Height vs. Volume

Sheet 1

Definition of *drip* (unit of volume) for your group: 1 drip = ______ ml

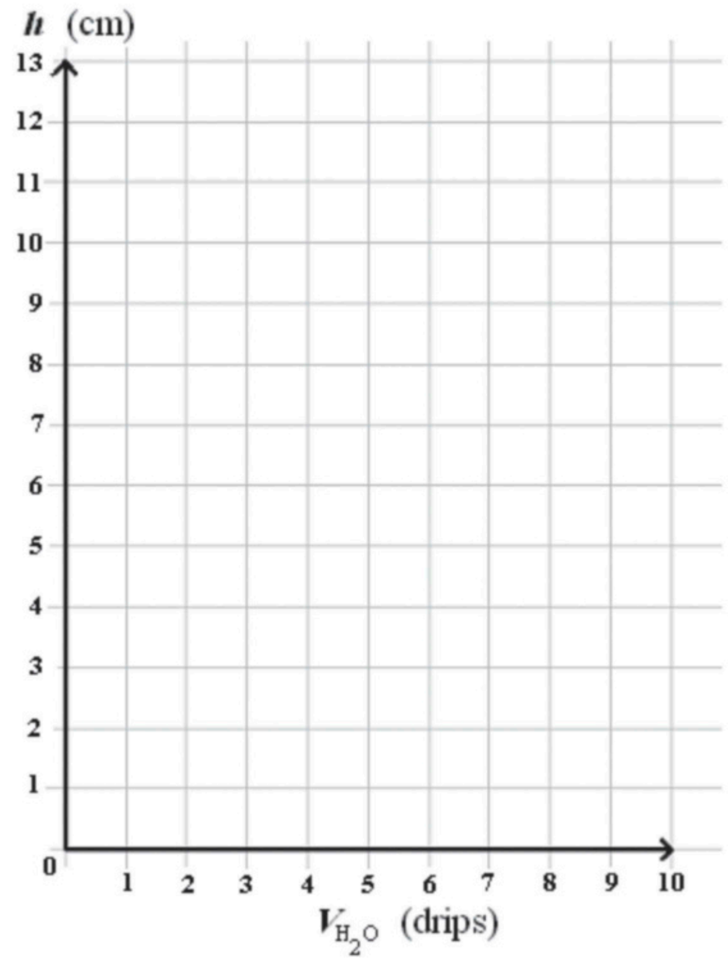
Make a good drawing of the bottle that your group was given. Pour water into the bottle, one “drip” at a time. Each time, measure the height (in cm) of the water in the bottle. Record your data in the table provided. Then graph these data and connect the data points according to how you think the graph should look.

Drawing of Bottle

Table

V_{H_2O} (drips)	h (cm)
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Graph



Notes:

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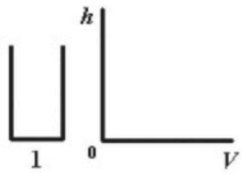
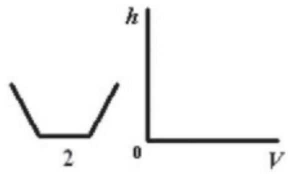
Bottles and Graphs

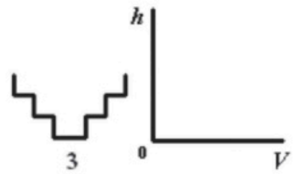
Sheet 2

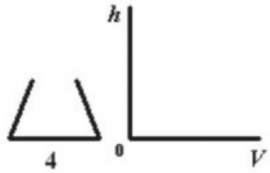
A. Drawing Graphs from Bottles

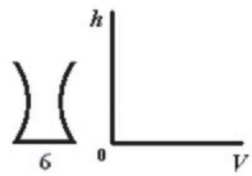
For each bottle shown below (numbered 1–6), sketch what its height-vs.-volume graph would look like. Pay no attention to the size of the bottles. What matters is the shape and how it affects the shape of the graph. Assume that the bottles have circular horizontal cross sections.





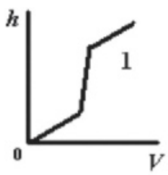


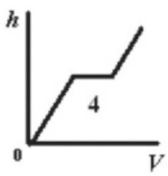


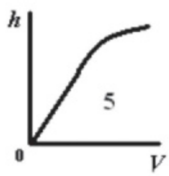


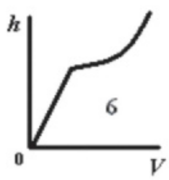
B. Drawing Bottles from Graphs

To the left of each height-vs.-volume graph shown below, draw a bottle that could produce such a graph. If no such bottle can exist, explain why.









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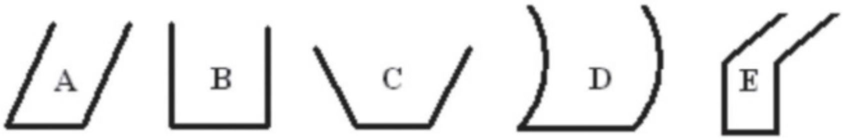
Properties of Bottles and Graphs

A. Linearity

1. Which of the bottles shown below have linear height-versus-volume graphs? Assume that all the bottles have circular horizontal cross sections. Write yes or no below each bottle.



2. For bottles that do have a linear height-versus-volume graph, which one has the largest slope? Which one has the smallest slope?

3. What is it about a bottle that makes its height-versus-volume graph (or a part of its graph) linear?

4. For the height-versus-volume graphs (or parts of graphs) that are linear, what is the slope?

B. Other Properties to Explore

1. Must the height-versus-volume graph be increasing for any bottle? Must it be strictly increasing? Explain.

2. Must the height-versus-volume graph be continuous? Explain.

3. When is the height-versus-volume graph concave up, and when it is concave down? Explain.

4. When does the height-versus-volume graph have a "kink" or "corner"? Explain.

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