

UNIT 1: CHEMISTRY-TOOLS FOR STUDY

Systeme Internationale (SI) Units of Measurement

1.				
_____	pico	=	_____	base unit
_____	kilo	=	_____	base unit
_____	nano	=	_____	base unit
_____	deci	=	_____	base unit
_____	centi	=	_____	base unit
_____	micro	=	_____	base unit
_____	giga	=	_____	base unit
_____	mega	=	_____	base unit
_____	milli	=	_____	base unit

Scientific Notation

2. Convert the following to proper scientific notation:

- | | |
|-----------------|------------------|
| a) 0.0102 _____ | d) 30500 _____ |
| b) 99010 _____ | e) 8200000 _____ |
| c) 0.0032 _____ | f) 0.677 _____ |

3. Convert the following to standard notation:

- | | |
|--------------------------------|--------------------------------|
| a) 3.4×10^6 _____ | d) 9.64×10^1 _____ |
| b) 6.8×10^{-1} _____ | e) 2.9×10^3 _____ |
| c) 8.53×10^{-5} _____ | f) 4.43×10^{-5} _____ |

4. Convert the following to proper scientific notation:

- | | |
|--------------------------------|-------------------------------|
| a) 235.2×10^1 _____ | d) 0.0889×10^5 _____ |
| b) 0.222×10^3 _____ | e) 676×10^7 _____ |
| c) 40.1×10^{-2} _____ | f) 0.01×10^0 _____ |

US-Metric Equivalents

Length	1 inch	=	2.54 cm		
	1 foot	=	12 inch		
	1 meter	=	39.37 inch	=	3.281 feet
	1 yard	=	3 feet	=	0.9144 meter
	1 mile	=	1.609 km	=	5280 feet
	1 light year	=	9.461×10^{15} meter		
Volume	1 m ³	=	10 ⁶ cm ³	=	35.34 ft ³
				=	6.102×10^4 in ³
	1 Liter (L)	=	1000 cm ³	=	1.0576 quart
				=	0.0353 ft ³
	1 gal	=	3.786 Liter	=	4 quart
	1 quart	=	2 pint	=	4 cups
	1 cup	=	8 fluid ounce		
Mass	1 ton	=	2000 pounds		
	1 metric ton	=	1000 kg		
	1 pound	=	0.4536 kg	=	16 ounce
	1 slug	=	14.59 kg		
Pressure	1 atm	=	760 mm Hg	=	101.4 kPa
				=	14.7 lb/in ²
Energy	1 Joule	=	0.738 ft·lb	=	10 ⁷ erg
	1 calorie	=	4.186 Joule		
	1 Btu	=	252 calorie	=	1.054×10^3 Joule
Quantity	1 mole	=	6.02×10^{23}	=	22.4 L
	Particles			(at STP)	= gram molar mass
	(atoms, molecules, ions, or formula units)				(determined from the periodic table)

Dimensional Analysis

5. Use the dimensional analysis/factor-label method and the relationships on the previous page to make the following conversions.

a) 0.25 pounds = ounces

b) 12.1 slugs = kilograms

c) 0.039 meters = decimeters

d) 0.69 quarts = fluid ounce

e) How many miles/hour is equal to 1 centimeter/second?

