Name:_____

Exercise I - B:

System International (Metric System)

Units

Meter = "m" = the unit of length and distance.
A meter is 3.37 inches longer than a yard.

Liter = "l" = the unit of volume.
A liter is slightly larger than a quart.

Gram = "g" = the unit for mass.
A gram is approximately the mass of a paper clip;
454 grams is equal to a pound.

Prefixes

k-				d-	c-	m-
kilo-	hecto-	deka-	**Unit**	deci-	centi-	milli-

<------I----------I----------I----------I----------I----------I----------I---------->

gram; g
liter; l
meter; m

Problems

1) 2 kg = _____ g
2) 625 mm = _____ cm
3) 3.4 g = _____ mg
4) 45.1 cL = _____ L
5) 400 mL = _____ L
6) 68 mg = _____ g
7) 200 mm = _____ cm
8) 870 mL = _____ L
9) 56 cm = _____ m
10) 0.539 mm = _____ km
11) 7.2 L = _____ mL
12) 1.26 g = _____ mg
13) 872 mg = _____ g
14) 0.391 g = _____ kg
15) 0.25 L = _____ mL
16) 0.50 m = _____ km
17) 0.75 g = _____ cg
18) 568 mm = _____ km
19) 290 cL = _____ L
20) 273 kg = _____ mg
21) 1.6 m = _____ cm
22) 0.0086 kL = _____ L

Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

Lab 1.1 - Observations: Aluminum and Copper (II) Chloride

*Make complete and accurate observations during the lab. Observations include such things as...what is happening; for any chemicals, the color, appearance, phase (solid, liquid, gas), and odor (but **NEVER** taste) ; temperature if requested; etc.*

Procedure	Observations

_____1. Place one scoop of copper (II) chloride ($CuCl_2$) in a plastic dish.

Observe: _____

_____2. Fill a 100 or 150 mL beaker 1/2 full of water. Is the beaker warm or cold ? _____

_____3. Without stirring. slowly add the copper (II) chloride ($CuCl_2$) crystals.

_____4. Let it stand for about 2 minutes. Observe closely:_____

_____5. Stir the water with a stirring rod until the crystals dissolve. Observe:_____

_____6. Feel the beaker; has the temperature changed ? _____

_____7. Cut a strip of aluminum foil approximately 1.0 cm x 6 cm.

_____8. Drop the aluminum into the copper (II) chloride ($CuCl_2$) solution. Name 2 things which happen within 10 seconds: _____

_____9. Submerge the aluminum (if necessary) with a stirring rod.

_____10. Leave the beaker undisturbed for **10 minutes**. Make observations during this time (including feeling the temperature of the beaker). There are at least 4 observations._____

_____

_____

_____

_____

_____

_____

Questions

1. What color was the copper (II) chloride ($CuCl_2$) solution ? _____

   a. What is causing the color, the element copper or the element chlorine ? _____

2. What happened to the aluminum ? _____

3. What is rust ? _____

4. Is aluminum able to rust ? _____

5. Consequently, determine what the dark substance was that was seen forming on the aluminum. Use complete sentences (include punctuation) to explain your reasoning.

   _____

   _____

   _____

6. What color was the solution after the reaction ? _____

7. What caused the color of the copper (II) chloride ($CuCl_2$) solution to change ?

   _____

_____

Review Questions

8. When does one yell "Code Red" ? _____

   _____

9. What are the last 3 things you should do at the end of each lab ? _____

   _____

   _____

10. If you are using heat, glassware, or chemicals, what **must** you be wearing ?

    _____

Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

Lab 1.2 - Measuring Mass, Length, Volume

*Make complete and accurate observations during the lab. Observations include such things as...what is happening; for any chemicals, the color, appearance, phase (solid, liquid, gas), and odor (but **NEVER** taste) ; temperature if requested; etc.*

Procedure	Observations

Part A - Measuring Mass

_____1. Obtain a balance. Be careful, they are precise, expensive pieces of equipment.

_____2. "Zero" your balance.

_____3. Measure the mass of any 3 objects to the nearest 0.1 g.

Object	Mass (g)

Part B - Measuring Length and Calculating Volume

_____1. Obtain 4 wooden blocks.

_____2. Measure the length, width, and height of each in centimeters to the nearest 0.1 cm .

_____3. (Do this step after you have completed the lab). Calculate the volume of each (remember volume = length x width x height).

