Chemical Reaction Sensor Lab Name_____ Per___

__ /as you read; X as you do! This is a lab best done by 2 people. Read out loud. Both work and mark X for done.

__1. Your **Problem**: **Determine if energy is gained or lost during a chemical reaction of $NaHCO_3$ + $C_2H_4O_2$.**
You will measure the temperature change during the reaction to find out if energy is gained or lost.

__2. **Background Information:** __A chemical change takes place during a chemical reaction.
___ A chemical change creates a new substance and either uses or releases energy.
___ When sodium bicarbonate ($NaCOH_3$) or baking _____ is added to 5% Acetic acid ($C_2H_4O_2$ or v_____)
the result is carbon dioxide (CO_2) gas AND, the solution changes temperature.
___ The chemical equation is **$NaHCO_3$ + $C_2H_4O_2$ → $NaCO_3$ + H_2O + CO_2**
___ **Exothermic reactions give off heat or become w_____.**
___ **Endothermic reactions take in and use heat so become c_____.**

__3. Finish this **Hypothesis** (as your prediction). Always use a complete sentence with no "it".
When vinegar and baking soda react to form carbon dioxide, the temperature will go_____ showing that energy is_____. The reaction will be _____thermic.
(up or down) gained (in) or lost (out)

__4. Be Ready:
__ a) Wear goggles! **Follow the directions!**
__ b) **Protect** your Computer. __A laptop should be up on something.
__Cords should be out of sink and any liquid.
__ **c) Place NO PRESSURE on sensor. Handle sensor with care.**
__ d) Prepare and **Test** the Application.
__ Open "Vernier Graphical Analysis".
__ Choose Sensor Data Collection. Plug in your temperature sensor.
__ Use "Mode" to set the **Start and Stop on "Manual"**
__ Choose "Graph and Table" in the upper right corner box.
__ Each of you use the "Graph Tools" (lower left) to draw your prediction for your elbow temperature.
__"Collect" Take turns placing the sensor inside your elbow.....Watch… "Stop". Checked_____.

__5. **Procedures and Observations**: **Check / as you read. X as you do.**
__ a) Open "Graphical Analysis". __ Start **NEW**. __ Check **ALL** of the **above settings**.
__ b) Sensor should be plugged in.
__ c) **Be Safe! __Goggles should be on. __No big sleeves. __Long hair tied back.**
Checked_____. __ d) Obtain a flask of vinegar.
__ Place the temperature sensor (thermometer) in your flask of vinegar.
__ **ALWAYS HOLD FLASK with one hand, when the sensor is in the flask.**
__ e) **Each of you** draw your prediction graph on screen. **Change "Prediction 1(2)" to your Name(s). Save.**
__ f) Obtain Sodium Bicarbonate on a paper towel. **Fold towel to make it easy to pour. DO NOT ADD.**
__ g) **"Collect"** to record temperature.
__ h) Record the **beginning** (before) temperature **here.** ____°C (degrees Celsius)
__ i) **NOW, with one hand holding the flask, SLOWLY add your Sodium bicarbonate (baking soda) to the acetic acid (vinegar).**
__ j) **Collect** until the bubbles are very slow or stop. Click on "**Stop**".
__ k) Record your **ending** temperature **here** ____°C (degrees Celsius)
__ l) Have your screen graph Checked_____ OR if time is too short, Save as…:
Save as….. Add your names + period →
__ m) Rinse and dry your sensor. **Ask! Please DO NOT wrap cord as that breaks wires.**

__ 6. Use Graph Tools ("Edit Graph Options" and "Add Annotations") to label: __ its name, __ your names, __ both prediction names, __ x-axis & __ y-axis.

__ 7. **Save.** Checked_____.

__ 8. **Conclusion**: Add your Conclusion as an Annotation next to the title, using a complete sentence with no "it".
When vinegar and baking soda react to form carbon dioxide, the temperature goes_____ showing that energy (in the form of heat) is_____ showing that it is an _____ reaction. **Save** Checked_____.