

MEASUREMENT & EQUIPMENT:

Making Biodiesel Blends

Georgia Performance Standards: SCSH2, SCSH3, SCSH4, SCSH5, SCSH6

National Science Standards: Content Standard A

Objective: Students will become familiar with using lab equipment and lab techniques such as measuring liquids precisely. Students will do calculations involving their measurements and will be sure to use proper significant figures.

Essential Questions:

- What lab equipment is needed when handling and measuring liquids?
- What are significant figures and why are they important in the lab setting?
- What is precision and accuracy of measurement?

Background: There are several reasons why using blends of biodiesel with petroleum diesel can be advantageous. Having some biodiesel blended into the petroleum will help offset the use and dependence on oil. Using at least a small percentage of biodiesel will also help in engine maintenance due to the natural lubricity of the fuel. Most blends used today are either B5 (5% biodiesel 95% petroleum diesel) or B20. Blends higher than that can require some minor engine modifications for some vehicles since biodiesel dissolves rubber components. Higher blends can also damage an engine if biodiesel that is not properly made and cleaned is accidentally used. Blending biodiesel with petroleum diesel is also advantageous in colder climates. Since the petroleum diesel has a lower freezing point than biodiesel, the blends can allow consumers to still use some percentage of biodiesel without worrying about gelled fuel lines in the winter. Currently the U.S. government offers a \$1.00 per gallon tax credit for blenders.

Procedure:

1. Obtain two 50 mL graduated cylinders and five 250 mL beakers
2. Label on graduated cylinder as “biodiesel” and the other as “petrodiesel”

3. After reading the background, do the calculations and devise a procedure for creating blends of B5, B20, B50, B80 and B95. Run the procedure by your instructor before you begin.
4. Make the blends of biodiesel and petrodiesel. Save the blends in properly labeled containers for a future lab activity. You will need to label the bottles with the blend, your names and your period.

Materials:

- 2 50 mL graduated cylinders per lab group
- 5 250 mL beakers per lab group
- Pre-made biodiesel
- Petroleum diesel
- Labels or labeling tape
- Storage containers (can be used plastic coke/water bottles)

Assessment: General lab rubric

Procedure for making blends

Don't forget to show your instructor!

Lab Data Sheet – Making Biodiesel Blends

| Blend | % Biodiesel | % Petrodiesel | Total mL | mL of biodiesel | mL of petrodiesel |
|-------|-------------|---------------|----------|-----------------|-------------------|
| B5 | | | | | |
| B20 | | | | | |
| B50 | | | | | |
| B80 | | | | | |
| B95 | | | | | |

Calculations and Observations:

Show all your calculations for determining the amount of milliliters of each fuel that was needed for the blend. Don't forget to keep track of your significant figures! Also include any qualitative observations made during blending.

MEASUREMENT & EQUIPMENT: **Notes to the Instructor**

Petroleum diesel can be purchased at any standard gas station that carries diesel fuel. That particular grade of diesel is called Diesel No. 2. It has more desirable properties and is a heavier distillate than Diesel No. 1.

Biodiesel can be purchased if you have a retailer selling B100 nearby. Purchasing B20 will NOT be suitable for this lab. If you can not purchase B100 nearby you can pre-make it. Follow the procedure listed for the Equilibrium Lab which is a 2-phase procedure for making the biodiesel. You can make any size batch as long as you keep the ratio as 1.0L of oil, 9 g of KOH and 200 mL of methanol.

The students need to save their blends in order to use them in the next listed lab on properties.

The standard lab rubric is listed on the next page and can be used for any lab in this book. The rubric is written up for a standard lab report written in a laboratory notebook. The lab report should include the sections: Date/Title, purpose, safety, hypothesis, procedure summary, data/observations, calculations/graphs, conclusion, theory, error, and questions. All information taken and calculations performed during the lab must be recorded in the lab notebook. No information should be written on any other piece of paper and nothing is written in pencil.

Lab sheets are included to guide the students in what information should go in their lab report. You may choose not to have your students write formal reports and therefore grading the lab sheets themselves would also be appropriate.