Block	Length (cm)	Width (cm)	Height (cm)	Volume (cm x cm x cm)
A				
B				
C				
D				

Part C - Finding Volumes by Water Displacement

_____1. Obtain a stopper. Observe the color and material:_____

_____2. Fill a 50 mL graduated cylinder about 1/2 way with water. Exact volume:_____

_____3. Gently slide the stopper into the cylinder so that no water splashes out. Tap the cylinder gently to dislodge any air bubbles. Observe the exact volume now: _____

_____4. Calculate the volume of the stopper:

Volume of water and stopper = _____mL

- Volume of water at beginning = _____mL

Volume of stopper = _____mL

_____5. Obtain a forceps.

_____6. Fill a 100 mL graduated cylinder about 1/2 way with water. Exact volume:_____

_____7. Gently slide the forceps into the cylinder so that no water splashes out. Tap the cylinder gently to dislodge any air bubbles. Observe the exact volume now: _____

_____8. Calculate the volume of the forceps:

Volume of water and forceps = _____mL

- Volume of water at beginning = _____mL

Volume of forceps = _____mL

Questions

1. What is the equation for calculating volume of a rectangular box ? _____

2. What are the units for volume if the box in Question 1 is measured in centimeters ? _____

3. What units are used for volume when using graduated cylinders ? _____

4. What is the relationship between milliliters (mL) and a cubic centimeters (cm^3) ? _____

5. Showing all your work, calculate the volume of a cereal box measuring 5.0 cm deep, 25.0 cm tall, and 20.0 cm wide (remember to include units):

Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

Lab 1.3: Density of Liquids and Solids

*Make complete and accurate observations during the lab. Observations include such things as...what is happening; for any chemicals, the color, appearance, phase (solid, liquid, gas), and odor (but **NEVER** taste) ; temperature if requested; etc.*

Procedure	Observations

Part A: Density of Liquids

Sample X (Liquid)

_____1. Mass a clean, dry, empty 50 mL graduated cylinder. Mass of **cylinder** (include units:_____

_____2. Add 25 mL of Sample X to the cylinder. Observe Sample X:_____

_____3. Mass the cylinder with Sample X in it. Mass (include units):_____

Sample Y (Liquid)

(Do the same procedure as #1 - 3)

_____4. Mass a clean, dry, empty 50 mL graduated cylinder. Mass of cylinder (include units):_____

_____5. Add 25 mL of Sample Y to the cylinder. Observe Sample Y:_____

_____6. Mass the cylinder with Sample Y in it. Mass (include units):_____

Sample Z (Liquid)

(Do the same procedure as #1 - 3, which is the same as #4-6)

