Advanced Chemistry Summer Assignment
Welcome to Advanced Chemistry with Mrs. Lammers!
Email: elammers@shermanisd.net
DUE: August 18, 2021 (First day of school)

NAME: _____

Late Grade: -15 points per day for being late. After 3 days you will receive a zero. This counts as a mastery grade. It is due on this day for both A and B day classes. This should be handed in on paper. Copies are available in my room (A311) from 5/21/21- 5/28/21. Make sure to sign your name after picking up a copy.

This packet includes some basic concepts that students should know prior to entering advanced chemistry. This material should have been studied in prior math and science classes.

Attached are some worksheets with some notes to refresh your memory and some practice problems that should be completed prior to the first day of school. **WRITE LEGIBLY**. If you need additional help there are numerous youtube videos and websites that can help (Tyler Dewitt on Youtube is excellent!). You may email me at elammers@shermanisd.net if you have any questions.

You should be able to do the following:
- Write numbers in correct scientific notation
- Calculate large and small numbers using scientific notation
- Know how to solve for a variable in scientific or mathematical equation.
- Know what a conversion factor is and be able to use it in dimensional analysis.
- Know the metric prefixes and use them as conversion factors
- Know the names and uses for common lab equipment
- Know basic information about atoms and the periodic table.
- BE PREPARED FOR A QUIZ on any of the above topics during the first week of school
- You must show your work on the problems to receive credit for them.

Memorize the following prefixes that have an asterisk*

Metric Prefixes

Prefix	Prefix symbol	meaning	equivalent
Mega	M	million	$1 \text{ Mg} = 10^6 \text{ g}$
Kilo*	k	thousand	$1 \text{ kg} = 10^3 \text{ g}$
Hecto	h	hundred	$1 \text{hg} = 10^2 \text{ g}$
Deca	da	ten	$1 \text{ dag} = 10^1 \text{ g}$
Deci	d	one tenth	$1 \text{ g} = 10^1 \text{ dg}$
Centi*	c	one hundredth	$1 \text{ g} = 10^2 \text{ cg}$
Milli*	m	one thousandth	$1 \text{ g} = 10^3 \text{ mg}$
Micro*	μ	one millionth	$1 \text{ g} = 10^6 \text{ μg}$
Nano	n	one billionth	$1 \text{g} = 10^9 \text{ ng}$
Pico	p	one trillionth	$1 \text{ g} = 10^{12} \text{ pg}$

Conversion Factor: A ratio of two measurements that are equal to one another. (top value = bottom value) ** The total conversion factor = 1 (unit)

Ex. $1.00 = 100 cents $\dfrac{\$1.00}{100 \ cents} = \dfrac{100 \ cents}{\$1.00}$ Ex. 4 quarters = 100 cents $\dfrac{4 \ quarters}{100 \ cents} = \dfrac{100 \ cents}{4 \ quarters}$

I. When a measurement is multiplied by a conversion factor, the value of the measurement remains the same because the unit compensates for any switch.

Ex. Convert $3.00 to cents. $\dfrac{\$3.00}{-} \left(\dfrac{100 \ cents}{\$1.00} \right)$ = 300 cents

(multiply across top, divide by bottom)

Note: There is a dollar sign on the top and bottom of the fractions, these "units" cancel out leaving only cents, the desired unit for the final answer!

II. The process of using conversion factors to solve problems is called **Dimensional Analysis**. This process will be used all year as we learn more conversion factors!

Solve using your knowledge of the prefixes and use conversion factors. **Show all work!**

Practice I:
    A. Utilizing the metric prefixes provided, make the following conversions:
        1) 57 cm to meters

        2) 4.32×10^{-3} kg to grams

        3) 0.0527 cal to kcal

        4) 7.60 g to micrograms

        5) 3.41 kJ to Joules

        6) 8.52 m to dm

        7) 2.0×10^{4} mm to km

B. Which of the following units in each of the following pairs represents the larger quantity? (circle)
        8) Mm   or   cm
        9) Ps   or   μm
        10) Kg   or   cg
        11) dL   or   mL

Scientific Notation (standard exponential form)
Definition: A number written as the product of two numbers: a coefficient and a power of ten. Used to write very large or very small numbers, a shorthand.

