

# Pascal's Law Worksheet

## Data Table 1.

| Syringe system | Plunger Pressed | Observations |
|----------------|-----------------|--------------|
| 3-mL/3-mL      | 3-mL            |              |
| 3-mL/20-mL     | 3-mL            |              |
|                | 20-mL           |              |
| 1-mL/20-mL     | 1-mL            |              |
|                | 20-mL           |              |

### Data Table 2.

| Syringe System | Syringe | Initial Distance (cm) | Final Distance (cm) | Net Plunger Movement (cm) |
|----------------|---------|-----------------------|---------------------|---------------------------|
| 3-mL/3-mL      | 3-mL    |                       |                     |                           |
| 3-mL/20-mL     | 3-mL    |                       |                     |                           |
|                | 20-mL   |                       |                     |                           |
| 1-mL/20-mL     | 1-mL    |                       |                     |                           |
|                | 20-mL   |                       |                     |                           |

#### Data Table 3.

| Syringe System |        | Mass   | Services Soula Formas (a) |  |
|----------------|--------|--------|---------------------------|--|
| Input          | Output | IVIASS | Spring-Scale Force (g)    |  |
| 3-mL           | 20-mL  | 1000 g |                           |  |
| 1-mL           | 20-mL  | 1000 g |                           |  |

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#### **Post-Lab Questions**

- 1. Review the results of the experiments in Data Table 1. Was it easier to move the 20-mL plunger by pressing the 1-mL plunger, or to move the 1-mL plunger by pressing the 20-mL plunger? Which plunger has the larger surface area? Use Pascal's law to explain the result.
- 2. Use the measurements from Data Table 2 and Equation 2 to determine the ideal mechanical advantage of the following syringe systems.

Input: 1-mL, Output: 20-mL

Input: 3-mL, Output: 20-mL

Input: 3-mL, Output: 3-mL

Input: 20-mL, Output: 3-mL

Input: 20-mL, Output: 1-mL

- 3. Compare the mechanical advantage calculations from Question 2 to how hard or easy it was to move the respective input plunger. Is it better to have a mechanical advantage greater than one or less than one?
- 4. Use the measurements from Data Table 3 and Equation 1 to determine the actual mechanical advantage of the following syringe systems.

Input: 1-mL, Output: 20-mL

Input: 3-mL, Output: 20-mL

- 5. Use Equation 3 to calculate the efficiency of the two systems described in Question 4.
- 6. List possible sources of error that may have led to the low efficiency. What improvements could be made to the systems to make them more efficient?
- 7. Refer to Figure 5. Which would Pascal predict as the winner in a "thumb wars" match? Why?