_____7. Mass a clean, dry, empty 50 mL graduated cylinder. Mass of cylinder (include units):_____

_____8. Add 25 mL of Sample Z to the cylinder. Observe Sample Z:_____

_____9. Mass the cylinder with Sample Z in it. Mass (include units):_____

Part B: Density of Rectangular Solids

First Solid

_____10. Obtain a solid metal block from your teacher. Observe the block: _____

What type of metal do you think the block is ? _____

_____11. Mass the block. Mass (include units): _____

_____12. Measure the length, width, and height to the nearest 0.1 cm (include units).

Length:_____

Width:_____

Height:_____

Second Solid

_____13. Obtain another solid metal block from your teacher. Observe the block: _____

What type of metal do you think the block is ? _____

_____14. Mass the block. Mass (include units): _____

_____15. Measure the length, width, and height to the nearest 0.1 cm (include units).

Length:_____

Width:_____

Height:_____

Part C: Density of an Irregularly Shaped Solid

_____16. Mass a plastic dish. Mass of dish (include units):_____

_____17. Obtain metal pellets from your teacher. Observe the pellets:_____

What type of metal do you think the pellets are ? _____

_____18. Mass the pellets and the dish. Mass of dish and pellets (include units) : _____

_____19. Obtain a 50 mL graduated cylinder.

_____20. Put 30 mL of water into the cylinder.

_____21. Gently, without splashing, pour the metal pellets into the cylinder.

_____22. Observe the volume of the cylinder with the pellets in it. Volume (include units):_____

_____23. Clean up: Over the sink, pour the pellets onto a metal screen. Take the pellets to your teacher.

_____24. Rinse all glassware used; wipe down your counter area; then wash your hands; take off your goggles.

Name:_____

Exercise I - C : Density

****Show all work including units****

1. How much matter occupies a given space is known as matter's...

   a) weight b) density c) mass d) volume

2. The density of water is 1.0 g/mL. Oil floats on water. Which density of those given, is probably that of oil ?

   a) 1.0 g/mL b) 1.9 g/mL c) 10 g/mL d) 0.9 g/mL

3. 100 grams of a liquid completely fill a 200 mL bottle. The density of the liquid is...

   a) 100 g/mL b) 200 g/mL c) 0.5 g/mL d) 2 g/mL

4. The mass of a book is 4000 g. The volume of the book is 500 cm^3. What is the density of the book ?

5. The density of an orange is 3 g/mL. The volume of the orange is 30 mL. What is the mass of the orange ?

6. The mass of a key is 6.5 g. The volume of the key is 0.83 mL. What is the density of the key ?

7. The density of a piece of foam is 0.15 g/mL. The volume of the foam is 80 mL. What is the mass of the foam ?

8. An empty graduated cylinder has a mass of 85 g. The cylinder plus 40 mL of an unknown liquid weighs 109 g.

a) What is the mass of the liquid ?

b) What is the density of the liquid ?

9. A sample of metal has a mass of 89.6 g. When the sample is added to 20 mL of water in a graduated cylinder, the volume increased to 31.2 mL.

a) What is the volume of the sample of metal ?

b) What is the density of the metal ?

Questions

Part A

Sample X

1. Calculate the mass of Sample X:

(Answer from procedure 3) Mass of cylinder and Sample X = _____g

-(Answer from procedure 1) Mass of cylinder only = _____g

Mass of 25 mL of Sample X =_____g

2. Calculate the density of Sample X. **Density = mass/volume** OR **D = m/V**

$$\text{Density} = \frac{\text{g (mass Sample X)}}{\text{mL (volume Sample X)}} = \text{g/mL}$$

Sample Y

3. Calculate the mass of Sample Y:

(Answer from procedure 6) Mass of cylinder and Sample Y = _____g

-(Answer from procedure 4) Mass of cylinder only = _____g

Mass of 25 mL of Sample Y =_____g

4. Calculate the density of Sample Y. **Density = mass/volume** OR **D = m/V**

$$\text{Density} = \frac{\text{g (mass Sample Y)}}{\text{mL (volume Sample Y)}} = \text{g/mL}$$

Sample Z

5. Calculate the mass of Sample Z:

(Answer from procedure 9) Mass of cylinder and Sample Z = _____g

-(Answer from procedure 7) Mass of cylinder only = _____g

Mass of 25 mL of Sample Z =_____g

6. Calculate the density of Sample Z. **Density = mass/volume** OR **D = m/V**

$$\text{Density} = \frac{\text{g (mass Sample Z)}}{\text{mL (volume Sample Z)}} = \text{g/mL}$$

7. Complete the following Data Table. From your data and the following identify each liquid:

Liquid	Density
Ethanol	0.79 g/mL
Glycerin	1.26 g/mL
Mineral oil	0.86 g/mL
Water	1.00 g/mL

Sample	Mass (g)	Volume (mL)	Density (g/mL)	Identity of Liquid	Actual Identity of Liquid
A					
B					
C					

Part B

8. Calculate the volume of the first block. Show your work and include units.

Volume = length x width x height OR **V = L** (cm) x **W** (cm) x **H** (cm)

9. Calculate the density of the first block.

$$\text{Density} = \frac{\text{g (mass of block)}}{\text{cm}^3 \text{ (volume of block)}} = \text{g/cm}^3$$

10. Calculate the volume of the second block. Show your work and include units.

Volume = length x width x height OR **V = L** (cm) x **W** (cm) x **H** (cm)

11. Calculate the density of the second block.

$$\text{Density} = \frac{\text{g (mass of block)}}{\text{cm}^3 \text{ (volume of block)}} = \text{g/cm}^3$$

