

Unit 0 – Matter & Measurement Objectives

At the end of this unit, you'll be able to...

- ✓ Classify types of matter
- ✓ Draw particle diagrams to represent different types of matter
- ✓ Recognize various techniques that can be used to separate matter
- ✓ Convert between units of measurements
- ✓ Differentiate between accuracy and precision
- ✓ Write numbers in scientific notation
- ✓ State rules to determine significant figures
- ✓ Count significant figures
- ✓ Understand the importance of significant figures
- ✓ Calculate the volume and density of an object

Unit 0 - Matter and Measurement

Term	Definition
Accuracy	How close your results are to the desired value
Chromatography	Separation of particles based on size and solubility.
Compound	Two or more elements chemically combined. Formula which contains 2+ different symbols/elements
Density	Amount of mass in a given space; RATIO of mass to volume
Distillation	Separate 2 or more liquids based on their boiling points.
Element	Simplest form of matter. Found on the periodic table.
Extensive Property	A property that depends on how much material you are dealing with. Can not be used to help identify matter
Filtration	Separation of substances based on solubility
Gram	Basic SI unit of mass
Heterogeneous Mixture	A mixture where the substances aren't equally distributed. Different throughout.
Homogeneous Mixture	A mixture that is the same throughout.
Intensive	A property that <i>does not</i> depend on how much material you are dealing with. Can be used to help identify matter; a constant about that particular type of matter.
Liter	Basic SI unit of Volume
Mass	The amount of matter in an object. The more mass, the more stuff is present.
Matter	Anything that has mass and volume (takes up space)
Meter	Basic SI unit of distance/length
Mixture	2 or more substances combined physically. Not a pure substance.
Particle Diagram	A drawing that represents atoms or molecules
Precision	A measurement of how repeatable a measurement is. The more significant figures, the more precise the measurement.
Pure Substance	A substance where each particle has the same composition
S.I. unit	The modern form of the metric system and is the world's most widely used system of measurement
Scientific Notation	Method for expressing very large or small numbers easily (Example: 6.02×10^{23} atoms = 1 mole)
Significant Figures	The number of digits in a number that tell you useful information.
Volume	Amount of SPACE an object takes up
Weight	The effect of gravity on an object's mass.

Name _____

Date _____

Period _____

Classify each as one of the following: element (E), compound (C), heterogeneous mixture (Hetero), homogeneous mixture (Homo)

Beaker of distilled water (H ₂ O)	
Beaker of Lake Ontario water	
Balloon filled with air	
Thermometer full of mercury	
Tank of carbon dioxide (CO ₂)	
Glass of Kool-Aid	
Piece of copper wire	
Slab of concrete	
Slab of iron	
Bowl of chicken noodle soup	
Salt water	
Milk	
Pepperoni Pizza	
Carbon	
Air	
Table salt	
Sugar dissolved in water	
Granite	
Oxygen	
Sand in water	

Name _____

Date _____

Period _____

For the following, use the same classifications as page 1 (some of these may have more than one answer though!)

Cannot be decomposed by chemical means	
Contains two or more elements	
Can be separated by filtration	
Can be separated by distillation	
Cannot be separated by physical means	
Composed of pure matter	
Two liquids mixed at the molecular level	
Has a consistent density throughout the sample	
Can be separated by chromatography	
Properties stay the same when broken apart into its simplest form	
Something with varying boiling points throughout	

Name _____

Date _____

Period _____

Elements, Compounds, and Mixtures

Classify each of the pictures below by placing the correct label in the blanks below:

A= Element

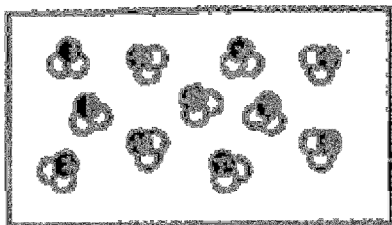
D= Mixture of compounds

B= Compound

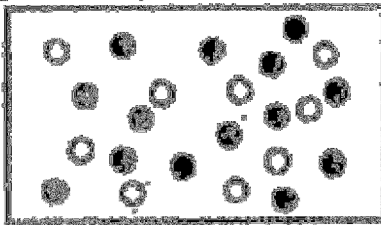
E= Mixture of elements and compounds

C= Mixture of elements

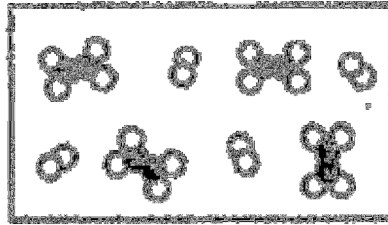
Each circle represents an atom and each different color represents a different kind of atom. If two atoms are touching then they are bonded together.



