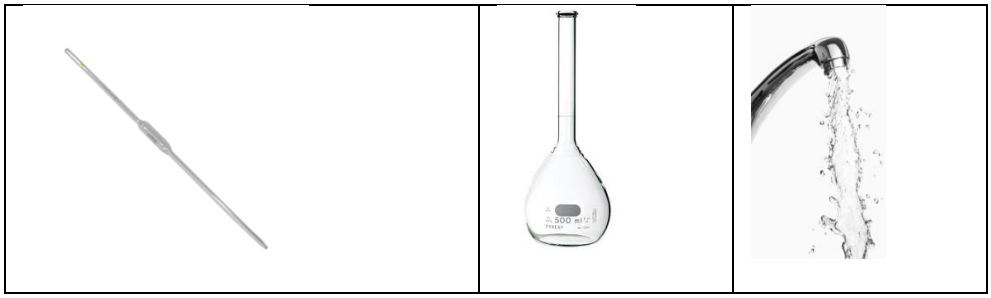
- **KEY CONCEPTS FROM ST LABS**

1. Electrolysis of Water $2\ H_2O \rightarrow 2\ H_2 + O_2$

- Water can be split with electricity and the help of acid or salt
- Electrodes connected to a battery are inserted into separate test tubes. Each one will collect a different gas.
- When it dissociates, in theory, it should give a 2: 1 ratio of H_2 and O_2 gases to reflect the balanced equation
- But because of competing impurities inthe water, usually less oxygen is produced.

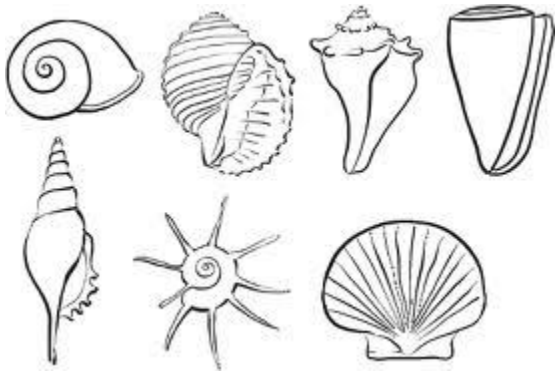
2. Preparing a Solution WDTA for a solid after using m =CV

and PTA for dilution



3. Carbon Cycle Lab

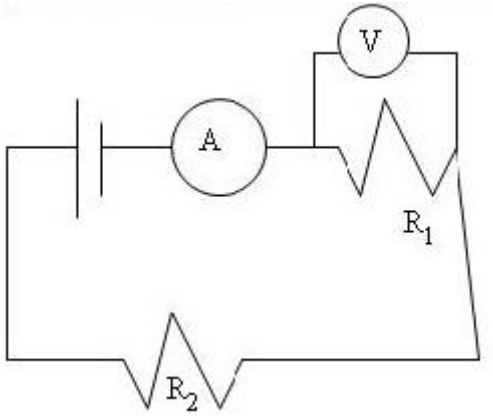
- By blowing into water or any aqueous solution we represented what happens when carbon dioxide from the atmosphere encounters water:
  $H_2O + CO_2 \rightarrow H_2CO_3$



- In the presence of base (high pH) and calcium ions, the ions from the H_2CO_3 react and form calcium carbonate, which is found in shells.
- Both vinegar and H_2CO_3 are acids, so both change the colour of bromothymol blue towards yellow. But since H_2CO_3 is a weaker acid, it only goes to the in-between colour of green.

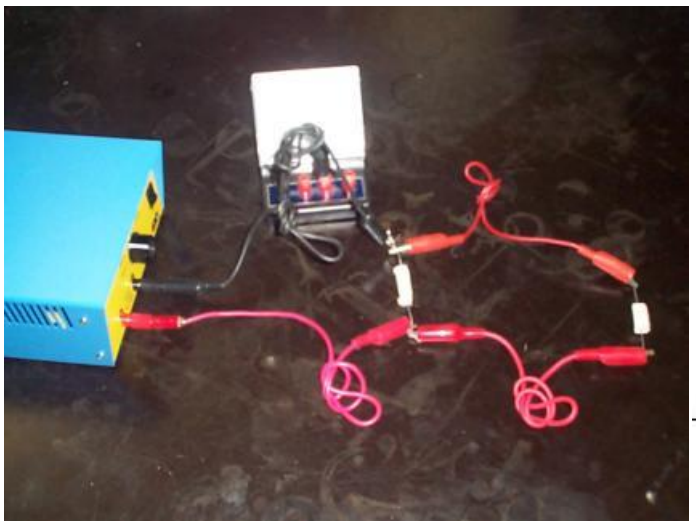
4. How to Build Circuits

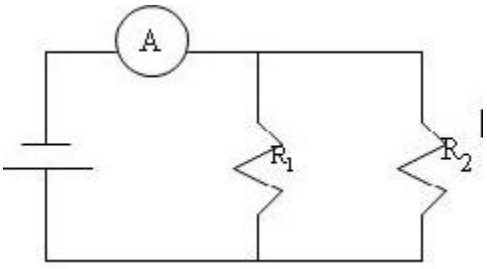
Case 1: Series Circuit (Note how the voltmeter is connected to each end of the resistor. The ammeter is only connected to one end.



