

When appropriate,
last significant figure
is underlined ex: 1.568

Recitation Worksheet One

Name:

Key

UGA ID:

Instructions:

- Please enter your first and last name as it appears on the eLC roster (do not use a nickname that is not reflected in eLC).
- Your UGA myID is a combination of letters and numbers (example: mine is jmj81738). Do *not* enter your 81x number.
- Download this worksheet and print it if you have a printer. Write the answers in the answer boxes and show your work when appropriate. Using the instructions in the Welcome module on eLC, convert your worksheet to a PDF and then upload it to Gradescope. If you have an iPhone or Android device, you can scan and upload directly through the Gradescope app. The pages must be in the correct order or Gradescope will not be able to read it.
- If you do not have a printer, download the worksheet and type your answers in the answer boxes and upload it to Gradescope. Write your work on separate sheets of paper, convert these pages to a PDF using the instructions in the Welcome module on eLC, then upload them to the dropbox on eLC for this worksheet.
- If you are using an app to annotate the worksheet, make sure the pages are in the correct order and have the same layout as the original or Gradescope will not be able to read it.
- Answers must be written in the corresponding answer box or no credit will be awarded.
- This worksheet is due no later than **11:59 PM on the Friday of the recitation week.**
- The instructions for uploading worksheets to Gradescope can be found in the Content area of eLC in the Welcome Module.
- **You must show your work to receive credit.**

1. Classify each statement as an observation, law, or theory.

Observation

n-butyl lithium combusts immediately in the air

law

A compound always contains the same proportion of elements by mass

theory

Each element is made up of tiny particles called atoms

2. Label the following statements as either qualitative or quantitative.

qualitative

Chemistry is more interesting than biology, math, or physics

qualitative

The density of copper is much higher than the density of magnesium
*no actual values given

quantitative

The melting point of nickel is 1455 °C

3. Consider three cubes of magnesium metal and their respective masses in the table below.

Cube A	2.5×10^{-2} megagrams
Cube B	2.5×10^{15} nanograms
Cube C	2.5×10^{14} micrograms

Which cube has the largest mass? You only need to record the corresponding letter in the box below.

Cube: C

$$2.5 \times 10^{-2} \text{ Mg} \times \frac{10^6 \text{ g}}{1 \text{ Mg}} = 2.5 \times 10^4 \text{ g}$$

$$2.5 \times 10^{15} \text{ ng} \times \frac{1 \text{ g}}{10^9 \text{ ng}} = 2.5 \times 10^6 \text{ g}$$

$$2.5 \times 10^{14} \text{ μg} \times \frac{1 \text{ g}}{10^6 \text{ μg}} = 2.5 \times 10^8 \text{ g}$$

4. A scientist finds a silver rod in the lab. They know silver has a density of 10.49 g/mL, and they realize they can find the density of the rod to confirm its identity. They determine the mass to be 68.19 grams and then carefully transfer the rod to a graduated cylinder with an initial volume of 20.00 mL. Upon transferring, what will the final volume be in the graduated cylinder (assuming the rod is 100% silver metal)?

26.50

mL

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

$$10.49 \frac{\text{g}}{\text{mL}} = \frac{68.19 \text{ g}}{V}$$

$$V = \frac{68.19 \text{ g}}{10.49 \frac{\text{g}}{\text{mL}}} = 6.5004766 \text{ mL}$$

$$\begin{array}{r} V_T = 20.00 \text{ mL} \\ + 6.5004766 \text{ mL} \\ \hline 26.50 \text{ mL} \end{array}$$

Strategy: need to solve for volume solid
since mass solid is given. We are given Volume total
so we must solve for volume liquid and use the
difference to get volume solid.

5. A student places a 31.49-gram object into an empty graduated cylinder. They then add enough methanol (a common organic solvent) to the graduated cylinder where the total volume of both components is 55.00 mL. If the mass of both the object and methanol is 61.42 grams, what is the density of the solid? The density of methanol is 0.791 g/mL.

1. Solve for mass liquid 4. solve for density solid

1.83 g/mL

$$m_{\text{liq}} = m_T - m_{\text{sol}}$$

$$= 61.42 \text{ g} - 31.49 \text{ g}$$

$$= 29.93 \text{ g}$$

$$d_{\text{sol}} = \frac{m_{\text{sol}}}{V_{\text{sol}}} = \frac{31.49 \text{ g}}{17.1618 \text{ mL}}$$

$$= 1.83 \frac{\text{g}}{\text{mL}}$$

2. solve for vol liq. using density

$$V_{\text{liq}} = \frac{m_{\text{liq}}}{d_{\text{liq}}} = \frac{29.93 \text{ g}}{0.791 \frac{\text{g}}{\text{mL}}}$$

$$= 37.83817952 \text{ mL}$$

3. solve for volume solid

$$V_{\text{sol}} = V_T - V_{\text{liq}}$$

$$= 55.00 - 37.83817952 \text{ mL}$$

$$= 17.16182047 \text{ mL}$$

6. Record the number of significant figures for each of the following values below. In each box, you only need to record the integer (e.g. for one sig fig, record "1").