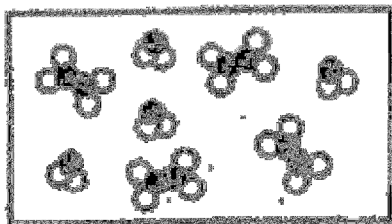
1) _____



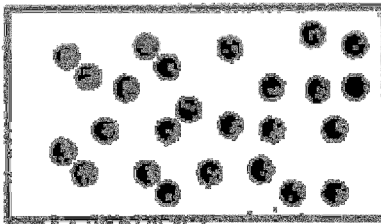
2) _____



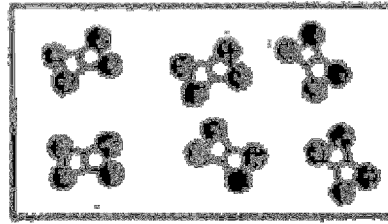
3) _____



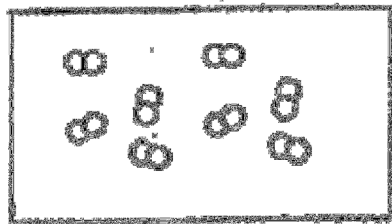
4) _____



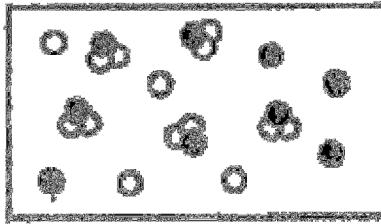
5) _____



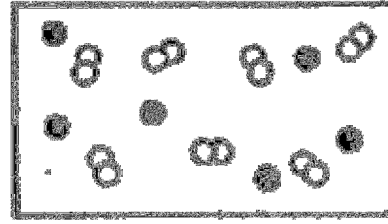
6) _____



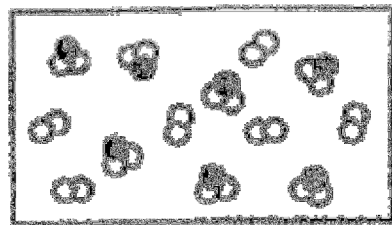
7) _____



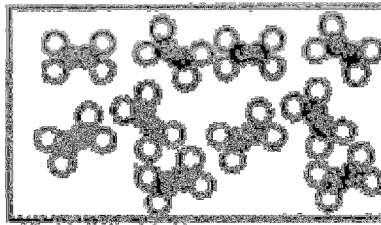
8) _____



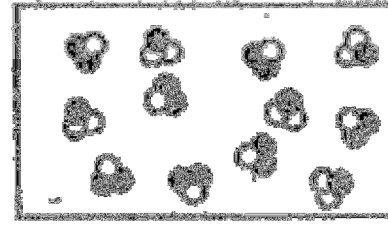
9) _____



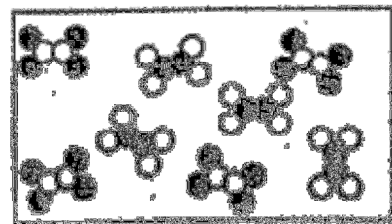
10) _____



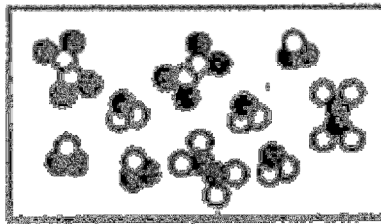
11) _____



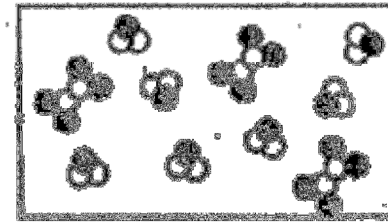
12) _____



13) _____



14) _____



15) _____

Name: _____

Hour: _____ Date: _____

Chemistry: Properties

Recall that *physical properties* can be observed without producing new substances. *Chemical properties* describe how a substance interacts with other substances to produce new substances. *Extensive properties* depend upon the amount of matter in the sample; *intensive properties* do not.

Directions, Part 1: Classify each of the properties listed below as extensive or intensive. Then classify each property as physical or chemical. Write the word out to earn full credit.

Property	Extensive or Intensive Property	Physical or Chemical Property
color		
combustibility		
hardness		
density		
mass		
melting point		
ductility		
volume		
reactivity with acid		
odor		
weight		
malleability		
tendency to corrode		

Directions, Part 2: Some measurements or descriptions of properties are listed below. Write which property is being described in each case. Select properties that are listed in the table from Part 1.

- | | |
|--|----------|
| A. 15 dm ³ | A. _____ |
| B. can easily be hammered into sheets | B. _____ |
| C. 2.8 g/cm ³ | C. _____ |
| D. burns when heated in the presence of O ₂ | D. _____ |
| E. shiny metal forms a chalky white layer on its surface | E. _____ |
| F. can be scratched by a diamond | F. _____ |
| G. 500°C | G. _____ |
| H. can easily be drawn into a wire | H. _____ |

Name _____

Date _____

Period _____

Classification of Matter - Fill in the Blanks

Word Bank:

Chemical changes
 Chemical property
 Compound
 Element
 Heterogeneous matter
 Homogeneous matter

Matter
 Mixture
 Physical changes
 Physical property
 Property
 Substance

_____ is anything that has mass and volume. Matter that has uniform characteristics throughout is called _____. Matter that has parts with different characteristics is called _____.

A characteristic by which a variety of matter is recognized is called a(n) _____. A characteristic that can be observed without producing new kinds of matter is called a(n)

_____. A characteristic that depends on how a kind of matter changes its composition (or fails to change its composition) during interactions with other kinds of matter is called a(n)

_____. _____ alter the identity of a substance, whereas _____ do not.

Matter can also be classified according to the basic types of matter it contains. A simple substance that cannot be broken down into other substances by chemical means is called a(n) _____. A chemical combination of simple substances is called a(n) _____. A physical combination of different substances that retain their individual properties is called a(n) _____. Either an element or a compound may be referred to as a(n) _____.

Name _____

Date _____

Period _____

Physical or Chemical Change?

Identify whether each of the following changes is a physical change or a chemical change. Write a "P" on the line for a physical change and a "C" for a chemical change.

- | | |
|------------------------------|--------------------------------|
| 1) _____ water boiling | 6) _____ leaves changing color |
| 2) _____ iron rusting | 7) _____ glass breaking |
| 3) _____ butter melting | 8) _____ mowing the lawn |
| 4) _____ alcohol evaporating | 9) _____ magnetizing a nail |
| 5) _____ wood rotting | 10) _____ baking a cake |

- 11) A piece of wood burns to form ash _____
- 12) Water turns into steam _____
- 13) A piece of cork is cut in half _____
- 14) A bicycle chain rusts _____
- 15) Food is digested in the stomach _____
- 16) Water is absorbed by a paper towel _____
- 17) Hydrochloric acid reacts with zinc _____
- 18) A piece of an apple rots on the ground _____
- 19) A tire is inflated with air _____
- 20) A plant turns sunlight, CO₂, and water into sugar and oxygen _____
- 21) Sugar dissolves in water _____
- 22) Eggs turn into an omelet _____
- 23) Milk sours _____
- 24) A popsicle melts _____
- 25) Turning brownie mix into brownies _____

Name _____

Date _____

Period _____

Element or Compound

Label each of the following as element or compound

On the line provided, record the number of different symbols within the species.