Ex. $12,000,000 = 1.2 \times 10^{7}$ Ex. $0.0072 = 7.2 \times 10^{-3}$

    (a) The coefficient should be a number between 1 and 9.99
    (b) The superscript is the power of 10 or the exponent
    (c) The exponent indicates how many times the coefficient must be multiplied by 10 to equal the number (Ex) $2.3 \times 10 \times 10 \times 10 = 2,300 \rightarrow 2.3 \times 10^{3}$
    (d) For numbers 1 or larger, count the number of places the decimal has been moved to the left. If there is no decimal assume it is after the number farthest to the right.
           (Ex) $120,000. = 1.2 \times 10^{5}$
    (e) Numbers less than one have a negative exponent. The number 0.00072 is written as 7.2×10^{-4} .

The negative exponent indicates that the exponent must be divided by 10 four times equal to 0.00072.

To **multiply** numbers written in exponential form, multiply the coefficients and add the exponents.

$$\text{(Ex)} \quad (3.0 \times 10^4)(2.0 \times 10^2)$$
$$= (3 \times 2) \times 10^{4+2}$$
$$= 6.0 \times 10^6$$

To **divide** numbers, divide the coefficients and subtract the exponent in the denominator from the exponent in the numerator.

$$\text{(Ex)} \quad \frac{3.0 \, x10^5}{6.0 \, x10^2} \;\rightarrow\; \frac{3.0}{6.0} \times 10^{5-2} \;\rightarrow\; 0.50 \times 10^3 \;\rightarrow\; 5.0 \times 10^2$$

Note: In order to have a number between 1 and 9.99 as the coefficient the decimal in 0.50 was moved to the right one, which brought the coefficient down to 2 because if the coefficient becomes larger, then the exponent gets smaller in order for both scientific notations to represent the same number. If you enter both of those scientific notations into your calculator you will get the same number- 500!

To add and subtract numbers in scientific notation, the exponents must be the same.

$$\text{(Ex)} \; (3.42 \times 10^{-5}) - (2.5 \times 10^{-6}) = (3.42 \times 10^{-5}) - (0.25 \times 10^{-5})$$
$$= (3.42 - 0.25) \times 10^{-5}$$
$$= 3.17 \times 10^{-5}$$

Note: In order to make the coefficients the same the decimal in 2.5 was moved to the left by one, which brought the coefficient up to -5 because if the coefficient becomes smaller, the exponent gets bigger in order for both scientific notations to represent the same number!

Practice II:
Express the following numbers in correct scientific notation.

12) 52.3

13) 0.000348

14) 0.007

15) 0.029

16) 180

17) 40,230,000

18) 345.0

19) 765,000

Expand the following scientific notations

20) **3.4x10⁵ = 340,000**

21) 5.67×10^3

22) 4.1×10^5

23) 6.2×10^{-3}

24) 9.83×10^{-5}

Solve the following and place answers in correct scientific notation

25) $(6.0 \times 10^{-3}) \times (1.5 \times 10^1)$

26) $(8.8 \times 10^2) \times (1.5 \times 10^4)$

27) $\dfrac{5.2x10^2}{1.3x10^{-7}}$

28) $\dfrac{1.36x10^{12}}{8.00x10^{15}}$

29) $(6.6 \times 10^{-8}) - (4.0 \times 10^{-9})$

30) $(3.75 \times 10^5) + (6.53 \times 10^3)$

Solving for a variable

In math, you were given an equation with multiple variables in it and asked to solve for one of them. The most common variable being "x". In order to do this, you have to understand the operations: addition, subtraction , multiplication and division.

      (a) Understand that whatever you do to one side of the equation, you MUST do the same thing to the other side.

      (b) Understand that addition and subtraction undo each other. If you want to get rid of a variable from one side that is being subtracted, then you must add it to both sides to remove it.

      (c) Understand that multiplication and division undo each other. If you want to get rid of a variable from one side that is being multiplied, then you must divide it on both sides to remove it.

      (d) Understand that sometimes multiplying by the reciprocal is a handy tool in removing parts of an equation that involves fractions.

(e) Understand that if you have the same variable on top and bottom of a fraction, they cancel each other out.