- | | |
|-----|---------------------------------|
| 5 | 1.0500 x 10 ⁴ meters |
| 6 | 1210.00 kilograms |
| inf | 410000 recitation worksheets |
| 3 | 0.191 °C |
| 5 | 0.00070000 milliliters |

7. Complete the mathematical operations below and record the answers in the appropriate number of significant figures.

#S.F.'s

$$\begin{array}{cccc} 7 & 4 & 7 & 3 \\ (75.00000 \times 0.9732) + (29.30291 \times 0.0538) = & \boxed{74.57} \end{array}$$

$$72.99 + 1.576496558 = 74.56649656$$

#S.F.'s

$$\begin{array}{ccc} 5 & 4 & 1 \\ 41.870 + 23.12 & - & 0.7 = \boxed{0.6} \\ 3 & 5.00 \times 10^1 & \end{array}$$

$$\frac{64.99}{5.00 \times 10^1} - 0.7 = 1.2998 - 0.7 = 0.5998 \approx 0.6$$

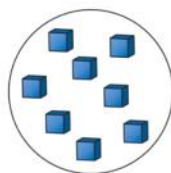
8. Using the images below, label each as either a homogeneous mixture, heterogeneous mixture, or pure substance.

a. pure substance

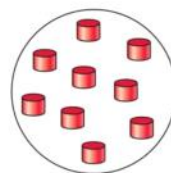
b. pure substance

c. homogeneous mixture

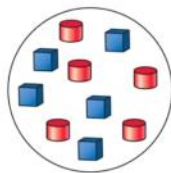
d. heterogeneous mixture



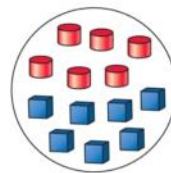
a.



b.



c.



d.

9. Using the Law of Multiple Proportions, complete the table to determine the masses of element "X" that will combine with element "M" to form hypothetical "MX" compounds.

Compounds	Mass of M (g)	Mass of X (g)
MX	1.00	1.55
MX ₂	1.00	3.10
MX ₆	1.00	9.30

$$2X = 3.10 \text{ g}$$

$$X = 1.55 \text{ g}$$

$$6X = 6(1.55 \text{ g})$$

$$6X = 9.30 \text{ g}$$

10. Fill out the missing blanks in the table below for three different hypothetical elements.

Element number	Mass number	Number of protons	Number of neutrons	Number of electrons
1	51	25	26	25
2	50	25	25	25
3	52	26	26	26

* Mass# = #p⁺ + #n⁰
 ** #e⁻ = #p⁺ for neutral atoms

11. From the table in question 10, which element number was **not** an isotope of the other two elements? You only need to record the integer in the box below (e.g. for element number 1, record "1").

different number of protons

Element number:

3

12. A worried parent goes to the pharmacy and asks for the best medicine for their 10-year old with a high fever. The druggist recommends 2.5 teaspoons of Children's Tylenol by mouth every 4 hours. If 1 teaspoon is equal to 5 mL, how many milligrams of acetaminophen will the child consume in 24 hours?



Report your final answer in 2 significant figures.

2400 mg

$$\frac{160 \text{ mg}}{5 \text{ mL}} \times \frac{5 \text{ mL}}{1} \times \frac{2.5}{4} \times 24 = 2400 \text{ mg}$$

13. Record the number of electrons for each of the ions written below. In each box, you only need to record the integer (e.g. for one electron, record "1").

K⁺ 18 electrons $19 - 1 = 18$

Fe²⁺ 24 electrons $26 - 2 = 24$

Cl⁻ 18 electrons $17 + 1 = 18$

O²⁻ 10 electrons $8 + 2 = 10$

take atomic number and
- add one electron for every negative charge
- subtract one electron for every positive charge

14. Classify the following as a chemical or physical change.

physical sucrose (sugar) dissolving in water

chemical lighting a match

chemical grilling a hamburger

physical shredding lettuce

15. Identify each of the following as an element, compound, or mixture.

element

aluminum foil

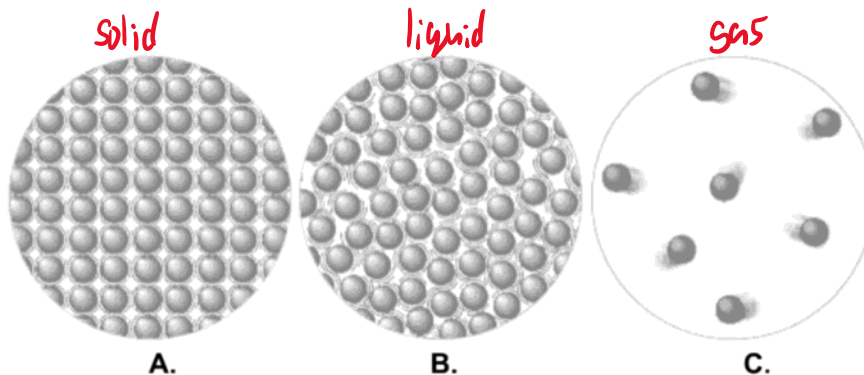
mixture

soda (carbonated beverage)

Compound

sucrose (sugar)

16. Which of the following options best represents image B?



C

- A. Solid because the particles are closer together.
- B. Gas because the particles are disordered.
- ☒ C. Liquid because the particles are close together but disordered.
- D. Solid because the particles are disordered
- E. Gas because the particles are close together but disordered.