CO _____

NI₃ _____

Mg _____

O₂ _____

Co _____

H₂O _____C₂H₅OH _____

NaCl _____

Al(CN)₃ _____

C _____

Cl₂ _____

Cu _____

H₂SO₄ _____

I _____

He _____

1) Does each compound have the same number of symbols? _____

2) For each ELEMENT above, how many total symbols are listed? _____

3) What is the minimum number of symbols that must be present in order for a species to be considered a compound? _____

Name _____

Date _____

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Period _____

For each of the following molecules, determine how many of atoms for each element.



carbon atoms _____

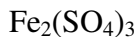
oxygen atoms _____



aluminum atoms _____

carbon atoms _____

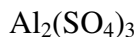
nitrogen atoms _____



iron atoms _____

sulfur atoms _____

oxygen atoms _____



Aluminum atoms _____

sulfur atoms _____

oxygen atoms _____



aluminum atoms _____

sulfur atoms _____

oxygen atoms _____



nitrogen atoms _____

hydrogen atoms _____

carbon atoms _____

oxygen atoms _____



beryllium atoms _____

nitrogen atoms _____

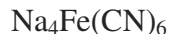
oxygen atoms _____



chromium atoms _____

sulfur atoms _____

oxygen atoms _____



sodium atoms _____

iron atoms _____

carbon atoms _____

nitrogen atoms _____



sodium atoms _____

phosphorous atoms _____

oxygen atoms _____



hydrogen atoms _____

oxygen atoms _____



H atoms _____

O atoms _____

Name _____

Date _____

Period _____

Lab Separation Techniques

<p>NAME and DESCRIBE the separation technique that could be used to separate two colorless liquids with varying boiling points.</p>	
<p>NAME and DESCRIBE the separation technique that could be used to separate a non-dissolving solid mixed with a liquid.</p>	
<p>NAME and DESCRIBE the separation technique that could be used to separate salt and water. Please note that you need both salt and water at the end of the separation.</p>	
<p>What type of separation cannot be used for a homogeneous mixture? Why not?</p>	
<p>Describe how you would separate a mixture of salt water and sand.</p>	

Name _____

Date _____

Period _____

Scientific Notation

Part A: Express each of the following in standard form.

1. 5.2×10^3 _____

2. 9.65×10^{-4} _____

3. 8.5×10^{-2} _____

4. 2.71×10^4 _____

5. 3.6×10^1 _____

6. 6.452×10^2 _____

7. 8.77×10^{-1} _____

8. 6.4×10^{-3} _____

Part B: Express each of the following in scientific notation.

9. 78,000 _____

10. 0.00053 _____

11. 250 _____

12. 2,687 _____

13. 16 _____

14. 0.0043 _____

15. 0.875 _____

16. 0.012654 _____

Name _____

Date _____

Period _____

Write each number in scientific notation.

0.07882 = _____

0.00000272338 = _____

118000 = _____

87200 = _____

0.00002786 = _____

0.000000664 = _____

450 = _____

74171.7 = _____

770 = _____

0.0000085 = _____

Name _____

Date _____

Period _____

Write each number in standard format.

$$3.443 \times 10^{-7} = \underline{\hspace{10cm}}$$

$$7.75763 \times 10^{-7} = \underline{\hspace{10cm}}$$

$$5.8 \times 10^{-7} = \underline{\hspace{10cm}}$$

$$1.525 \times 10^6 = \underline{\hspace{10cm}}$$

$$6.58157 \times 10^7 = \underline{\hspace{10cm}}$$

$$5.1821 \times 10^{-4} = \underline{\hspace{10cm}}$$

$$1.21 \times 10^{-7} = \underline{\hspace{10cm}}$$

$$5.2314 \times 10^{-7} = \underline{\hspace{10cm}}$$

$$7.141 \times 10^{-5} = \underline{\hspace{10cm}}$$

$$5.256 \times 10^6 = \underline{\hspace{10cm}}$$

Name _____

Date _____

Period _____

Unit Conversions

Directions: Complete all of the following conversions. Please show all work and report the answer with the proper units.

1. How many milliliters are there in 21.59 L?
2. Convert 1.62 m into centimeters.
3. How many millimeters are there in 0.064 m?
4. Convert 15 g to kilograms.
5. How many kilograms are in 2648 grams?
6. Convert 253 mL to liters.
7. Convert 1258 cm to meters.
8. Convert 1254 kilojoules to joules.
9. Convert 2500 mL to liters.

Name _____

Date _____

Period _____

10. A car travels 845 km. How many meters is this?

11. Convert 0.0290m to millimeters.

More Metric Conversions: Show all work and report with the proper units.

12. Convert a measurement of 100 cm to its equivalent in m. _____

13. Convert a measurement of 0.001 m to its equivalent in mm. _____

14. Convert a measurement of 10. L to its equivalent in mL. _____

15. Convert a measurement of 1000 g to its equivalent in kg. _____

16. Convert a measurement of 50 cm to its equivalent in mm. _____

17. Convert 24 mg to cg. _____

18. Convert a measurement of 36 mL to its equivalent in dL. _____

Name _____

Date _____

Period _____

19. Convert a measurement of 0.00883 km to its equivalent in cm. _____

20. Convert a measurement of 350.0 mg to its equivalent in kg. _____

21. How many cL are in 0.0895 kL? _____

A Bit More Challenging Conversions:

22. How many seconds pass in 3.11 hours?

23. How many seconds pass in 5 days?

24. How many seconds are in a year?

25. How old are you in seconds?

26. How many more minutes until your next birthday?

27. How old are you in dog years (1 human year = 7 dog years)?

Name _____

Date _____

Period _____

Percent Error Practice Problems: Show all work.

