

Activity 1: Planning an Investigation

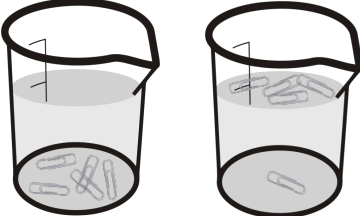
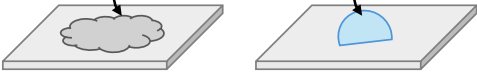
Your chemistry teacher is planning a lab investigation. You and your lab group will visit three stations set up around the room. At each station, you will quickly design and conduct an investigation with the provided materials in order to accumulate evidence to support a claim regarding the strength of the intermolecular (IM) forces between particles of the two or three liquids at that station.

The stations can be described as follows:

Station #	Description	Available Materials
1	Show the relation between evaporation rates and the strength of the IM Forces holding particles together.	1) Test tubes containing acetone and water 2) A plastic pipet in each test tube 3) Two whiteboards
2	Show the relation between the amount of surface tension and the strength of the IM Forces holding particles together.	1) Two beakers, half-filled with acetone and water 2) Paper clips 3) Forceps for handling paper clips
3	Show the relation between the tendency to bead (form a droplet) and the strength of the IM Forces holding particles together.	1) Test tubes containing acetone and water 2) A plastic pipet in each test tube 3) Wax paper

Activity 2: Claim-Evidence-Reasoning

One lab group produced the following Data Table. Use the table in order to answer the questions in Activity 2.

Station #	Procedure	Results
1	We distributed a pipet's worth of each liquid uniformly across each whiteboard. We observed for a minute.	After 60 seconds: 1) Acetone whiteboard: completely dry 2) Water whiteboard: H ₂ O still visible; no observable change.
2	We carefully added five paper clips to the surfaces of water and acetone.	<p style="text-align: center;">Acetone Water</p> 
3	We placed a drop of each liquid onto the wax paper. We made observations of the drops and diagrammed what we saw.	<p style="text-align: center;"><i>Acetone spread out over surface</i> <i>Water forms a definite drop</i></p>  <p style="text-align: center;">Acetone Water</p>

Activity 3: Getting into the Flow of IM Forces

In a second lab investigation, you and your lab group will investigate the viscosity of different liquids. **Viscosity** is the general resistance to flow. Liquids like syrup have a high viscosity and resist the tendency to flow. On the other hand, water has a significantly lower resistance and will flow more easily. Substances with strong interparticle forces tend to have a greater viscosity.

You have the following materials at your lab station:

- A container with several glass marbles of varying size and weight
- A bin filled with numerous test tubes with different lengths and diameters
- A bin of test tube stoppers of varying sizes
- Five different-sized bottles of liquid, labeled A, B, C, D, and E
- A stopwatch, mass balance, and centimeter ruler

You must design an experiment to collect quantitative data in order to compare the viscosity of the five unknown liquids. You are told that you should use the fact that the liquids can flow around a marble. High viscosity liquids will flow more slowly than low viscosity liquids. Before you can start collecting data, you must develop a plan and have it approved by your teacher. Get started.

Activity 4: Results Are In

The lab investigation was conducted and the following times have been determined. Use the data table to answer the questions in Activity 4.

Time Measurements for the 5 Liquids (seconds)					
Trial	A	B	C	D	E
1	1.34	16.20	8.21	3.22	28.82
2	1.36	16.45	8.24	12.65	35.60
3	1.33	15.88	8.18	3.44	24.88
4		22.64		3.28	39.55
5		16.12		3.31	30.22
6		16.35			33.16
7					38.22

Activity 5: Do It Yourself Investigations

The teacher told the class that they must design their own experiment to investigate the effect of IM Forces upon the observable properties of materials. Each lab group needed to come up with either a testable question or a problem that they were trying to solve.

In this activity you will inspect several of the experimental designs and identify the testable question or problem that the design sought to answer or solve.