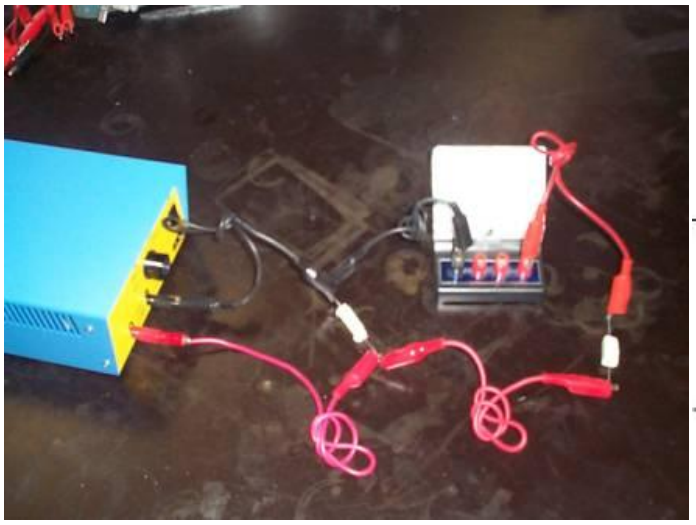
Case 2: Parallel Circuit

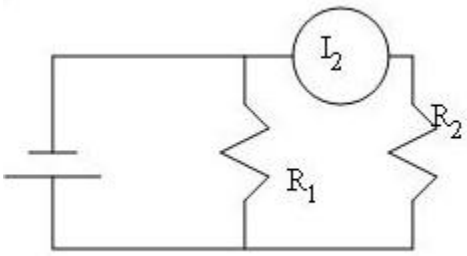
a. Ammeter Positioned to Measure Total Current



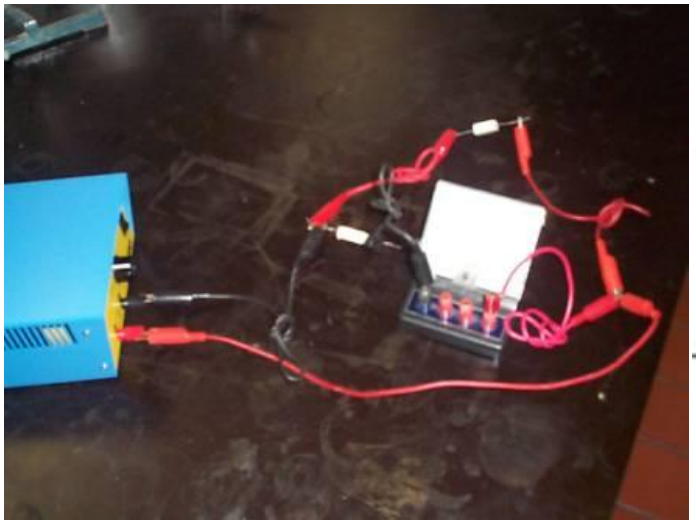


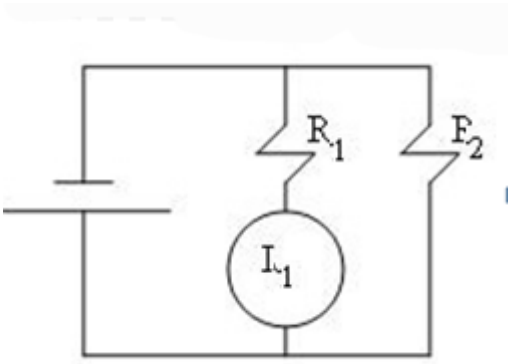
b. Ammeter Positioned to Measure I_2





c. Ammeter Positioned to Measure I_1





5. Gears: Practical Concepts

A) In order to have a velocity ratio greater than 1, you need to have the larger gear as the input.

B) To further increase the ratio, a gear box can be used.

C) In order to maintain same direction for the output as input, you need:
   (1) An odd number of gears in a gear train.
   (2) Or use a chain between two gears
   (3) Or use a belt between two grooved wheels.

6. Transformation Systems

You can transform circular motion to linear motion with

(1) Rack and pinion
(2) Cam and follower
(3) Crank-slider