17. Which of the following is an extensive property? Choose all that apply, and answer with capital letters with no spaces in between (e.g. ABCDE).

BC

- A. Density
- B. Mass
- C. Volume
- D. Melting point

18. A sample of a certain compound contains 10.00 g of carbon and 13.32 g of oxygen. A different sample of the same compound that contains 25.00 g of carbon will contain how many grams of oxygen?

33.30 g

$$\frac{10.00 \text{ g C}}{13.32 \text{ g O}} = \frac{25.00 \text{ g C}}{x \text{ g O}}$$

$$x = 33.30 \text{ g}$$

19. Which of the following subatomic particles is the lightest (lowest mass)?

C

- A. Proton
- B. Neutron
- C. Electron
- D. More than one of the above

20. When a metal forms a cation, it...

B

- A. gains one or more electrons
 - B. loses one or more electrons
 - C. gains one or more protons
 - D. loses one or more protons
 - E. gains one or more neutrons
 - F. loses one or more neutrons
- > changes charge
> changes element
> changes isotope

21. Consider three students below in the table who each took multiple measurements collecting the mass of a 20.00 gram block of copper metal. Answer the questions below by writing the corresponding letter of each student in the boxes provided.

	Student A	Student B	Student C
Trial 1	20.02 g	20.79 g	19.77 g
Trial 2	19.99 g	19.55 g	19.79 g
Trial 3	20.03 g	19.93 g	19.76 g
Trial 4	20.01 g	20.44 g	19.78 g

Which student was inaccurate and imprecise?

B

Which student was inaccurate and precise?

C

Which student was accurate and precise?

A

22. Fill out the table below with the names of elements from their chemical symbols.

Symbol	Element Name
S	Sulfur
Se	Selenium
Sr	Strontium
Mn	Manganese
Mg	Magnesium
Co	Cobalt
Ag	Silver
Br	Bromine
Ba	Barium

23. Which one of these statements about temperature scales is false?

B

- A. The boiling point of water on the Fahrenheit scale is 212 degrees.
- B. One degree Celsius represents a smaller temperature difference than one degree Fahrenheit
- C. The freezing point of water on the Celsius scale is 0 degrees.
- D. All temperatures on the Kelvin scale are positive numbers.

24. The formula of a salt is XCl_2 . The X ion in this salt has 28 electrons, and a chloride ion has a -1 charge. The metal X is:

Zn



$$\text{X}^{+2} = 28 \text{ e}^-$$

$$\text{X} = 28 + 2 = 30 \text{ e}^-$$

25. Which of the statements is **incorrect**?

C

- A. A molecule is the smallest part of a compound that can have a stable independent existence.
- B. Some elements occur as molecules in their elemental form.
- C. The atomic number of an element is defined as the number of neutrons in the nucleus.
- D. Molecules of compounds are composed of more than one kind of atom.
- E. The charge on an electron is negative and the charge on a proton is positive.

26. Which of the statements is not an idea from Dalton's Atomic Theory?

C

- A. An element is composed of extremely small indivisible particles called atoms.
- B. All atoms of a given element have identical properties which differ from those of all other elements.
- C. Atoms can be transformed into atoms of another element.
- D. Compounds are formed when atoms of different elements combine with each other in small whole-number ratios.
- E. The relative numbers and kind of atoms are consistent in a given compound.

27. The subatomic particle that contributes to the charge of an atom but not the mass is called a(n)...

B

- A. Proton
- B. Electron
- C. Neutron
- D. Quark

28. Which of the following species DOES NOT represent an element in its most stable form? Select all that apply, and enter your answer as a series of capital letters (e.g. ABCDE).

BCD

- A. N₂
- B. Cl → Cl₂
- C. C₈ → C
- D. S₂
- E. He → S₈

29. How many protons (p) and neutrons (n) are in an atom of calcium-46?

⁴⁶₂₀Ca

A

- A. 20 p, 26 n
- B. 20 p, 46 n
- C. 26 p, 20 n
- D. 46 p, 60 n

$$p + n = 46$$

$$20 + n = 46$$

$$n = 26$$

30. In an alternate universe, the charge to mass ratio of an electron was determined from Rutherford's cathode-ray tube experiment to be 0.759×10^8 C/g, and the charge on a single electron was determined from the Millikan oil drop experiment to be 2.602×10^{-19} C, so the mass of a single electron is _____ kg.

3.43E-30

kg

$$2.602 \times 10^{-19} \text{ C} \times \frac{1 \text{ g}}{0.759 \times 10^8 \text{ C/g}} \times \frac{1 \text{ kg}}{10^3 \text{ g}} = 3.43 \times 10^{-30} \text{ kg}$$

U

Ba

Zr

K

Ce

Br

halogen

B

-