ACTIVITY

ACTIVITY 1

A Determining the Densities of Regular Solids

1. Using a balance, measure the mass of each cylinder in grams. Record the results in Data Table 1.
2. Using a ruler, measure the height (h) and diameter (d) of each cylinder in centimeters. Record these measurements in Data Table 1.

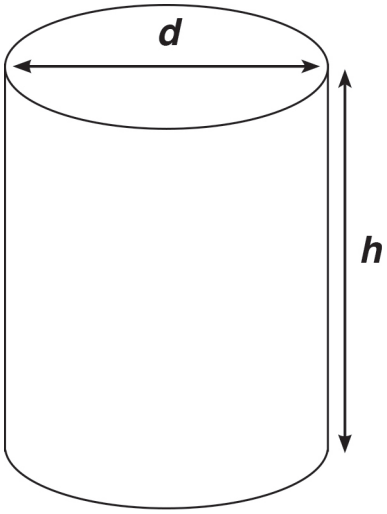


Figure 1.

3. The diameter of a circle is equal to twice its radius (d = 2r or r = d/2). Find the radius of each cylinder by dividing the diameter of the circle by 2.
4. Record these dimensions in Data Table 1.
5. Calculate the volume of each cylinder using the equation $V = \pi r^2 h$. The approximate value of π is 3.14.
6. Calculate the density of each cylinder by dividing its measured mass by its calculated volume (D = M/V).
7. Record the results in Data Table 1.

(input this into calculator)

formula
$V = \pi r^2 h$

÷2 ↓

$d = \frac{m}{V}$

Data Table 1: Determining the Densities

Cylinder Type	Mass (g)	Height (cm)	Diameter (cm)	Radius (cm)	Calculated Volume (cm^3)	Density (g/cm^3)
Al Aluminum (silver)	4.34g	1.30cm	1.20cm	0.6cm	1.470cm	2.95g/cm3
Acrylic (clear)	1.87g	1.30cm	1.30cm	0.65cm	1.725cm	1.08g/cm3
Polyethylene (white)	1.56g	1.30cm	1.30cm	0.65cm	1.725cm	0.904g/cm3

Radius height volume

Aluminum $V = \pi r^2 h \rightarrow \pi(0.6)^2(1.30) = 1.470cm$ $d = \frac{m}{V}$ $\frac{4.34g}{1.470} = 2.952$

Acrylic $V = \pi r^2 h \rightarrow \pi(0.65)^2(1.30) = 1.725cm$ $d = \frac{m}{V}$ $\frac{1.87}{1.725} = 1.08$

Polyethylene $V = \pi r^2 h \rightarrow \pi(0.65)^2(1.30) = 1.725cm$ $d = \frac{m}{V}$ $\frac{1.54}{1.725} = 0.904$

Data Table 2: Density

(− empty cylinder) =

Percentage of Sucrose in Solution	Volume (mL)	Mass of Solution + Graduated Cylinder (g)	Mass of Cylinder (g)	Mass of Solution (g)
(water) with sugar! out 0%	5	35.00g	− 29.91	= 5.09g
	10	40.07g	− 29.91	= 10.16g
	15	45.14g	− 29.91	= 15.23g
	20	50.06g	− 29.91	= 20.15g
	25	55.08g	− 29.91	= 25.17g
water with sugar ↓ 10%	5	35.13g	− 29.91	= 5.22g
	10	40.14g	− 29.91	= 10.23g
	15	45.09g	− 29.91	= 15.18g
	20	50.15g	− 29.91	= 20.24g
	25	55.01g	− 29.91	= 25.10g
20%	5	35.07g	29.91	= 5.16g
	10	41.11g	29.91	= 11.2g
	15	46.14g	29.91	= 16.23g
	20	52.07g	29.91	= 22.16g
	25	57.08g	29.91	= 27.17g
30%	5	35.14g	29.91	= 5.23g
	10	41.30g	29.91	= 11.39g
	15	47.09g	29.91	= 17.18g
	20	52.85g	29.91	= 22.94g
	25	58.00g	29.91	= 28.09g
40%	5	35.50g	29.91	= 5.59g
	10	41.45g	29.91	= 11.54g
	15	47.90g	29.91	= 17.99g
	20	54.12g	29.91	= 24.21g
	25	59.70g	2991	= 29.79g
50%	5	37.18g	29.91	= 7.27g
	10	43.27g	29.91	= 13.36g
	15	48.60g	29.91	= 18.69g
	20	55.07g	29.91	= 25.16g
	25	61.19g	29.91	= 31.28g

