

CHAPTER 6	Investigation 6.B: Testing the Arrhenius Theory of Acids and Bases	BLM 6.1.6
HANDOUT		

Using the Arrhenius theory of acids and bases, predict whether the following solutions are acidic, basic, or neutral. Then measure pH and verify your predictions. Recall from your previous science courses that acids have a pH less than 7, and bases have a pH greater than 7. Neutral solutions have a pH of approximately 7.

### Question

Does the Arrhenius theory of acids and bases successfully predict and explain the properties of acids and bases?

### Prediction




Predict whether each solution will be acidic, basic, or neutral. Explain your predictions.

### Safety Precautions



- Hydrochloric acid, sodium hydroxide, and ammonia are toxic and corrosive. Wash any spills on skin or clothing with plenty of cool water. Inform your teacher immediately.
- When you have completed this investigation, wash your hands.

### Materials

- Distilled water
- Solutions of:
  - 0.10 mol/L  $\text{C}_{12}\text{H}_{22}\text{O}_{11}(\text{aq})$
  - 0.10 mol/L  $\text{HCl}(\text{aq})$  
  - 0.10 mol/L  $\text{NaOH}(\text{aq})$  
  - 0.10 mol/L  $\text{NH}_3(\text{aq})$  
  - 0.10 mol/L  $\text{NaCl}(\text{aq})$
  - 0.10 mol/L  $\text{CH}_3\text{COOH}(\text{aq})$
  - 0.10 mol/L  $\text{NaHCO}_3(\text{aq})$
  - pH paper/pH meter

### Procedure

1. Construct a table to record your data. Include a column for your predictions.

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2. Measure the pH of the distilled water, which will act as a control.
3. Measure the pH of each solution using a pH meter or pH paper.
4. Record your results.
5. Dispose of your materials as directed by your teacher.

### Analysis

1. Provide the IUPAC and classical name for each of the substances in solution.
2. All the solutions were of equal concentration. Did all the acids have the same pH? What about all the bases? Explain your answers.

### Conclusions

3. Re-examine your predictions.
  - (a) Did any results surprise you? Explain your answer.

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- (b) Explain your observations using the Arrhenius theory of acids and bases. Did any of your observations appear to contradict the Arrhenius theory of acids and bases? If so, specify.

### Extension

- For each of the solutions that produced unexpected results, describe two tests that you could perform to verify your observations. With your teacher's permission, perform these tests. Did your additional results support the pH you measured? What do these results suggest?