1. There are 140 calories in one can of Coke. In an experiment you determine that there are 210! You are a bit off, but what is your percent error for the experiment?

2. There are 35 mg of sodium in a can of Coke. You determine it to be 15 mg. What is your percent error?

3. There is 3.5 grams of fat in a granola bar. You determine the fat content to be 4.0 g in the lab. What is the percent error?

Name _____

Date _____

Period _____

4. Working in the laboratory, a student finds the density of a piece of pure aluminum to be 2.85 g/cm^3 . The accepted value for the density of aluminum is 2.699 g/cm^3 . What is his percent error?

5. A student experimentally determines the specific heat of water to be $4.29 \text{ J/g} \times \text{C}^\circ$. He then looks up the specific heat of water on a reference table and finds that it is $4.18 \text{ J/g} \cdot \text{C}^\circ$. What is his percent error?

6. A student takes an object with an accepted mass of 200.00 grams and masses it on his own balance. He records the mass of the object as 196.5 g. What is his percent error?

Name _____

Date _____

Period _____

Significant Figures

How many SF's in each number below?

520 mL _____ 10.002 ns _____ 0.0102 ms _____ 0.451 Pa _____

0.230 kg _____ 0.001 cm _____ 25,600 L _____

		Decimal Present or Absent	Number of sig figs
1	0.03092		
2	3092		
3	309.200		
4	392		
5	1020		
6	1200		
7	1200.		
8	1200.00		
9	0.00120		
10	18		
11	152.3		
12	4.000		
13	0.0205		
14	8.40		
15	22.200 g		
16	657 m		
17	0.000711 kg		
18	876.223 mg		
19	52.345 g		
20	0.3609 mL		
21	500000 m		
22	86000. mg		
23	8955.0 g		
24	87200 mL		
25	520 mL		
26	3.092×10^3		
27	520 mL		
28	0.001 cm		
29	0.451 Pa		
30	0.0102 g		

Name _____

Date _____

Period _____

How many significant figures are in each of the following numbers?

31. 5.40 _____

32. 210 _____

33. 801.5 _____

34. 1000 _____

35. 101.0100 _____

36. 1.2×10^3 _____

37. 0.00120 _____

38. 0.0102 _____

39. 9.010×10^{-6} _____

40. 2,370.0 _____

41. Why are significant figures important when gathering data in the laboratory?

42. Why are significant figures NOT important when solving problems in your math class?

43. Using two different instruments, I measured the length of my foot to be 27 centimeters and 27.00 centimeters. Explain the difference between these two measurements.

Name _____

Date _____

Period _____

Calculations Using Sig Figs

Solve each problem. State your answer in the proper number of significant figures.

1) $1.0 + 13.45 =$

24) $2.2 \times 7.776 =$

2) $9.2 - 5 =$

25) $3.5 \times 8.76 =$

3) $5.800 + 0.4289 =$

26) $7.543/2.92 =$

4) $5.3 - 2.104 =$

27) $9.12 + 2.1598 =$

5) $123.45 + 0.82 =$

28) $8.452 - 2.9 =$

6) $37.0 / 4 =$

29) $3.2 + 4.75 + 18 =$

7) $0.63 \times 9.754 =$

30) $34.892 - 4.75 =$

8) $40.0 / 8.74 =$

31) $0.3287 \text{ g} \times 45.2 \text{ g} =$

9) $0.02384 \times 1.37 =$

32) $0.258 \text{ mL} + 0.36105 \text{ mL} =$

10) $(2.2)(7.776) =$

33) $125.5 \text{ kg} + 52.68 \text{ kg} + 2.1 \text{ kg} =$

11) $5.22 \times 82.7 =$

34) $15 + 8.5 + 9.63 =$

12) $4.008 / 0.061 =$

35) $0.032 + 0.10 + 0.3 =$

13) $9.475 / 12.05 =$

36) $400 + 27 + 96.4 =$

14) $4.123 + 9.0 =$

37) $87 - 2.5 =$

15) $76.9 - 45.21 =$

38) $400. - 137 =$

16) $100. - 3.4 =$

39) $43 \times 4 =$

17) $4.3 \times 85.47 =$

40) $1.32 \times 1.4 =$

18) $100.0 / 2.0 =$

41) $12.020 \times 9.24 =$

19) $100 / 2.000 =$

42) $18.0/3.0 =$

20) $37.0 / 4 =$

43) $0.32/1.42 =$

21) $0.63 \times 9.754 =$

44) $80/3.6 =$

22) $40.0 / 8.74 =$

45) $0.3287 \text{ g} \times 45.2 \text{ g} =$

23) $0.02384 \times 1.37 =$

46) $125.5 \text{ kg} + 52.68 \text{ kg} + 2.1 \text{ kg} =$

Name _____

Date _____

Period _____

More Difficult

$$47) \frac{52.8 \text{ Pa} + 3.0025 \text{ Pa}}{253.4 \text{ Pa}} =$$

$$48) (0.12 \text{ g} + 5.16 \text{ g}) (45.56 \text{ g} - 93.0 \text{ g}) =$$

$$49) 68.32 \text{ ns} + (-1.001 \text{ ns}) + (-0.00367 \text{ ns}) + (-678.1 \text{ ns}) =$$

$$50) (1250 \text{ cal} - (234.207 \text{ cal} / 52.69 \text{ cal})) =$$

$$51) \frac{78.26 \text{ L} + 89.50 \text{ L}}{678.2 \text{ L} + 9511 \text{ L}} =$$

Name _____

Date _____

Period _____

Density Problems

1. A gold-colored ring has a mass of 18.9 grams and a volume of 1.12 mL. Is the ring pure gold? (The density of gold is 19.3 g/mL.)

2. What volume would a 0.871 gram sample of air occupy if the density of air is 1.29 g/L?

3. Pumice is volcanic rock that contains many trapped air bubbles. A 225 gram sample occupied 236.6 mL. What is the density of pumice?

