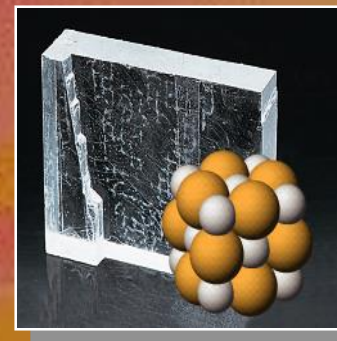
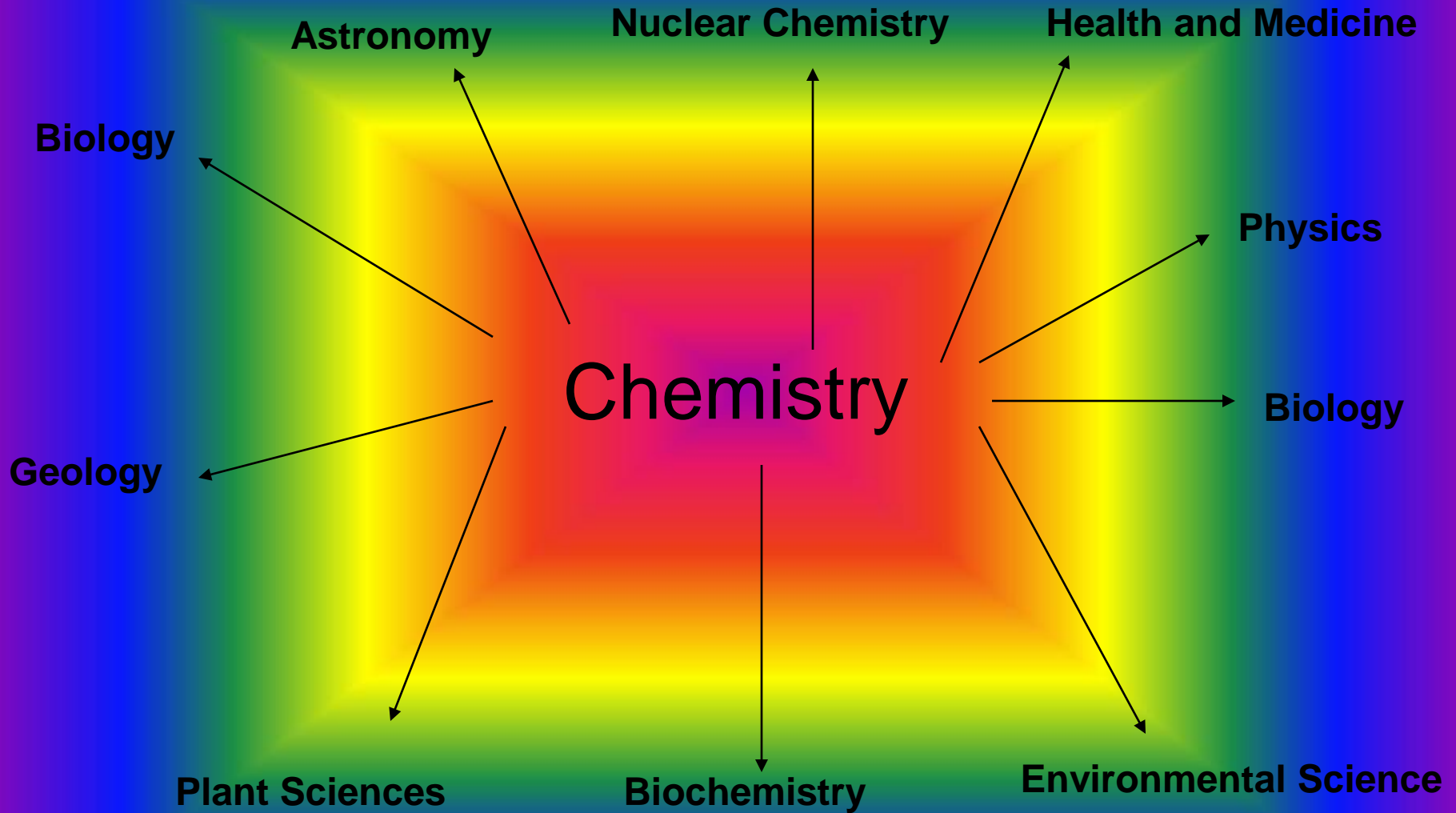