12. Using your data, determine what type of metal the block is by using information below:

Metal	Density
Aluminum	2.7 g/cm^3
Brass	8.5 g/cm^3
Lead	11.35 g/cm^3
Steel	7.8 g/cm^3

a. From your data, what is the identity of your first block:_____

b. What is the actual identity of your first block: _____

c. From your data, what is the identity of your second block:_____

d. What is the actual identity of your second block: _____

Part C

13. Calculate the mass of the pellets:

(Answer from procedure 18) Mass of the pellets and dish = _____g

- (Answer from procedure 16) Mass of dish =_____g

Mass of pellets = _____g

14. Calculate the density of the pellets.

$$\text{Density} = \frac{\text{g (mass of pellets)}}{\text{mL (volume of pellets)}} = \text{g/mL}$$

15. Using your data, determine the identity of the pellets from the information below:

Metal	Density		
Aluminum	2.7 g/mL	Lead	11.35 g/mL
Brass	8.5 g/mL	Nickel	8.90 g/mL
Cobalt	8.92 g/mL	Steel	7.8 g/mL
Copper	8.96 g/mL	Tin	7.31 g/mL
		Zinc	7.13 g/mL

a. From your data, what is the identity of your pellets:_____

b. What is the actual identity of your pellets: _____

Extra Questions

16. Calculate the density of a 350 g sample of rock which has a volume of 100 cm^3. Show your work.

17. Would a large chunk of sulfur have the same density as a small chunk of sulfur ? _____. Using complete sentences (including punctuation), briefly explain your reasoning.

Review Questions

18. How should you smell a chemical ? _____

19. What should be done while heating a test tube in a burner flame ? _____

_____

20. What causes the blue color of copper chloride solution ? _____

21. When you dropped a piece of aluminum into a copper chloride solution, what solid formed on the bottom ? _____

22. What is the formula for determining the volume of a rectangular solid ? _____

23. If you measure in centimeters, what will the units be for a volume calculation ? _____

24. In System International, what is the unit for mass ? _____

    a. What is the abbreviation ? _____

25. In System International, what is the unit for length ? _____

    a. What is the abbreviation ? _____

26. In System International, what is the unit for volume ? _____

    a. What is the abbreviation ? _____

Name:_____

Exercise I - D: Chapter I Review

1. What is the correct way to smell a chemical in lab ? _____

2. What is the purpose of a fume hood ? _____

3. If you see someone with their clothes on fire, what should **you** do ? _____

_____

4. What is the color of copper chloride ($CuCl_2$) solution ? _____

5. If you put aluminum foil into copper chloride (CuCl2) solution, what is the dark material that forms on the aluminum ? _____

6. What reaction did the aluminum foil have in methylene blue solution ? _____

_____

7. The System International unit for length is _____; for .mass is _____; for volume is _____ or _____.

8. The formula for calculating the volume of a rectangular box is _____.

9. Calculate the volume of the rock from this data (show your work, including units):
   Volume of water in graduated cylinder: 35 mL
   Volume of water and rock in graduated cylinder; 71 mL

10. Change the following:

a) 54 g = _____mg

b) 34 cm = _____mm

c) 0.0064 KL = _____L

d) 0.49 g = _____Kg

e) 76 500 mm = _____Km

f) 925 mL = _____L

g) 9 Kg = _____cg

h) 0.0918 m = _____mm

i) 5000 L = _____cL

j) 0.123 cg = _____g

11. For each letter, circle the one with the greater density:

a) oil or water

b) diet soda or regular soda

c) brass or lead

12. Calculate the density of the following liquid (show your, including units):

Volume of liquid = 45 mL
Mass of graduated cylinder and liquid = 123.5 g
Mass of graduated cylinder = 62.4 g

13. Calculate the density of the following block of metal (show your, including units):

Height of block = 6 cm
Width of block = 4 cm
Length of block = 10 cm
Mass of block 84 g

14. Calculate the density of the following metal pieces (show your, including units):

Volume of water and metal = 88 mL
Volume of water only = 66 mL
Mass of dish and metal pieces = 55 g
Mass of dish = 2 g

Chemistry Laboratory
Safety Procedures and Rules Contract

As your chemistry teacher, safety in the laboratory is the top priority. I want to be able to offer you educational and worthwhile laboratory activities. I need your cooperation for labs to be successful and safe. Please read the following and sign below.