after filling everything up in the chart I will need to make a graph

continued on next page

ACTIVITY

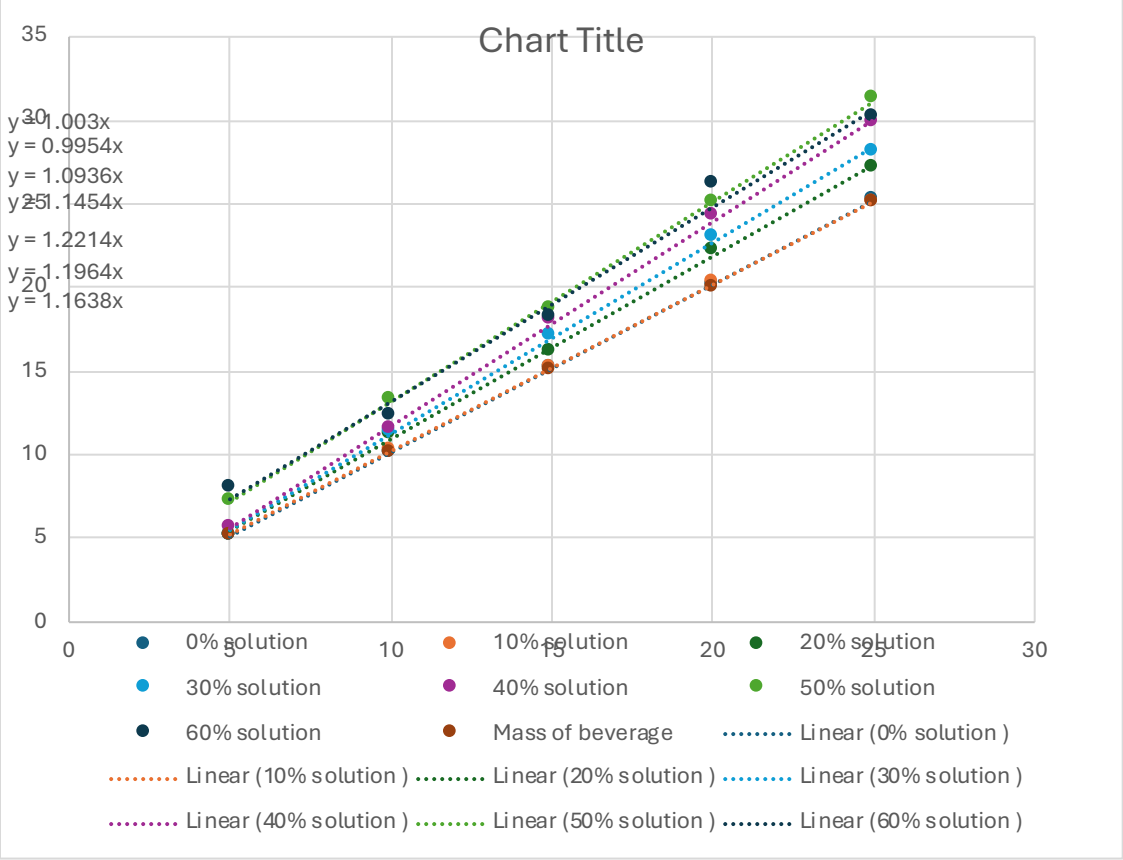
Data Table 2: Density (continued)

Percentage of Sucrose in Solution	Volume (mL)	Mass of Solution + Graduated Cylinder (g)	Mass of Cylinder (g)	Mass of Solution (g)
60%	5	37.91 g	29.91	8
	10	42.29 g	29.91	12.38
	15	48.07 g	29.91	18.16
	20	56.12 g	29.91	26.21
	25	60.09 g	29.91	30.18

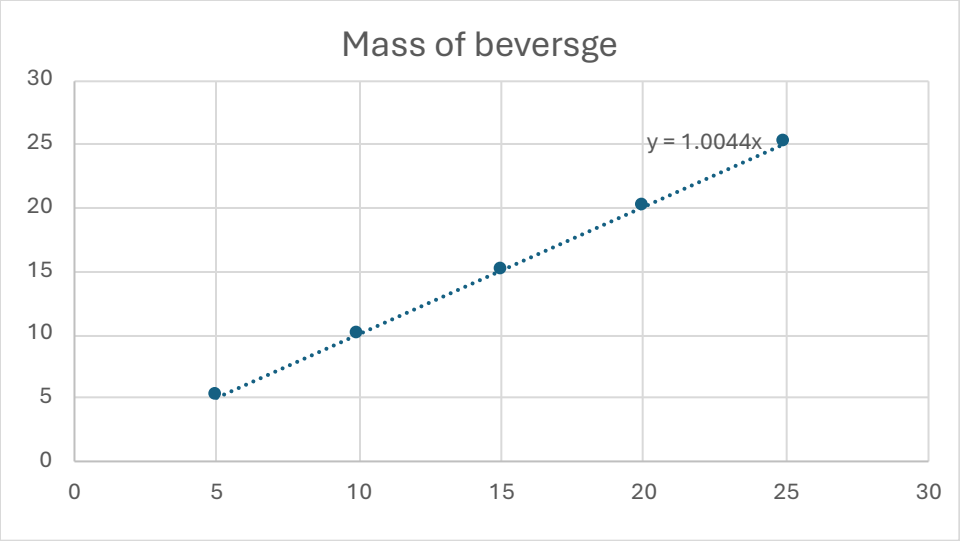
Data Table 3: Density Results (Based on graphs on excel) (ex: equation: $y = 1.2364x$) (ex: Density 1.2364 g/mL)