$1 \frac{\text{cm}}{\text{second}}$ = $\frac{\text{miles}}{\text{hour}}$

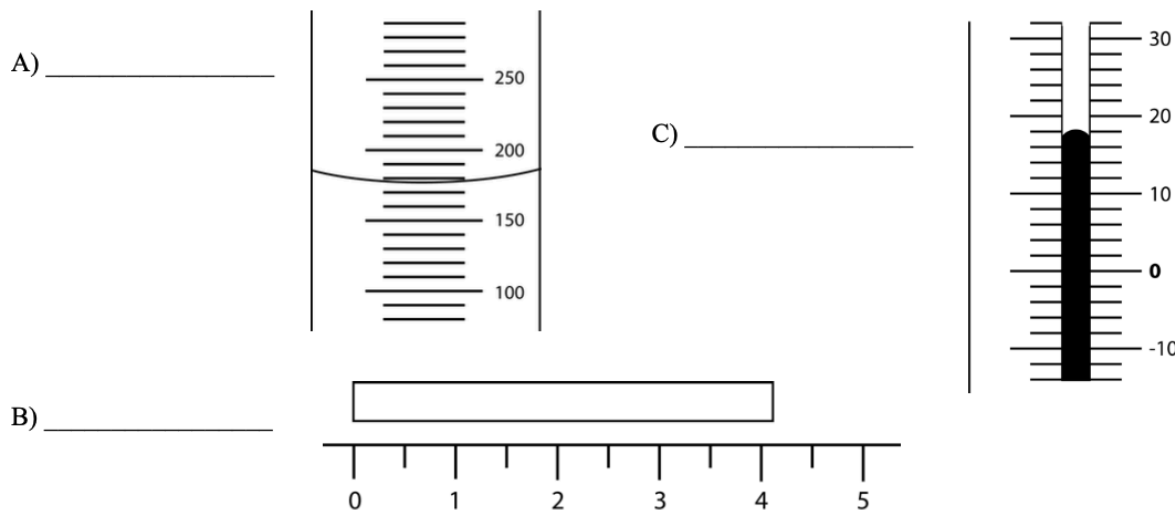
Percent Error

6. Determine the percent error in the following problems:

Experimental Value = 96.4 g Accepted Value = 100.3 g
Experimental Value = 1.26×10^{-2} Accepted Value = 1.48×10^{-2}

SIGNIFICANT FIGURES

7. Measure the following to the correct number of significant figures. Units are mL, cm, and °C, respectively.



Significant Figures in Calculations

8. Determine the number of significant figures in the following numbers.

- | | | | |
|----------|-------|-----------|-------|
| a) 0.990 | _____ | d) 2200 | _____ |
| b) 661 | _____ | e) 5000.0 | _____ |
| c) 807.0 | _____ | f) 6051. | _____ |

9. Round the following answers according to the rules for significant figures:

- | | | |
|--|---|--|
| a) 20007 x 2450 | = | 49017150 |
| b) 387000 ÷ 0.001870 | = | 206951871.7 |
| c) 7.76 ÷ 70.0 | = | 0.110857143 |
| d) 580500 x 840000 | = | 4.8762 x 10 ¹¹ |
| e) $\begin{array}{r} 62.900 \\ + 0.0099 \\ \hline 62.9099 \end{array}$ | | g) $\begin{array}{r} 8.16 \\ + 90.002 \\ \hline 98.162 \end{array}$ |
| f) $\begin{array}{r} 989200 \\ - 3320 \\ \hline 985880 \end{array}$ | | h) $\begin{array}{r} 1717000 \\ - 82900 \\ \hline 1634100 \end{array}$ |

UNIT 2: ATOMIC STRUCTURE

Modeling Atoms

1. List the four parts to Dalton's Atomic Theory:

a)

b)

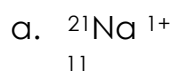
c)

d)

2. Complete the table:

	ELEMENT Or Ion	ATOMIC NUMBER	MASS #	PROTONS	NEUTRONS	ELECTRONS	CHARGE
1			11	5			3+
2	Se				46		2-
3			134	54			0

3. List the number of protons, neutrons, and electrons in the following atoms.



b. nitrogen-16

4. What was Rutherford's Gold Foil Experiment and what did it conclude?

5. Calculate the atomic mass:

96.0% Magnesium – 24

3.3 % Magnesium – 25

0.7% Magnesium – 26

6. What is an isotope?

Radioisotopes and Radiation

7. Complete the following table:

Type of Radiation	How is it formed?	Greek Symbol	Chemical Symbol	Charge	Penetrating Power	How can you block it?
Alpha						
Beta						
Gamma						

8. Write a balanced nuclear equation for the alpha decay of:

Radon-180

9. Write a balanced nuclear equation for the beta decay of:

Lead-175

Half-life Problems

10. How many days will it take for 160 grams of a radioactive material to decay down to 20 grams if it has a 2-day half-life. (Show work)

11. How many grams of a radioactive material will be left after 2 days if you start with 64 grams and it has a 12 hour half-life. (Show work)

Nuclear Fission & Fusion

12. Complete the table:

Type of Nuclear Reaction	Definition	Where is it commonly found?	Describe how a nuclear reactor of this type sustains AND controls the reaction
Fission			
Fusion			

UNIT 3: ELECTRONS IN ATOMS

History of the Atom

1. Briefly summarize the contributions of the following to the atomic model:

- a) Democritus

- b) Dalton

- c) Thomson

- d) Rutherford

- e) Bohr

- f) Schroedinger (Quantum Model)