(Ex) Solve for x.

$$y=mx+b \qquad \rightarrow \qquad \underline{y-b} =\underline{mx} \qquad \rightarrow \qquad \underline{y-b} = x$$
$${-b} \quad {-b} \qquad\qquad\qquad m \quad m \qquad\qquad\qquad m$$

Subtract b from both sides   divide by m on both sides, m cancels on the right.

Practice III:

Solve for x in all of the following problems.

31) 12ax = b - y

32) $\dfrac{a}{b} = \dfrac{x}{8}$

33) $\dfrac{5}{8}$ x = ab

34) $\dfrac{4a}{x} = 12c$

35) a + b = c (x - y)

36) $\dfrac{2(700)}{300} = \dfrac{4(x)}{250}$

Basic Rounding

._ tenths place   .__ hundredths place   .___ thousandths place

Remember: 5↑ round it up 4↓ leave it alone. You will be looking at the number behind the place you are rounding to.

Ex) Round to the tenths place: 4.06   We are targeting the 0. Look at the 6. Since it is 5 or higher, we will round the 0 up to the next number, which is 1. If it was 4 or lower, we would leave it as 0. The answer would be 4.1

Round the following to the appropriate places:

37) 4.5687 round to the tenths place

38) 797.0078 round to the hundredths place

39) 5.111247 round to the tenths place

40) 8.090102 round to the hundredths place
Lab Equipment
Watch the following video over lab equipment. Answer the questions as you go.
https://www.youtube.com/watch?v=_A3JxpMU63s

41) What two pieces of equipment can be used to hold liquids and get an estimate of the volume, but not accurate measurement?

42) Name at least 2 pieces of equipment that could be used to get an accurate measurement of a liquid's volume.

43) What is the purpose of a watch glass?

44) Why are there two different varieties of tongs?

45) What is the difference between a test tube rack and a test tube holder?
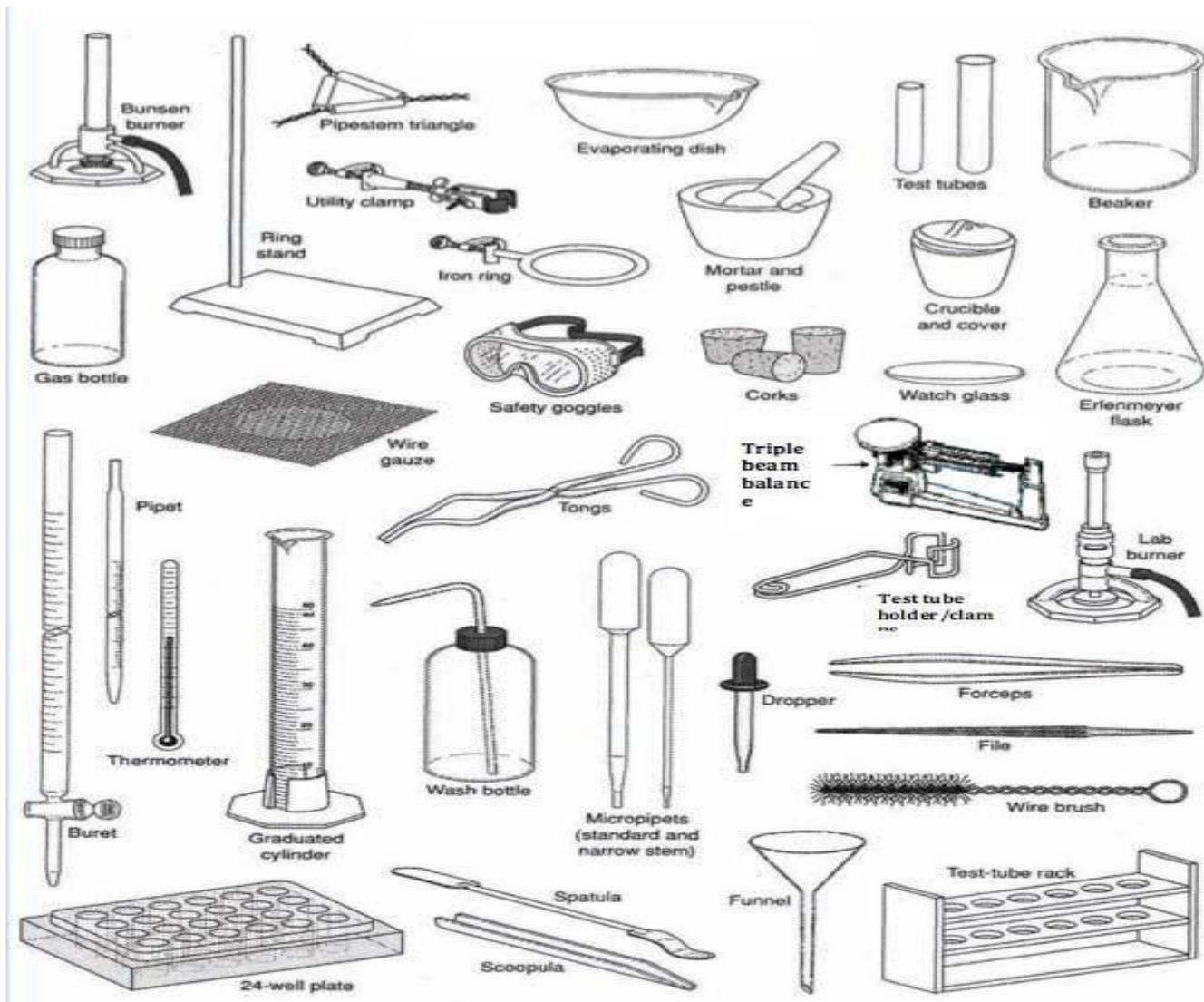
Follow the link to watch the following video about the structure of the atom.
https://www.youtube.com/watch?v=pNroKeV2fgk