Will pumice float on water? The density of water is 1.0 g/mL.

4. A cup of sugar has a volume of 237 mL. What is the mass of the cup of sugar if the density is 1.59 g/mL?

5. Which has the greater mass, 1 liter of water or 1 liter of gasoline? The density of water is 1.00 g/mL and that of gasoline is approximately 0.68 g/mL.

6. A crumpet recipe calls for 175 grams of flour. According to Julia Child's data, the density of flour is 0.620 g/mL. How many mL of flour are needed for this recipe?

Name _____

Date _____

Period _____

7. From their density values, decide whether each of the following substances will sink or float when placed in sea water, which has a density of 1.025 g/mL.

Gasoline 0.66 g/mL _____ Asphalt 1.2 g/mL _____

Mercury 13.6 g/mL _____ Cork 0.26 g/mL _____

8. Mercury is a liquid metal having a density of 13.6 g/mL. What is the volume of 1.00 lb of mercury metal?

9. A sample of lead is found to have a mass of 32.6 g. A graduated cylinder contains 2.8 mL of water. After the lead sample is added to the cylinder the water level reads 5.7 mL. Calculate the density of the lead sample.

10. A piece of magnesium is in the shape of a cylinder with a height of 5.62 cm and a diameter of 1.34 cm. If the magnesium sample has a mass of 14.1 g, what is the density of the sample?

Name _____

Date _____

Period _____

More Density Problems

1) A student measures the mass of an 8 cm³ block of brown sugar to be 12.9 g. What is the density of the brown sugar?

2) A chef fills a 50 mL container with 43.5 g of cooking oil. What is the density of the oil?

3) Calculate the mass of a liquid with a density of 2.5 g/mL and a volume of 15 mL.

4) Calculate the volume of a liquid with a density of 5.45 g/mL and a mass of 65 g.

5) A machine shop worker records the mass of an aluminum cube as 176 g. If one side of the cube measures 4 cm, what is the density of the aluminum?

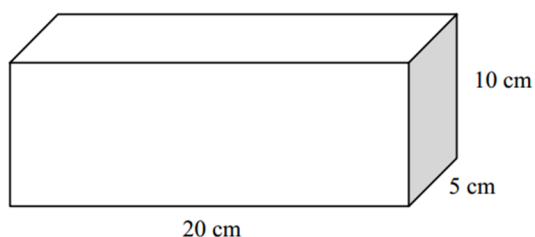
Name _____

Date _____

Period _____

6) A teacher performing a demonstration finds that a piece of cork displaces 23.5 mL of water. The piece of cork has a mass of 5.7 g. What is the density of the cork?

7) A carver begins work on the following block of granite that weighs 2700 g. What is the density of the granite?



8) A piece of PVC plumbing pipe displaces 60 mL when placed into a container of water. If the pipe has a mass of 78 g, what is the density of PVC?

9) A solid magnesium flare has a mass of 1300 g and a volume of 743 cm³. What is the density of the magnesium?

Name _____

Date _____

Period _____

10) A graduated cylinder has a mass of 50 g when empty. When 30 mL of water is added, the graduated cylinder has a mass of 120 g. If a rock is added to the graduated cylinder, the water level rises to 75 mL and the total mass is now 250 g. What is the density of the rock?

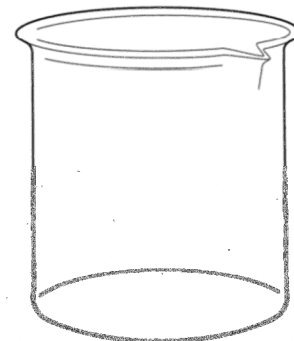
11) A student performs an experiment with three unknown fluids and obtains the following measurements:

Fluid A: $m = 2060 \text{ g}$, $V = 2000 \text{ mL}$

Fluid B: $m = 672 \text{ g}$, $V = 850 \text{ mL}$

Fluid C: $m = 990 \text{ g}$, $V = 1100 \text{ mL}$

Draw how the fluids would be layered if they were combined in a beaker.



12) Use your density skills to find the identity of the following mystery objects.

Table of Densities			
Solids	Density g/cm^3	Solids	Density g/cm^3
Marble	2.56	Copper	8.92
Quartz	2.64	Gold	19.32
Diamond	3.52	Platinum	21.4



While digging in the backyard, you find an old coin. Its mass is 26.76 g and its volume is 3 cm.



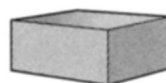
You think you have found a diamond. Its mass is 5.28 g and its volume is 2 cm^3 .

What is the coin made of? _____

What did you find? _____



You find a ring with a mass of 107 g. You fill a graduated cylinder up with 10 mL of water and put the ring into the cylinder. The water rises up to the 15 mL mark.



There is a block on your desk that acts as a paperweight. Its measurements are 3 cm by 4 cm by 6 cm. The block has a mass of 184.32 g.

What is the ring made of? _____

What is the block made of? _____

Name _____

Date _____

Period _____

A Sig Fig Word Problem:

A renowned chemistry student names Bubba timed how long it would take him to complete 4 chemistry problems of varying difficulty. The first problem was fairly difficult and took him 103.9 seconds. The second one was extremely easy and only too him 1.37 seconds. The third problem was a real brain buster and required him to call his good friend Ernest on the phone for help. When he finally got the help he needed for this difficult problem it took him 3999 seconds. The last problem he remembered copying into his notes took him only 14.278 seconds. Since all four numbers were recorded at different degrees of accuracy, Bubba now needs your help to add these numbers together and round to the proper number of sig figs. **Show all work** in the space provided.

Miscellaneous Problems:

1. What is the difference between mass and weight?

2. Calculate the density of a cube that is 5 cm by 2 cm and is 2 cm tall. The mass of the cube is 10 grams. **SHOW ALL WORK!!**

3. You are playing darts with your friends and you are “up” next. All three of your darts hit the double bull (the VERY center of the target), but you weren’t exactly aiming for the bulls eye. Would you say that you have high accuracy, high precision, or both? Explain your reasoning.

