

## Air Bag Module – Master Materials and Equipment

### Equipment by Activity

*NOTE: Italicized entries indicate items not available from PASCO. The quantity indicated is per student or group.*

| Act | Title  | Materials and Equipment   | Qty  |
|-----|--|---|--|
| 1   | <b>Understanding Pressure</b><br>Use a pressure sensor and a temperature sensor to determine how temperature, volume, and amount of a gas affect pressure.                           | Data collection system<br>Pressure sensor<br>Stainless steel temperature sensor with blue tubing<br>Syringe<br>Sampling bottle, plastic, 500-mL<br><i>Beaker, 1000-mL</i><br>Rubber stopper to fit the sampling bottle, two-hole, fitted with a quick-release connector<br>Stopcock connected to a tubing connector<br><i>Ice and water</i><br><i>Paper towels</i>  | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>500 mL<br>several      |
| 2   | <b>Pressure and Chemical Reactions</b><br>Use a pressure sensor to determine the smallest ratio of sodium bicarbonate and acetic acid that when mixed will produce the most product. | Data collection system<br>Pressure sensor<br>Sampling bottle, plastic, 500-mL<br>Stopper to fit the sampling bottle, two-hole, fitted with a quick-release connector and a stopcock<br>Balance, readability 0.01 g<br><i>Beaker, 100-mL</i><br>Syringe<br><i>Sodium bicarbonate (NaHCO<sub>3</sub>)</i><br><i>0.50 M Acetic acid (HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>)</i><br><i>Waste container</i><br><i>Water to rinse the sampling bottle between trials</i> | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1.2 g<br>40 mL<br>1         |
| 3   | <b>Variable Volumes</b><br>Use a pressure sensor and a temperature sensor to determine the volume of gas and the amount of gas needed to fill three different size plastic bags.     | Data collection system<br>Pressure sensor<br>Temperature sensor<br>Syringe<br>Rubber stopper to fit the flask, two-hole, fitted with a quick-release connector and a stopcock<br><i>Balloon, large</i><br><i>Plastic bags of various sizes</i><br><i>Graduated cylinder, 1000-mL</i><br><i>Tap water</i><br><i>Beaker, 400-mL</i><br><i>Tub, plastic</i><br><i>Paper towels</i>   | 1<br>1<br>1<br>1<br>1<br>1<br>3<br>1<br>1<br>1<br>1<br>several |

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|-----|---|---|--|
| 4   | <b>Chemical Calculations</b><br>Calculate the amount and concentrations of reactants needed to produce a certain number of moles of a product without either of the chemicals being wasted. | Calculator  | 1  |
| 5   | <b>Reaction Rates</b><br>Use a pressure sensor to determine how stirring and concentration of reactants affect how fast the reaction between acetic acid and sodium bicarbonate occurs.     | Data collection system<br>Pressure sensor<br>Sampling bottle, plastic, 500-mL<br>Stopper to fit the sampling bottle, 2-hole, fitted with a quick-release connector and a stopcock.<br>Graduated cylinder, 100-mL<br>Beaker, 100-mL<br>Balance, readability 0.01 g<br>Magnetic stirrer<br>Magnetic stirring bar<br>Syringe<br>Waste container<br>Sodium bicarbonate (NaHCO <sub>3</sub> )<br>0.50 M acetic acid (HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> )<br>Water<br>Water to rinse the sampling bottle between trials | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>2 g<br>60 mL<br>180 mL |