46) What is the charge of a proton?

47) Where are electrons located within the atom?

48) What is the charge of a neutron?

49) What particles make up the nucleus of the atom?

50) How do electrons compare to protons/neutrons in terms of mass and/or size?

51) The atomic number of an element is equal to the number of _____ in an atom.

Periodic Table
You will need a periodic table to answer the following.
One can be found at https://ptable.com/#Properties

52) Which element contains 17 protons?

53) Which element contains 36 electrons?

54) How many protons does a Helium atom have?

55) How many electrons does a Sodium atom have?

56) How many groups (vertical columns) are on the periodic table?

57) Where are metals located on the periodic table?

58) Where are the majority of the non-metals located on the periodic table?

59) How many metalloids are listed on the periodic table?

60) Name 3 elements that are included in the Halogen group.

61) All elements in Group 18 have 8 valence electrons. What is the name of group 18?

62) What are the names of the areas of the periodic table that are separated at the bottom?

63) Name 3 elements that are alkali metals.

64) How many periods (horizontal rows) are on the periodic table?

65) Color the periodic table on the following page according to the key provided.

        Group 1 : Alkali Metals   BLUE

        Group 2: Alkaline Earth Metals   ORANGE

        Groups 3-12: Transition Metals   RED

        Post Transition Metals   YELLOW

        Group 17: Halogens   DK. GREEN

        Group 18: Noble Gases   PINK

        Lanthanides/oids   PURPLE

        Actinides/oids   LT. GREEN

        Put CIRCLES inside the boxes of all NON-METALS.

Put TRIANGLES inside the boxes of all METALLOIDS.

PERIODIC TABLE OF THE ELEMENTS

Atomic number — 14
Symbol — **Si**
Atomic mass — 28.086
Silicon — Name

Mass numbers in parentheses are those of the most stable or most common isotope.

