Pre-lab Questions
1. List all the possible indicators of a chemical reaction:

2. Compare and contrast: physical change versus chemical change.

3. Define endothermic and exothermic in terms of chemical reactions.

4. In chemistry, what is an indicator?

Objective
In this lab, you will determine the difference between chemical and physical changes, identify indicators of a chemical change and understand the difference between exothermic and endothermic reactions.

Materials
- Safety goggles
- Gloves
- Universal indicator & indicator chart
- 50 ml graduated cylinder
- 10 ml graduated cylinder
- Wash bottle with distilled water
- 4 re-sealable plastic bags
- 1 gram Calcium
- 7 grams Anhydrous Calcium Chloride
- 6 grams of Ammonium Nitrate
- 5 grams of Ammonium Chloride
- Electronic balance or Triple beam balance
- 4 weigh boats
- Permanent marker
- Thermometer (Optional)
Safety
- Always wear safety goggles when handling chemicals in the lab.
- Wear gloves when handling the solid substances.
- Wash your hands thoroughly before leaving the lab.
- Follow the teacher’s instructions for clean-up of materials and disposal of any chemicals.

Procedure
1. Label each of the baggies 1-4.
2. Measure 30 mL of distilled water and pour it into bag 1. Repeat for bags 2-4.
3. Add 5 ml of the universal indicator to each bag. Note the color in your data table.
4. Squeeze out the any excess air and seal the bags.
5. Measure 1 gram (or use 3 nuggets) of Calcium, and add it to bag 1.
6. Make sure the bag is tightly sealed. Gently shake it until solid dissolves. Record your observations in the data table, including temperature change. Caution: Some reactions may be extremely hot or extremely cold to the touch.
7. Measure 7 grams of Anhydrous Calcium Chloride (CaCl$_2$), and add it to bag 2.
8. Make sure the bag is tightly sealed. Gently shake it until solid dissolves. Record your observations in the data table, including temperature change. Caution: Some reactions may be extremely hot or extremely cold to the touch.
9. Measure 5 grams of Ammonium Chloride (NH$_4$Cl), and add it to bag 3.
10. Make sure the bag is tightly sealed. Gently shake it until solid dissolves. Record your observations in the data table, including temperature change. Caution: Some reactions may be extremely hot or extremely cold to the touch.
11. Measure 6 grams of Ammonium Nitrate (NH$_4$NO$_3$) and add it to bag 4.
12. Make sure the bag is tightly sealed. Gently shake it until solid dissolves. Record your observations in the data table, including temperature change. Caution: Some reactions may be extremely hot or extremely cold to the touch.
13. Disposes of the contents and the baggies as instructed by the teacher.

Data

<table>
<thead>
<tr>
<th>Bag &amp; Contents</th>
<th>Initial Water Color (Universal Indicator added)</th>
<th>Observations (Color change After Reaction? Heat released or absorbed? Other?)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bag 1:</strong> Calcium (Ca)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bag 2:</strong> Anhydrous Calcium Chloride (CaCl$_2$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bag 3:</strong> Ammonium Nitrate (NH$_4$NO$_3$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bag 4:</strong> Ammonium Chloride (NH$_4$Cl$_2$)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Analysis
1. When the universal indicator was added to the water, was this a physical or chemical change? Explain.

2. What is the purpose of the universal indicator? How does it help indicate a chemical reaction? Does the indicator give any particular indication for exothermic or endothermic reactions?

3. In each bag, what were signs of a chemical change?

Conclusion
Discuss in paragraph form how the Law of the Conservation of Mass (Matter) was demonstrated throughout this lab.