Procedures...Procedures...Procedures...Procedures

1. Lab aprons are recommended and available for use.

2. Open-toed shoes should not be worn during lab activities.

3. Report all accidents, no matter how minor, to the teacher.

4. If someone is **seriously injured**, or there is a **seriously dangerous situation**, repeatedly yell **CODE RED**.

5. **Never** touch, or taste, any chemical or solution.

6. Immediately and thoroughly wash off any chemical spilled on your skin.

7. Know the location of, and how to use, the fire extinguisher, fire blanket, and eye wash/body shower.

8. Know the location of, and how to use, the fume hood (if available), the emergency gas/electric shut-off button, and the ventilation system button.

9. Do only the experiment assigned. Never do anything not called for in the lab procedure or by your teacher. Follow all directions given.

10. Tie back long hair.

11. Fasten or remove loose clothing and jewelry.

12. Never pick up broken glassware with your bare hands.

13. Any glassware, or equipment, broken will be billed to the student(s) responsible for the breakage.

14. When heating a test tube, point the test tube toward the wall (away from any people).

15. If the procedure indicates to smell a chemical, use your hand and waft the vapors towards your nose. Never smell any chemical directly.

16. Stay at your lab station, unless directed to do otherwise.

17. Work in a quiet businesslike manner at all times.

18. Do not put unused chemicals back into the reagent/stock bottle (original container).

19. Dispose of all chemicals as instructed; do not assume they can go down the sink.

20. At the conclusion of each lab, in this order...
wash your glassware; wash/wipe down your lab counter; wash your hands.

21. Material Safety Data Sheets (MSDS) are available for all chemicals used. Students have the right to know the precautions and hazards associated with all chemicals used in the class (Right To Know Law). These sheets are kept on file in the main chemical prep room. Students may request to see them at any time.

Rules...Rules...Rules...Rules...Rules...Rules...Rules

1. Whenever **glassware, heat, or chemicals** are being used, **full chemical splash goggles** will be worn **at all times.**

2. Horseplay of any type **will not be tolerated.**

3. **Never** eat or drink in lab.

4. **NEVER** go into the chemical prep room. This will result in the most severe disciplinary action allowed.

****Any violation of the above procedures will be dealt with in an appropriate manner, resulting in any or all of the following:**

1) disciplinary action;
2) receiving no credit for the laboratory activity;
3) restriction from involvement in future laboratory activities.

I, _____, have read and agree to abide by the safety procedures as set forth above. I further agree to follow all other instructions given during class.

_____

Date Signature

I/We, the parents or guardian of the student above, have read the Laboratory Safety Procedures and Rules Contract:

_____

Date Signature(s)

Received date and teacher initials: _____

Name:_____

Chemistry:
Lab Safety Procedures and Rules Worksheet

Answer all the questions. If you are unsure of an answer, make a logical guess.

1. What is the purpose of wearing a lab apron ? _____

_____

2. What should you do if a minor accident occurs ? _____

3. What 2 things should you do if a serious accident occurs in which someone is seriously injured ? _____

_____

4. What is wrong with the following statement: When making observations in lab, you should note the appearance, color, phase, odor, and feel of the chemical. _____