1 1A																	18 8A
1 **H** 1.008 Hydrogen	2 2A											13 3A	14 4A	15 5A	16 6A	17 7A	**2** **He** 4.003 Helium
3 **Li** 6.941 Lithium	**4** **Be** 9.012 Beryllium											**5** **B** 10.812 Boron	**6** **C** 12.011 Carbon	**7** **N** 14.007 Nitrogen	**8** **O** 15.999 Oxygen	**9** **F** 18.998 Fluorine	**10** **Ne** 20.180 Neon
11 **Na** 22.990 Sodium	**12** **Mg** 24.305 Magnesium	3 3B	4 4B	5 5B	6 6B	7 7B	8	9 8B	10	11 1B	12 2B	**13** **Al** 26.982 Aluminum	**14** **Si** 28.086 Silicon	**15** **P** 30.974 Phosphorus	**16** **S** 32.066 Sulfur	**17** **Cl** 35.453 Chlorine	**18** **Ar** 39.948 Argon
19 **K** 39.098 Potassium	**20** **Ca** 40.078 Calcium	**21** **Sc** 44.956 Scandium	**22** **Ti** 47.867 Titanium	**23** **V** 50.942 Vanadium	**24** **Cr** 51.996 Chromium	**25** **Mn** 54.938 Manganese	**26** **Fe** 55.845 Iron	**27** **Co** 58.933 Cobalt	**28** **Ni** 58.693 Nickel	**29** **Cu** 63.546 Copper	**30** **Zn** 65.38 Zinc	**31** **Ga** 69.723 Gallium	**32** **Ge** 72.64 Germanium	**33** **As** 74.922 Arsenic	**34** **Se** 78.96 Selenium	**35** **Br** 79.904 Bromine	**36** **Kr** 83.798 Krypton
37 **Rb** 85.468 Rubidium	**38** **Sr** 87.62 Strontium	**39** **Y** 88.906 Yttrium	**40** **Zr** 91.224 Zirconium	**41** **Nb** 92.906 Niobium	**42** **Mo** 95.96 Molybdenum	**43** **Tc** (98) Technetium	**44** **Ru** 101.07 Ruthenium	**45** **Rh** 102.906 Rhodium	**46** **Pd** 106.42 Palladium	**47** **Ag** 107.868 Silver	**48** **Cd** 112.412 Cadmium	**49** **In** 114.818 Indium	**50** **Sn** 118.711 Tin	**51** **Sb** 121.760 Antimony	**52** **Te** 127.60 Tellurium	**53** **I** 126.904 Iodine	**54** **Xe** 131.294 Xenon
55 **Cs** 132.905 Cesium	**56** **Ba** 137.328 Barium	**71** **Lu** 174.967 Lutetium	**72** **Hf** 178.49 Hafnium	**73** **Ta** 180.948 Tantalum	**74** **W** 183.84 Tungsten	**75** **Re** 186.207 Rhenium	**76** **Os** 190.23 Osmium	**77** **Ir** 192.217 Iridium	**78** **Pt** 195.085 Platinum	**79** **Au** 196.967 Gold	**80** **Hg** 200.59 Mercury	**81** **Tl** 204.383 Thallium	**82** **Pb** 207.2 Lead	**83** **Bi** 208.980 Bismuth	**84** **Po** (209) Polonium	**85** **At** (210) Astatine	**86** **Rn** (222) Radon
87 **Fr** (223) Francium	**88** **Ra** (226) Radium	**103** **Lr** (262) Lawrencium	**104** **Rf** (267) Rutherfordium	**105** **Db** (268) Dubnium	**106** **Sg** (271) Seaborgium	**107** **Bh** (272) Bohrium	**108** **Hs** (270) Hassium	**109** **Mt** (276) Meitnerium	**110** **Ds** (281) Darmstadtium	**111** **Rg** (280) Roentgenium							

Lanthanide Series

57 **La** 138.905 Lanthanum	**58** **Ce** 140.116 Cerium	**59** **Pr** 140.908 Praseodymium	**60** **Nd** 144.242 Neodymium	**61** **Pm** (145) Promethium	**62** **Sm** 150.36 Samarium	**63** **Eu** 151.964 Europium	**64** **Gd** 157.25 Gadolinium	**65** **Tb** 158.925 Terbium	**66** **Dy** 162.500 Dysprosium	**67** **Ho** 164.930 Holmium	**68** **Er** 167.259 Erbium	**69** **Tm** 168.934 Thulium	**70** **Yb** 173.055 Ytterbium

Actinide Series

89 **Ac** (227) Actinium	**90** **Th** 232.038 Thorium	**91** **Pa** 231.036 Protactinium	**92** **U** 238.029 Uranium	**93** **Np** (237) Neptunium	**94** **Pu** (244) Plutonium	**95** **Am** (243) Americium	**96** **Cm** (247) Curium	**97** **Bk** (247) Berkelium	**98** **Cf** (251) Californium	**99** **Es** (252) Einsteinium	**100** **Fm** (257) Fermium	**101** **Md** (258) Mendelevium	**102** **No** (259) Nobelium