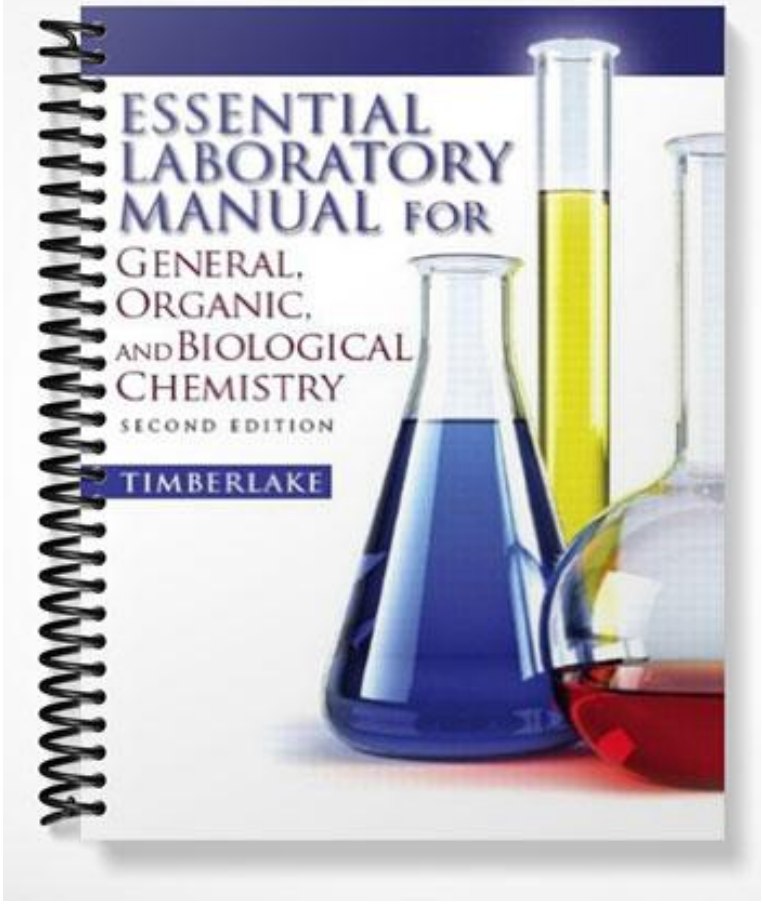
SOLUTIONS MANUAL



Report Sheet - Lab 2

Date _____ Name _____

Section _____ Team _____

Instructor _____ _____

Pre-Lab Study Questions

1. What property of oil makes it float on water?

   The density of oil is less than the density of water.

2. Why would heating the gas in an air balloon make the balloon rise?

   Heating the gas in an air balloon adds energy to the gas making the molecules move faster. The faster movement increases the volume of the balloon and therefore decreases its density, allowing the balloon to rise.

3. What is the difference between density and specific gravity?

   Density is expressed in g/mL. Specific gravity is the ratio of the density of a substance to the density of water (1.00 g/mL) and has no units.

4. How does a graph help us interpret scientific data?

   A graph is a visual representation of the relationship between two variables.

A. Density of a Solid

A.1 **Mass of the solid** _____24.62 g_____

A.2 **Volume of the solid by displacement**

Initial water level (mL) _____20.0 mL_____

Final water level with solid (mL) _____23.1 mL_____

Volume of solid (mL) _____3.1 mL_____

A.3 **Calculate the density of the solid** _____7.9_____ g/mL

(Show calculations.)

24.64 g/3.1 mL = 7.9 g/mL

A.4 Type of metal ____**Iron (7.86 g/mL)**___

Questions and Problems *(Show complete setups.)*

Q.1 An object made of aluminum has a mass of 8.37 g. When it was placed in a graduated cylinder containing 20.0 mL of water, the water level rose to 23.1 mL. Calculate the density and specific gravity of the object.

Volume of aluminum = 23.1 mL – 20.0 mL = 3.1 mL

Density = 8.37 g/3.1 mL = 2.7 g/mL

Specific gravity = $\frac{\text{2.7 g/mL (Al)}}{\text{1.00 g/mL (H}_2\text{O)}}$ = 2.7

B. Density of a Liquid

B.1 **Volume of liquid**	**Liquid 1**	**Liquid 2**
Type of liquid	**water**	**2-propanol**
Volume (mL)	**20.0 mL**	**20.1 mL**
B.2 **Mass of liquid**		
Mass of beaker	**0.00 g (tared)**	**0.00 g (tared)**
Mass of beaker + liquid	**19.82 g**	**15.88 g**
Mass of liquid	**19.82 g**	**15.88 g**
B.3 **Density of liquid**		
Density	**0.991 g/mL**	**0.790 g/mL**

(Show calculations for density.)

19.82 g/20.0 mL = 0.991 g/mL **15.88 g/20.1 mL = 0.790 g/mL**

C. Specific Gravity

C.1 Specific gravity	0.991	0.790

(Calculated using B.3. Show calculations.)

