

Science 10 – Lab pre and post assessment

Lab 9A: Mass and Chemical Reactions

Prelab

€ **Hypothesis: Predication**

- Written in the following format: “If a reaction takes place in a closed system (independent variables) then the mass of the products (dependent variable) will _____ because_____ . While if a reaction takes place in an open system (independent variable) then the mass of the products (dependent variable) will _____ because _____ .

Name: _____

9A

€ **Method: Flowchart**

- Excellent organization
- Clear diagrams
- Clear concise word commands for each step
- All steps included

Post lab

- € Answer the discussion questions and conclusion #a-e correctly in full, thoughtful sentences

| | | Beginning | Developing | Accomplished | Exemplary |
|-----------------|---|--|--|---|---|
| Prelab | Criterion D Hypothesis | - not included | -The student attempts to state a focused problem or research question. | -The student states a focused problem or research question and makes a hypothesis but does not explain it using scientific reasoning. | -The student states a clear focused problem or research question, formulates a testable hypothesis and explains the hypothesis using scientific reasoning. |
| | Criterion D – method (flowchart) | - no flowchart completed | -The method (in flowchart form) is incomplete. | -The student writes a mostly complete method (flowchart) | -The student writes a clear, logical method (flowchart). |
| Post lab | Criterion D Scientific Inquiry | The student does not reach a standard described by any of the descriptors given to the right | -The student attempts to evaluate the method. -The student attempts to evaluate the method. - The student suggestions one improvement to the method or makes one suggestion for further inquiry. | -The student partially evaluates the method. -The student partially evaluates the method. - The student suggests some improvements to the method or makes suggestions for further inquiry. (or includes one of each) | -The student evaluates the method, commenting on its reliability and validity . -The student comments on the validity of the hypothesis based on the outcome of the investigation. - The student suggests realistic improvements to the method and makes suggestions for further inquiry. |
| | Criterion E Data Processing | The student does not reach a standard described by any of the descriptors given to the right | -The student collects some data and attempts to record it in a suitable format. -The student attempts to identify a trend, pattern or relationship in the data. -The student attempts to draw a conclusion but this is not consistent with the interpretation of the data. | -The student collects sufficient relevant data and records it in a suitable format. -The student states a trend, pattern or relationship shown in the data. -The student draws a conclusion consistent with the interpretation of the data. | -The student collects sufficient relevant data and records it in a suitable format. -The student describes a trend, pattern or relationship in the data and comments on the reliability of the data. -The student draws a clear conclusion based on the correct interpretation of the data and explains it using scientific reasoning. |

Lab 9A: Mass and Chemical Reactions (pg.258-259)

1. What do you think happens to the overall mass when chemicals change during a chemical reaction?

Read the method of the lab on – the next page.

2. What are the reactants? _____ and _____
3. Describe what is meant by the term closed system: _____
4. Describe what is meant by the term open system: _____
5. What is the independent variable? - the one variable that will be manipulated during your experiment?

6. What is the dependent variable? - the one variable you will measure during your experiment?

7. What are the constant variables - the things you will try to keep the same during your experiment? (list as many as you can:

Using the information in numbers 1-7 – write a hypothesis for this lab in the following format:

- a. If a reaction takes place in a **closed system** then the mass of the products will _____ because _____.
- b. While if a reaction takes place in an **open system** then the mass of the products will _____ because _____.

Materials:

- safety goggles
- pop bottle and lid
- mass balance
- weighing boat
- sodium bicarbonate (baking soda)
- 1 test tube (16 mm x 150 mm)
- test tube rack
- 5 % acetic acid solution (vinegar)

Method:

1. Put on your safety goggles.
2. Obtain a pop bottle (with a lid) a test tube that will fit inside the bottle. Temporarily assemble this empty equipment as shown in Figure 1 to make sure that everything fits.
3. On a weigh boat, weigh approximately 1.0 g of sodium bicarbonate powder. The mass does not have to be exact, but it should be close.
4. Transfer the sodium bicarbonate powder to your bottle.
5. Place the test tube in the test tube rack and half fill with acetic acid.
6. Tilt the bottle at an angle and carefully lower the test tube into the bottle without spilling the acetic acid.
7. Place the lid on the pop bottle (make sure it is tightly sealed). The acetic acid and the sodium bicarbonate powder are the reactants.
8. Record the appearance of the reactants in your copy of Table 1.
9. Weigh your assembled apparatus containing the reactants and record this mass in Table 1.
10. Once again, make sure that the lid is tightly held in by the tape. Start the reaction by slowly and gently turning the bottle upside down to allow the reactants to mix and form products. Do this a few times to ensure good mixing. Observe what happens and record your observations.
11. Weigh your apparatus containing the products and record this mass.
12. Remove the sealed apparatus from the scales and *carefully* loosen the lid. As you unseal the apparatus, observe and record what happens.
13. With the lid on loosely, reweigh your apparatus and record this mass.
14. Empty the bottle into a sink to remove the test tube and all chemicals. Clean up all materials with lots of water.



Make a flowchart for the method (in pencil):

- Include all steps in short concise words commands with diagrams

Observations:

Table 1

| | Observations | Total Mass (g) |
|---------------------------------|---------------------|-----------------------|
| Sealed apparatus and reactants | | |
| Sealed apparatus and products | | |
| Unsealed apparatus and products | | |

Discussion and conclusion:

- a. **Data Analysis:** Describe the trends/patterns/relationships found in the data. Also comment on the reliability of the data which includes comments on any outliers or anomalies (data that just doesn't seem to fit the trend) in the data.

- b. **Reliability and Validity: Evaluate** the method and make comments on its **reliability** and **validity**. This includes the sources of error and limitations of the experiment.

- i. **Reliability of the method:** refers to whether the method allows for the collection of sufficient reliable data to answer the question. This depends upon the selection of the measuring instrument, the precision and accuracy of the measurements, errors associated with the measurement instrument, the size of the sample, the sampling techniques used and the number of readings.

- ii. **Validity of the method:** refers to whether the method allows for the collection of sufficient valid data to answer the question. This includes factors such as whether the measuring instrument measures what it is supposed to measure, the conditions of the experiment and the manipulation of variables (fair testing).

- c. **Assessing the Hypothesis:** Comment on the validity of the hypothesis based on the outcome of the investigation. Includes a statement about the hypothesis being supported or not supported.

- d. **Improvements and suggestions for further investigation:** suggest **realistic** improvements to the method and make suggestions for further inquiry when relevant. This includes new questions, what could be investigated next time, how the variables could be manipulated next time.

- e. **Conclusion:** draw a **clear** conclusion **based on** the **correct interpretation** of the data and **explain it** using scientific reasoning. Also explain what can be concluded based on the data with reference to the hypothesis.