_____

5. If your hand itches, burns slightly, or appears red in lab, what 2 things should you do ?

_____

6. Where are the following located in the lab ?

Fire extinguisher_____

Fire blanket_____

Eye washes _____

_____

Body shower _____

7. What 2 or 3 things would you do if your lab bench caught on fire ? _____

_____

_____

8. Why should one fasten back long hair ? _____

9. Besides disciplinary action, what could be a result of not following the correct steps of the lab ?

_____

10. Loose jewelry should not be worn in lab. Why ? _____

_____

11. Loose clothing should not be worn in lab. Why ? _____

_____

12. How should you take care of broken glassware ? _____

_____

13. How should you heat a test tube ? _____

_____

14. How should you smell any chemical or substance in lab ? _____

_____

15. Why is it important to work in a businesslike manner, quietly, and with a minimum of movement around the lab ? _____

_____

16. Why should you never put unused chemicals back into the original container ? _____

_____

17. How should you dispose of used chemicals after the lab is complete ? _____

_____

18. In order, what are the last 3 things that you should do at the end of lab ? _____

_____

19. Why should you clean all your glassware before using it, even if it already looks clean ?

_____

20. Why are safety goggles the most important piece of safety equipment in the lab ? _____

_____

21. Why is horseplay dangerous in lab ? _____

_____

22. Eating and drinking in lab are forbidden. Why ? _____

_____

23. What is a possible consequence of going into the chemical prep room ? _____

_____

24. Why are bottles of chemicals kept tightly closed except when chemicals are being removed ?

_____

25. Why should all drawers and cabinets be closed unless you are taking something out or putting something away ? _____

26. What is the difference between sterilized and clean? _____

_____

_____

27. What is the purpose of the goggle cabinet, other than holding goggles? _____

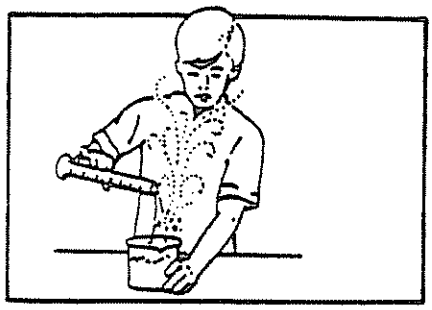
_____

28. Why should you NOT put a stopper, cork, or cap from a bottle on the counter top ? _____

_____

Identify **all** that is wrong in each picture of the laboratory activities below:

1.

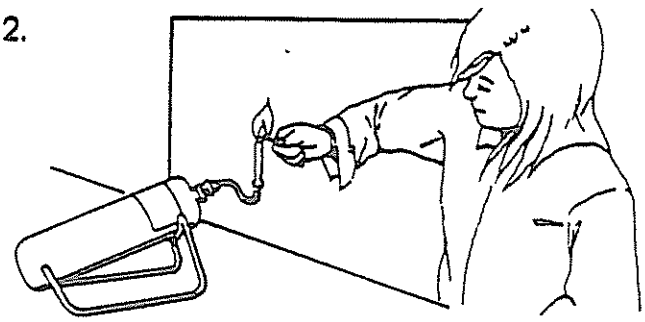


_____

_____

_____

2.



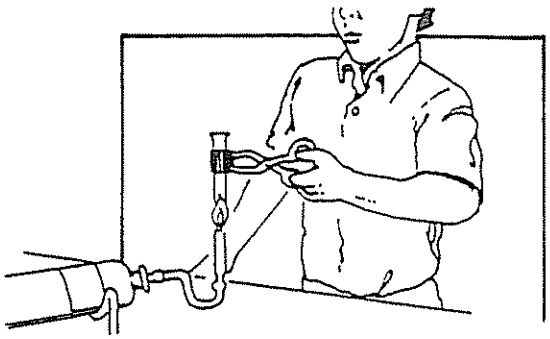
_____

_____

_____

OVER

3.



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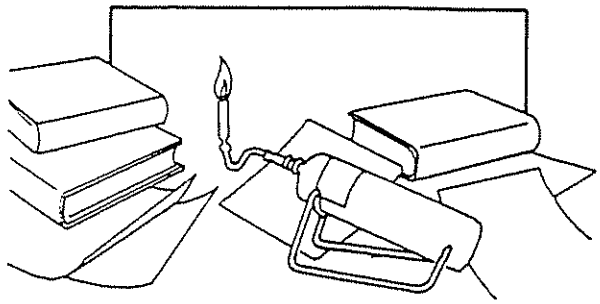

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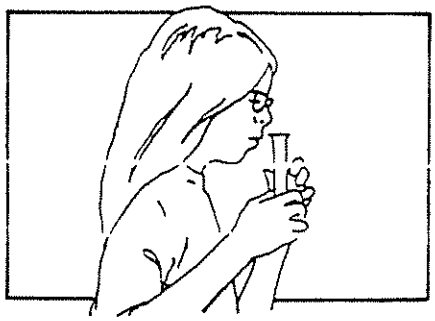

6.