$\frac{\text{0.991 g/mL}}{\text{1.00 g/mL}}$ = 0.991 **$\frac{\text{0.790 g/mL}}{\text{1.00 g/mL}}$ = 0.790**

C.2 Specific gravity		
(Hydrometer reading)	0.995	0.790

How does the *calculated* specific gravity compare to the hydrometer reading for each liquid?

They are both very close.

Questions and Problems *(Show complete setups.)*

Q.2 What is the mass of a solution that has a density of 0.775 g/mL and a volume of 50.0 mL?

50.0 mL x 0.775 g/mL = 38.8 g

Q.3 What is the volume of a solution that has a specific gravity of 1.2 and a mass of 185 g?

If the specific gravity is 1.2, the density is 1.2 g/mL.

$$\textbf{185 g} \times \frac{\textbf{1 mL}}{\textbf{1.2 g}} = \textbf{159 mL}$$

D. Graphing Mass and Volume

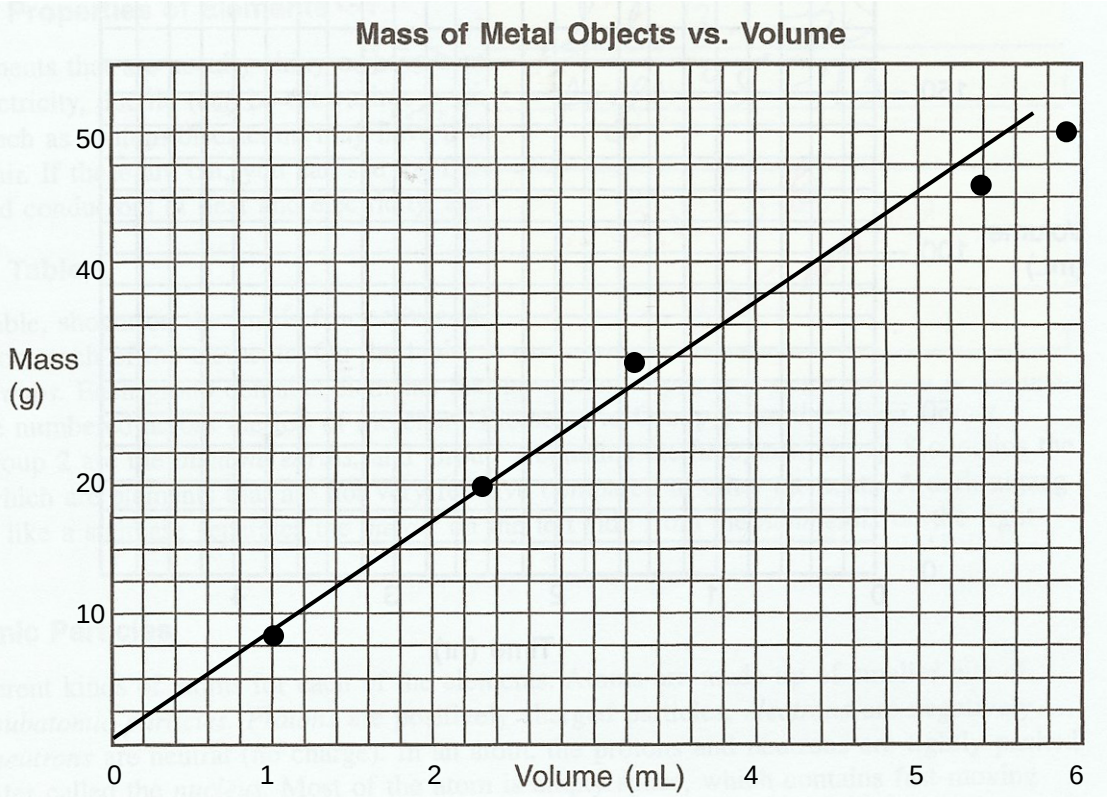
D.1 Type of metal _____**Brass**_____

Initial volume of water (mL) _____22.7 mL_____

D.2 Initial mass of cylinder + water (g) _____43.85 g_____

D.3	**Mass of Metal Pieces**	**Final Volume**	**Total Volume of Metal (mL)**
	____8.4_____ g	_____23.7_____ mL	_____1.0_____ mL
	___19.5_____ g	_____25.0_____ mL	_____2.3_____ mL
	___29.1_____ g	_____26.2_____ mL	_____3.5_____ mL
	___46.1_____ g	_____28.2_____ mL	_____5.5_____ mL
	___50.0_____ g	_____29.7_____ mL	_____6.0_____ mL

D.4 Graph



D.5 Density of the metal = $\frac{\text{Mass }(2) - \text{Mass }(1)}{\text{Volume }(2) - \text{Volume }(1)}$ =

46.1 – 8.4 = 8.4

5.5 – 1.0

= _____**8.4**_____ g/mL

Questions and Problems

Q.4 An IV pump delivers the following volume of saline solution over 4 hours.

Volume (mL)	**Time (hours)**
0	**0**
50	**1.0**
100	**2.0**
125	**2.5**
150	**3.0**
200	**4.0**

Prepare a graph to represent the data above.