burning splint and should go out

Types of Reactions - Burning Sulfur

4) Write a balanced equation for when sulfur reacts with oxygen.

\[ S + O₂ \rightarrow SO₂ \]

5) Draw a particulate drawing of the reactants and the products, draw 3 reactants and as many products as you can.

6) What will form when the product combines with water? How can you test to confirm you are correct?

\[ H_2SO₃/ \text{an acid, use an indicator} \]

Types of Reactions - KClO₃

7) Write a balanced equation for when potassium chlorate decomposes.

\[ 2KClO₃ \rightarrow 2KCl + 3O₂ \]

8) Draw a particulate drawing of the reactants and the products of the decomposition of potassium chlorate. Draw 2 formula units of the reactant and as many products as you can make from the reactants.
Types of Reactions- KClO₃

9) If sucrose (C₁₂H₂₂O₁₁) is added to the test tube after the potassium chlorate decomposes, which product will react with the sucrose? O₂
What type of reaction will take place? combustion

10) Write the balanced equation for the reaction that will take place with the sucrose.

\[ C_{12}H_{22}O_{11} + 12O_2 \rightarrow 12CO_2 + 11H_2O \]

Types of Reactions- Zn and HCl

11) Write a balanced equation for when hydrochloric acid reacts with zinc metal

\[ 2HCl + Zn \rightarrow ZnCl_2 + H_2 \]

12) Draw a particulate drawing of the reactants and the products of the reaction between zinc and hydrochloric acid. Draw 4 of each reactant and as many products as you can make from the reactants.

- Zinc
- Hydrogen
- Chlorine

13) What gas is given off? And how can you test to confirm that you are correct?
H₂- burning splint should "pop"

Types of Reactions- NaCl and AgNO₃

14) Write a balanced equation for when aqueous sodium chloride reacts with aqueous silver nitrate.

\[ NaCl + AgNO_3 \rightarrow AgCl + NaNO_3 \]

15) Draw a particulate drawing of the reactants and the products of the reaction between the aqueous solutions of sodium chloride and silver nitrate. Draw 3 of each reactant and as many products as you can make from the reactants.

- Na⁺
- Cl⁻
- Ag⁺
- Ag⁺
- NO₃⁻

16) What type of double replacement reaction is this an example of?
Types of Reactions - HCl and NaOH

17) Write a balanced equation for when aqueous sodium hydroxide reacts with aqueous hydrochloric acid.

\[ \text{NaOH} + \text{HCl} \rightarrow \text{H}_2\text{O} + \text{NaCl} \]

18) Draw a particulate drawing of the reactants and the products of the reaction between the aqueous solutions of sodium hydroxide and hydrochloric acid. Draw 3 of each reactant and as many products as you can make from the reactants.

\[ \text{Reactants} \quad \rightarrow \quad \text{Products} \]

- Na\(^+\)
- OH\(^-\)
- H\(^+\)
- Cl\(^-\)

19) What type of double replacement reaction is this an example of?

20) What do we need to add to see that a reaction is taking place?

Electrolytes

- What kind of substances are electrolytes?
- acids, bases and salts
- What makes them electrolytes?
- dissociate into ions
- Are these substances electrolytes in all states of matter?
- no

Do you think HCl is an electrolyte, why?

Then I would test HCl

Electrolytes

- Write the equation for HCl dissolving:
- \[ \text{HCl} \rightarrow \text{H}^+ + \text{Cl}^- \]
- Draw a picture of HCl in solution. Draw 3 molecules of HCl

Do you think vinegar (HC\(_2\)H\(_3\)O\(_2\)) is an electrolyte, why?

Then I would test HC\(_2\)H\(_3\)O\(_2\)

- What accounts for the difference in brightness between this solution compared to the HCl?
- Write the equation for HC\(_2\)H\(_3\)O\(_2\) dissolving:
- \[ \text{HC}_2\text{H}_3\text{O}_2 \rightarrow \text{H}^+ + \text{C}_2\text{H}_5\text{O}_2^- \]
- Draw a picture of HC\(_2\)H\(_3\)O\(_2\) in solution. Draw 3 molecules of HC\(_2\)H\(_3\)O\(_2\)

Do you think C\(_2\)H\(_5\)O\(_2\) is an electrolyte, why?
A/B/N salts

1) Write the balanced dissociation equation for KCl.

\[
\text{KCl} \rightarrow \text{K}^+ + \text{Cl}^{-}
\]

2) Decide which ion (or any) is acidic or basic, and write the balanced reaction of that ion with water (if it is neutral, just write neutral).

both neutral

3) Write the equilibrium expression if appropriate for the reaction above.

N/A

4) Do you predict this salt to be acidic, basic or neutral? Why?
neutral because the conjugate of a SA or SB is neutral (KOH and HCl)

Then test KCl, repeat for potassium carbonate and ammonium

Limiting Reactant

1) Write a balanced equation for the reaction of magnesium metal and hydrochloric acid.

\[
\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2
\]

All three Erlenmeyer flasks contain 100 mL of 1.0 M hydrochloric acid and some universal indicator. In the balloon attached to each flask is different amounts of magnesium.

2) Flask 1 contains 0.3g of magnesium metal. Calculate the moles of hydrogen gas that should be produced from this reaction given these two starting amounts.

3) Flask 2 contains 1.2g of magnesium metal. Calculate the moles of hydrogen gas that should be produced from this reaction given these two starting amounts.

4) Flask 3 contains 4.8g of magnesium metal. Calculate the moles of hydrogen gas that should be produced from this reaction given these two starting amounts.
Limiting Reactant

5) Draw a picture of representing the sizes of each of the balloons after the reaction has stopped in all the flasks. (Make sure to label each flask)

6) Did the balloons get 4x larger from 1 to 2 and 2 to 3? ______ why or why not?

7) Draw a particulate representation showing what is in the flask at the end of the reaction for each flask.

Other places to add particle diagrams:

1) Lab pre/post lab questions
2) Animations
3) Worksheets
4) ... other ideas?

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