Electron Configuration

2. Draw the short form of the electron configuration for the following ($1s^2 2s^2 \dots$):

a) Mg

b) V

c) F^{-1}

3. Draw the long form of the electron configuration for the following (using arrows for electrons):

a) Be

b) N

c) Al^{+3}

Electrons and Light

4. A laser pointer has a wavelength of 990 nm. What is the frequency of this light,

5. What is the energy of the light in Question 4, in joules?

Unit 4: Periodic Trends

Parts of the Periodic Table

1. Classify the following elements:

Element	Period	Metal or Nonmetal	Transition metal, Inner transition metal, or Representative Element	Alkali metal, Alkaline Earth Metal, Halogen, Noble gas, or None of the Above
Cl (17)				
Sb (51)				
Ca (20)				
K (19)				
Th (90)				
Xe (54)				
Al (13)				
H (1)				

Answer Choices for # 2-6: Mg Be Sr Ca All Same

- 2. Which of the elements has the smallest first ionization energy? _____
- 3. Which of the elements has the highest electronegativity? _____
- 4. Which of the elements has the smallest atomic radius? _____
- 5. Which of the elements has the largest nuclear charge? _____
- 6. Which of the elements experiences the most shielding? _____

Answer Choices for # 7-11: Li F N Be All Same

- 7. Which of the elements has the smallest first ionization energy? _____
- 8. Which of the elements has the highest electronegativity? _____
- 9. Which of the elements has the smallest atomic radius? _____
- 10. Which of the elements has the largest nuclear charge? _____
- 11. Which of the elements experiences the most shielding? _____

12. Which is larger: Mg ⁺² or Mg. Explain.

13. Which is larger: O ⁻² or O. Explain.

14. Which is larger: O ⁻² or S⁻². Explain.

UNIT 5A: IONIC & METALLIC BONDING

- Draw how the following will form an ionic compound. Be sure to show:
 - Dot structures of each element.
 - Arrows showing how the electrons will move
 - A balanced ionic equation
 - The name of the resulting ionic compound.

Na	
S	

- Review the properties of ionic and metallic compounds
- Use the following names below to write a balanced ionic equation showing reactants and products. Be sure to show the correct ions and balance your equation.

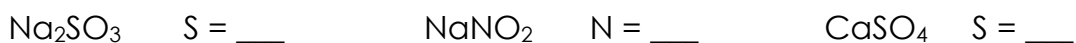
Compound	Balanced Ionic Equation
calcium bromide	
cobalt III sulfide	

- Combine the following atoms/molecules to make and name ionic compounds:
 - Show the correct ions
 - Balance your equation
 - Name each correctly

Elements or Polyatomic ions	Equation	Name
$\text{Rb}^{1+} + \text{CO}_3^{2-}$		
$\text{Al}^{3+} + \text{F}^{1-}$		

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5. Determine the oxidation number (charge) of the element listed after each compound:



6. Fill in the missing names for the following ionic compounds.

a. Na_2SO_3 _____

b. KBr _____

c. $(\text{NH}_4)_2\text{O}$ _____

d. $\text{Al}_2(\text{CO}_3)_3$ _____

e. MnPO_4 _____

7. Fill in the missing formulas for the following ionic compounds.

a. ammonium oxide _____

b. iron II chloride _____

c. sodium fluoride _____

d. strontium cyanide _____

e. lithium nitride _____

UNIT 5B: COVALENT BONDING

1. Complete the following names and formulas:

a) nitrogen hexachloride _____

b) sulfur trioxide _____

c) _____ CBr_4

d) _____ Si_3F_7

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2. Complete the following table:

Electron Dot Structure	Shape	Draw the 3D shape and structure	Bond Polarity	Molecule Polarity
O ₂	Tetrahedral Trigonal Pyramidal Trigonal Planar Bent Linear		Polar Nonpolar	Polar Nonpolar
SiO ₂	Tetrahedral Trigonal Pyramidal Trigonal Planar Bent Linear		Polar Nonpolar	Polar Nonpolar
SO ₂	Tetrahedral Trigonal Pyramidal Trigonal Planar Bent Linear		Polar Nonpolar	Polar Nonpolar
PH ₃	Tetrahedral Trigonal Pyramidal Trigonal Planar Bent Linear		Polar Nonpolar	Polar Nonpolar
SeO ₃	Tetrahedral Trigonal Pyramidal Trigonal Planar Bent Linear		Polar Nonpolar	Polar Nonpolar
CCl ₄	Tetrahedral Trigonal Pyramidal Trigonal Planar Bent Linear		Polar Nonpolar	Polar Nonpolar