Classifying Substances Based on Reactions Lab

Problem: How can we categorize different substances based on their reactions?

Equipment/Chemicals:

- LabPro w/ Conductivity Sensor
- Well Plate
- Steel Wool
- 0.1 M HCl
- 0.1 M NaOH
- 0.1 M H_2SO_4
- 0.1 M HNO_3
- 0.1 M KOH
- Saturated $Ba(OH)_2$
- 1.0 M $Ca(NO_3)_2$
- Deionized Water
- Magnesium Ribbon, Mg, 10 cm
- Bromthymol blue indicator
- Phenolphthalein indicator
- Universal indicator

Hazard Notes and Procedure Warnings:

- ✓ The chemicals in lab can be very harmful to skin, eyes, and clothes.
- ✓ Apron, and Goggles are needed.
- ✓ Rinse all reaction materials into the large waste beaker in the hood.

Procedure:

1. Arrange a matrix within the well plate to match the pattern from the data table on the back.

2. Add a drop of phenolphthalein to a sample of each of the seven test solutions. Record your observations.

3. Add a drop of bromthymol blue to a different sample of each of the seven test solutions. Record your observations.

4. Add a drop of universal indicator to a different sample of each of the seven test solutions. Record your observations.

5. Clean a piece of magnesium ribbon with fine-grade sandpaper or steel wool until it is shiny. Cut the ribbon into seven pieces small enough to fit in the test tubes or wells.

6. Add a piece of magnesium, Mg, to each of the seven test solutions. Record your observations.

7. Add a drop of calcium nitrate solution, $Ca(NO_3)_2(aq)$, to a different sample of each of the seven test solutions. Record your observations.

8. Use the conductivity tester on the last sample of each of the seven test solutions. Rinse the conductivity tester in fresh distilled water after testing each sample. Record your observations.

Data:

Test Reagents		Test Solutions						
		HCl	NaOH	H_2SO_4	HNO_3	KOH	$Ba(OH)_2$	H_2O
	Phenolphthalein							
	Bromthymol blue							
	Universal indicator							
	Magnesium Ribbon							
	$Ca(NO_3)_2$							
	Conductivity							

Analysis of Data: Classifying Lab

1. Use your observations to group the test solutions into as many categories as are needed to account for similarities and differences in chemical reactivity. Be prepared to justify your classification scheme.
2. For those solutions that indicated high conductivity with the tester, identify the ions present in solution.

Conclusion Questions: Classifying Lab

1. What strategy could you use to identify an unknown substance as an acid or a base?
2. A drop of bromthymol blue placed in an unknown solution turns yellow. Is the solution acidic or basic?
3. Why do you think universal indicator is called an indicator?
4. What ionic species is common among the group of compounds you categorized as acids? As bases?

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