4. When reading any volume in the laboratory, we always read where the bottom of the water curve falls. This is called the _____

Name _____

Date _____

Period _____

Unit Conversions, Scientific Notation, Percent Error
Convert the following to scientific notation

1) 65,700 = _____

9) 0.0000654 = _____

2) 0.008 = _____

10) 19.8 = _____

3) 42 = _____

11) 0.0094 = _____

4) 0.7 = _____

12) 327 = _____

5) 32100 = _____

13) 0.228 = _____

6) 1066 = _____

14) 314 = _____

7) 0.722 = _____

15) 0.0224 = _____

8) 87992 = _____

16) 1239 = _____

Convert the following from scientific notation to standard form

17) $2.34 \times 10^3 =$ _____

20) $8.1 \times 10^2 =$ _____

18) $3.2 \times 10^{-2} =$ _____

21) $7.6 \times 10^5 =$ _____

19) $6.43 \times 10^6 =$ _____

22) $1.8 \times 10^{-4} =$ _____

Make the following metric conversions. Where necessary, put your answer in scientific notation.

23) 4.3 liters = _____ milliliters

26) 277 kilograms = _____ grams

24) 678 milliliters = _____ liters

27) 11.7 grams = _____ kilograms

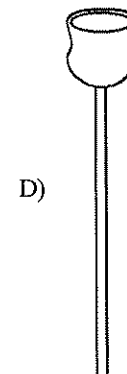
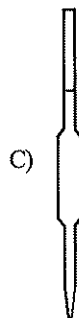
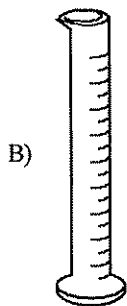
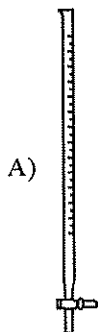
25) 9.0 kilograms = _____ grams

Complete the following percent error calculations (show work to space at right). Express your answer in the appropriate number of significant figures.

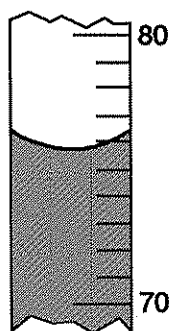
28) Measured Value: 50 Accepted Value: 45

29) Measured Value: 8.56 Accepted Value: 9.81

- 12) What is the number 215.0 expressed in proper scientific notation with the correct number of significant digits?
 A) 2.15×10^{-2} B) 2.150×10^2 C) 2.150×10^{-2} D) 2.15×10^2
- 13) In an experiment, the gram atomic mass of magnesium was determined to be 24.7. Compared to the accepted value 24.3, what is the percent error for this determination?
 A) 98.4 B) 24.7 C) 0.400 D) 1.65
- 14) Which diagram represents a graduated cylinder?

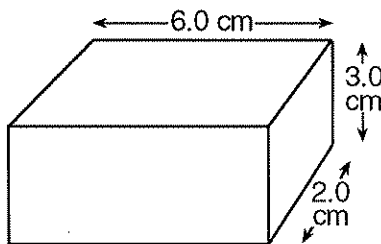


- 15) The diagram below shows a section of a 100-milliliter graduated cylinder.



When the meniscus is read to the correct number of significant figures, the volume of water in the cylinder would be recorded as

- A) 75.7 mL B) 84.30 mL C) 84.3 mL D) 75.70 mL
- 16) The solid object shown below has a mass of 162.2 grams.



What is the density of the object to the correct number of significant figures?

- A) 0.22 g/cm^3 B) 4.506 g/cm^3 C) 4.5 g/cm^3 D) 0.2219 g/cm^3
- 17) To determine the density of an irregularly shaped object, a student immersed the object in 21.2 milliliters of H_2O in a graduated cylinder, causing the level of the H_2O to rise to 27.8 milliliters. If the object had a mass of 22.4 grams, what was the density of the object?
 A) 3.4 g/mL B) 3.0 g/mL C) 27.8 g/mL D) 6.6 g/mL

- 18) A student collected the data shown below to determine experimentally the density of distilled water.

Mass of graduated cylinder + distilled H₂O sample..... 163 g

Mass of empty graduated cylinder..... 141 g

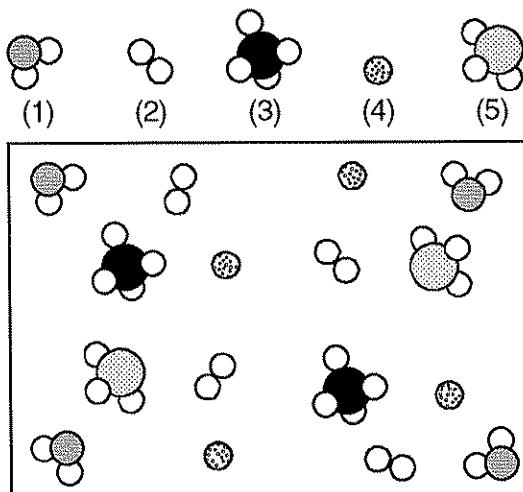
Mass of distilled H₂O sample..... G g

Volume of distilled H₂O sample..... 25.3 mL

Based on the experimental data collected, what is the density of the distilled water?