Percentage of Sucrose in Solution	Equation of the Best-Fit Line (with y-intercept = 0)	Density (slope) (in g/mL)
0%	$y = 1.003x$	1.003 g/mL
10%	$y = 0.9954x$	0.9954 g/mL
20%	$y = 1.0936x$	1.0936 g/mL
30%	$y = 1.1454$	1.1454 g/mL
40%	$y = 1.2214x$	1.2214 g/mL
50%	$y = 1.1964x$	1.1964 g/mL
60%	$y = 1.1638x$	1.1638 g/mL

	0% solution	10% solution	20% solution	30% solution	40% solution	50% solution	60% solution
5	5.09	5.22	5.16	5.23	5.59	7.27	
10	10.16	10.23	11.2	11.39	11.54	13.36	12.3
15	15.23	15.18	16.23	17.18	17.99	18.69	18.1
20	20.15	20.24	22.16	22.94	24.21	25.16	26.2
25	25.17	25.1	27.17	28.09	29.79	31.28	30.1



	Mass of beverage
5	5.15
10	10.1
15	15.06
20	20.01
25	25.13


Mass of beversge
y = 1.0044x
30
25
20
15
10
5
0
0
5
10
15
20
25
30

ACTIVITY 3

A Will It Sink or Float?

1. Based on the calculated densities of the cylinders from Activity 1 and solutions from Activity 2, predict whether each cylinder will float or sink in each of the sucrose solutions and water. Record the predictions in Data Table 4.
2. Test the predictions by placing the aluminum (silver-colored) cylinder in at least the following two solutions: the solution in which you predict the aluminum is most likely to sink, and the one in which you predict the aluminum is most likely to float.

> Remove excess solution from the cylinder before you place it in the next solution.

3. Record the results in Data Table 4.
4. If the predictions were incorrect, test the aluminum cylinders in other solutions.
5. Repeat steps 1–4 for the acrylic (clear) and polyethylene (white) cylinders.
6. After testing the cylinders, rinse them with fresh water and dry them.

ACTIVITY 4

A Determination of the Sugar Content in a Beverage

> The beverage must be completely flat, or decarbonated, to accurately determine the concentration of sucrose.

1. Use a graphing program and the data from Activity 2 to create a scatter-plot of Sucrose Percentage versus Density.
2. Use the same procedure as that of Activity 2 to determine the mass of 5 mL, 10 mL, 15 mL, 20 mL, and 25 mL of the beverage.
3. Record all of the data in Data Table 5.

Data Table 4: Will It Sink or Float?

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Sucrose Solution	Predictions			Observations		
	Aluminum Cylinder	Acrylic Cylinder	Polyethylene Cylinder	Aluminum Cylinder	Acrylic Cylinder	Polyethylene Cylinder
0%	sink	sink	sink?	sink	sink	float
10%	sink	float	float	sink	sink	float
20%	sink	float	float	sink	sink	float
30%	sink	float	float	sink	sink	float
40%	sink	float	float	sink	sink	float
50%	sink	float	float	sink	float	float
60%	float	float	float	sink	float	float

4. Use a graphing program to plot the mass of the solution on the y-axis and the volume of the solution on the x-axis.
5. On the graph, draw a best-fit line through all of the points.
6. Determine the slope of the best-fit line and read the value. This is an average of all five data points with units in g/mL.
7. Record the slope (average density) below the data table.
8. Use the graph created in step 1 to determine the percentage of sucrose in the beverage.
   - Determine the density of the beverage from the y-axis.
   - Draw a horizontal line from this point across the graph until it intercepts the best-fit line.
   - Draw a vertical line from the intersection of the horizontal line and best-fit line to the x-axis.
   - Record the percentage of sucrose from the intersection of the vertical line and the x-axis. This is the percentage of sucrose in the beverage.

Disposal and Cleanup

1. Dispose of the sucrose solutions in the sink.
2. Clean and dry all of the equipment; return items to the equipment kit.
3. Sanitize the workspace.

Table 5: Determination of Sugar in a Beverage

y = 1.0044

Volume (mL)	Mass of Beverage and Graduated Cylinder (g)		Mass of Cylinder (g)		Mass of Beverage (g)	
5% mL	35.15 g	−	30.00g	=	5.15g	0.146
10% mL	40.10g	−	30.00g	=	10.1g	0.251
15% mL	45.06g	−	30.00g	=	15.06g	0.334
20% mL	50.01g	−	30.00 g	=	20.01g	0.400
25% mL	55.13g	−	30.00 g	=	25.13g	0.455

example: 1.14 → 24-25%

10% = 1.1
30% = 1.2

Density (slope) of Beverage: 1.0044

Percentage of Sucrose in Beverage: (0%-10%.) 3%

example: (24-25%)

0% − 20 % solutions

0% 1.003
10% 0.9954
20% 1.0936

CAROLINA