- A) 1.15 g/mL B) 0.87 g/mL C) 0.253 g/mL D) 1.0 g/mL
- 19) A student is filtering a mixture of sand and salt water into a beaker. What will be found in the beaker after the filtration is completed?
- A) salt, only B) sand and salt C) sand, only D) salt and water
- 20) What procedure represents the safest technique to use for diluting a concentrated acid?
- A) Add the water slowly to the acid with steady stirring. C) Add the acid slowly to the water with steady stirring.
B) Add the water to the acid quickly. D) Add the acid to the water quickly.
- 21) A student determines the mass of a sample of copper to be 32.16 grams and the volume to be 3.50 mL.
- (a) Calculate the density of the sample of copper. [*Write the correct formula. Show all work. Round answer to the correct decimal place and include an appropriate unit.*]
- (b) The accepted value for the density of copper is 8.96 g/mL. Calculate the percent error in the student's determination. [*Write the correct formula. Show all work.*]
- 22) An example of a mixture is
- A) pure water B) gold C) salt water D) silver
- 23) When sugar is dissolved in water, the resulting solution is classified as a
- A) heterogeneous mixture C) homogeneous mixture
B) heterogeneous compound D) homogeneous compound
- 24) When sample *X* is passed through a filter paper, a white residue, *Y*, remains on the paper and a clear liquid, *Z*, passes through. When liquid *Z* is vaporized, another white residue remains. Sample *X* is *best* classified as
- A) an element C) a homogeneous mixture
B) a heterogeneous mixture D) a compound
- 25) Which of the following is a chemical property of water?
- A) it decomposes into H₂ and O₂ C) it freezes
B) it evaporates D) it boils
- 26) Which of the following is an extensive physical property?
- A) mass B) ductility C) density D) color
- 27) Which would be considered a chemical change?
- A) rusting of iron B) bending of iron C) melting of iron D) magnetizing of iron
- 28) An example of a substance that can be decomposed by a chemical change is
- A) silver B) water C) iron D) helium
- 29) Which of the following is an example of a physical change in matter?
- A) fizzing produced when magnesium metal is added to acid
B) melting of sodium metal
C) sodium metal exploding in water
D) magnesium metal burning with a bright white flame

- 30) The diagram below represents a gaseous mixture of the substances labeled 1 through 5.



- (a) Which of the five substances are compounds? *[Explain why.]*
- (b) Which of the five substances are elements? *[Explain why.]*
- (c) Does the diagram represent a homogeneous or a heterogeneous mixture? *[Give one reason to justify your answer.]*

31) Convert 750 mL to Liters _____

32) Convert 3.7 grams to picograms _____

- 33) Darla measures the density of water in three different trials. The following are Darla's findings:

Trial Number	Calculated Density of Water
1	1.0 g/mL
2	1.1 g/mL
3	1.0 g/mL

The actual density of water is 1.0 g/mL. Given the information we can say that Darla's results are:

- a) precise only
- b) accurate only
- c) precise and accurate
- d) neither precise nor accurate

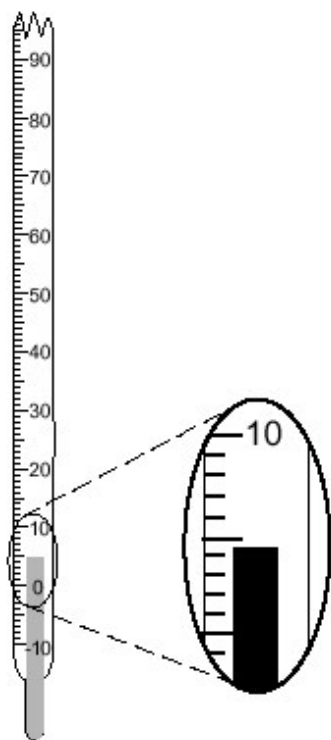
Name: _____

Teacher: Mr. Roderick

Unit 0 Practice Test

1. One similarity between all mixtures and compounds is that both
 - A. are heterogeneous
 - B. are homogeneous
 - C. combine in a definite ratio
 - D. consist of two or more substances
2. A mixture of sand and table salt can be separated by filtration because the substances in the mixture differ in
 - A. boiling point
 - B. density at STP
 - C. freezing point
 - D. solubility in water
3. Powdered sulfur is yellow, and powdered iron is gray. When powdered sulfur and powdered iron are mixed at 20°C, the powdered iron
 - A. becomes yellow
 - B. becomes a liquid
 - C. remains ionic
 - D. remains magnetic

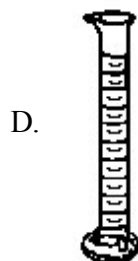
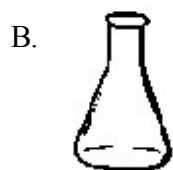
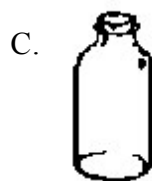
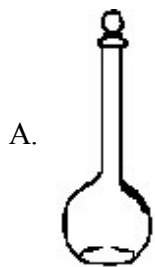
4. The diagram represents a Celsius thermometer recording a certain temperature.



What is the correct reading of the thermometer?

- A. 5°C
- B. 4.3°C
- C. 0.3°C
- D. 4°C

5. Which diagram represents an Erlenmeyer flask?



6. Which of these contains only one substance?

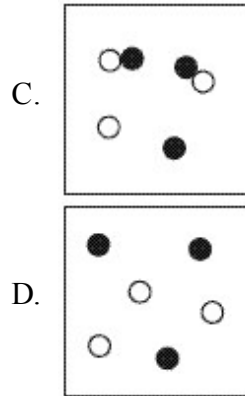
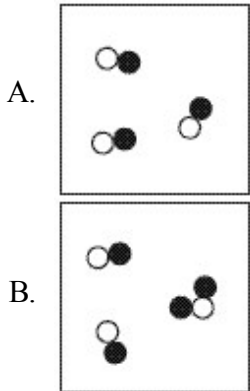
- A. distilled water
- B. sugar water
- C. saltwater
- D. rainwater

7. A mixture of crystals of salt and sugar is added to water and stirred until all solids have dissolved. Which statement best describes the resulting mixture?

- A. The mixture is homogeneous and can be separated by filtration.
- B. The mixture is homogeneous and cannot be separated by filtration.
- C. The mixture is heterogeneous and can be separated by filtration.
- D. The mixture is heterogeneous and cannot be separated by filtration.

8. Which particle diagram represents a mixture of element *X* and element *Z*, only?

Key	
●	= atom of <i>X</i>
○	= atom of <i>Z</i>



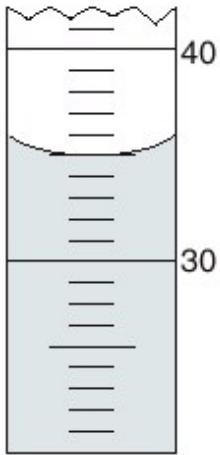
9. When sodium chloride is dissolved in water, the resulting solution is classified as a

- A. heterogeneous compound
- B. homogeneous compound
- C. heterogeneous mixture
- D. homogeneous mixture

10. A student is filtering a mixture of sand and salt water into a beaker. What will be found in the beaker after the filtration is completed?

- A. sand, only
- B. salt, only
- C. sand and salt
- D. salt and water

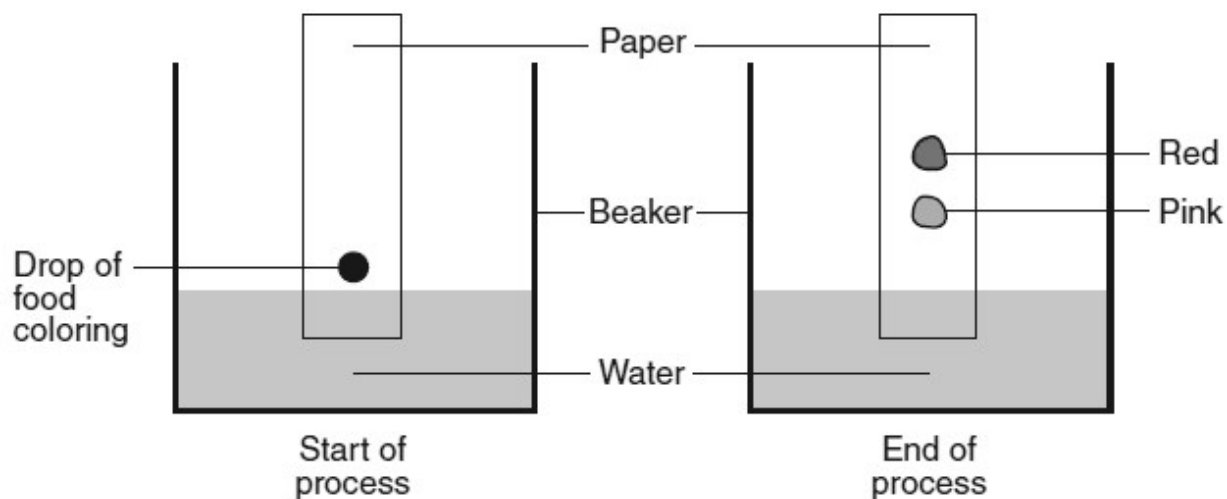
11. The diagram represents a portion of a 100-milliliter graduated cylinder.



What is the reading of the meniscus?

- A. 35.0 mL
 - B. 36.0 mL
 - C. 44.0 mL
 - D. 45.0 mL
12. A dilute, aqueous potassium nitrate solution is best classified as a
- A. homogeneous compound
 - B. homogeneous mixture
 - C. heterogeneous compound
 - D. heterogeneous mixture
13. When sugar is dissolved in water, the resulting solution is classified as a
- A. homogeneous mixture
 - B. heterogeneous mixture
 - C. homogeneous compound
 - D. heterogeneous compound
14. Salt water is classified as a
- A. compound because the proportion of its atoms is fixed
 - B. compound because the proportion of its atoms can vary
 - C. mixture because the proportion of its components is fixed
 - D. mixture because the proportion of its components can vary
15. Two substances in a mixture differ in density and particle size. These properties can be used to
- A. separate the substances
 - B. chemically combine the substances
 - C. determine the freezing point of the mixture
 - D. predict the electrical conductivity of the mixture
16. Which is a characteristic of all mixtures?
- A. They are homogeneous.
 - B. They are heterogeneous.
 - C. Their composition is a definite ratio.
 - D. Their composition can be varied.

17. Given the diagram representing a process being used to separate the colored dyes in food coloring:



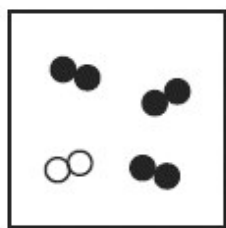
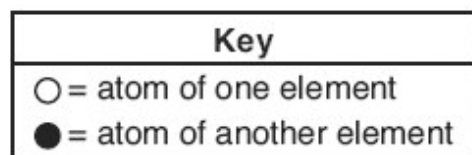
Which process is represented by this diagram?

- A. chromatography
- B. electrolysis
- C. distillation
- D. titration

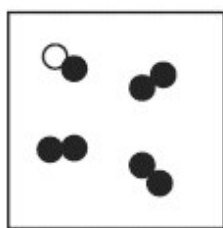
18. Equal amounts of ethanol and water are mixed at room temperature and at 101.3 kPa. Which process is used to separate ethanol from the mixture?

- A. distillation
- B. reduction
- C. filtration
- D. ionization

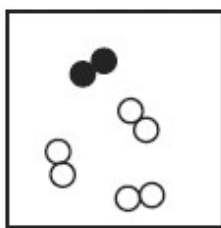
19. Which two particle diagrams represent mixtures of diatomic elements?



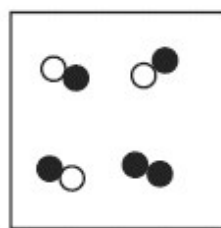
A



B



C



D

- A. A and B
- B. A and C
- C. B and C
- D. B and D

20. Powdered iron is magnetic, but powdered sulfur is *not*. What occurs when they form a mixture in a beaker at room temperature?

- A. The iron retains its magnetic properties.
- B. The iron loses its metallic properties.
- C. The sulfur gains magnetic properties.
- D. The sulfur gains metallic properties.