# Welcome to the World of Chemistry



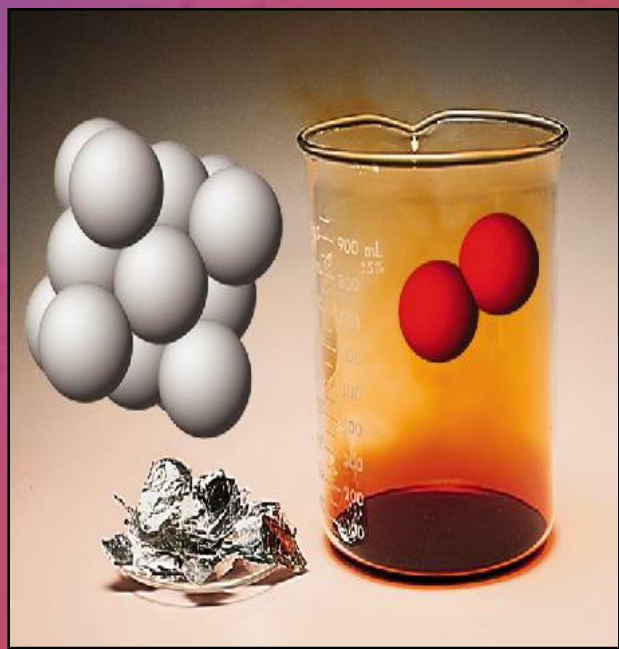
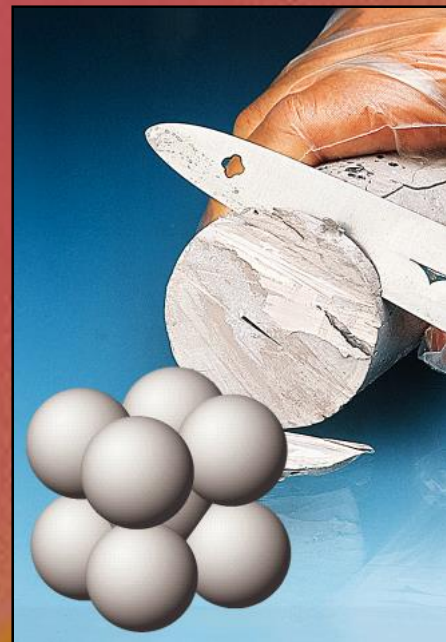
Mrs. Panzarella  
Rm. 351

# “The Central Science”

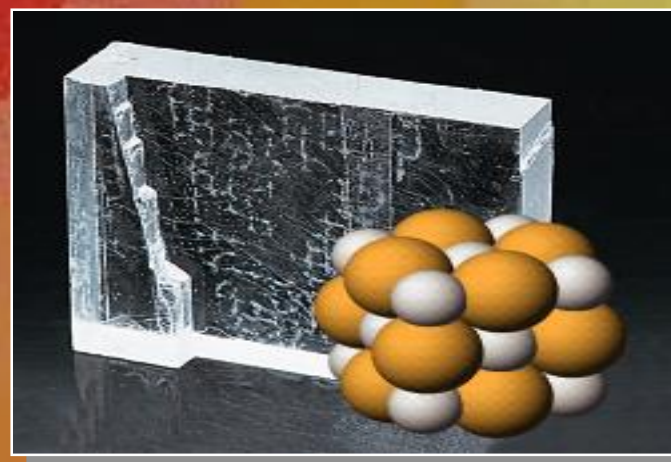


# Chemistry

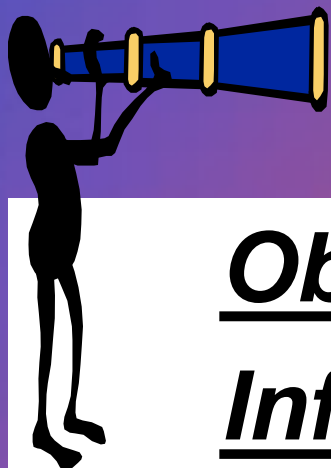
- Deals with the composition of matter, the changes matter undergoes, and the energy associated with these changes.



*What is chemistry video*



# Collecting Data



**Observations** – info collected with the senses

**Inferences** - a conclusion based on an observation

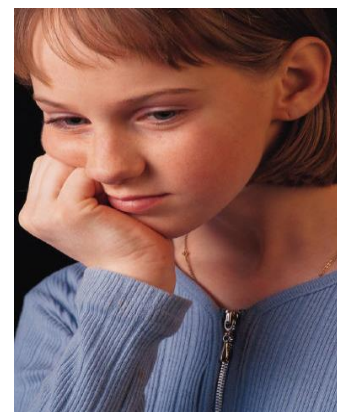
## **Two Types of Observations**

### **1. Qualitative**

- non-numeric form; uses the senses
- Ex. Color, shape, odor, phase (s, l, g)

### **2. Quantitative**

- involves Numbers; measurement
- Ex. 20 grams, 10 cm, 273 K



# The Language of Chemistry

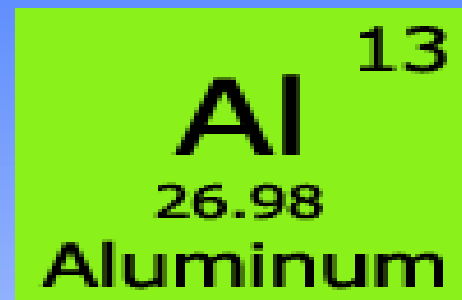
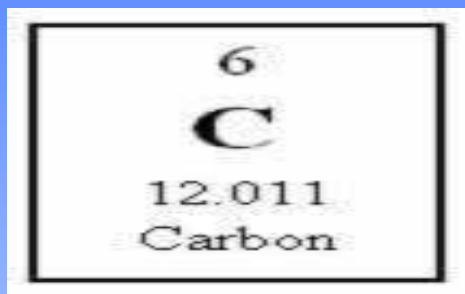
- Elements on the periodic table are represented by a chemical symbol based on their atomic number

<http://www.privatehand.com/flash/elements.html>

											<div style="display: flex; justify-content: space-between;"> <span style="color: blue;">■</span> Metals</div> <div style="display: flex; justify-content: space-between;"> <span style="color: green;">■</span> Metalloids</div> <div style="display: flex; justify-content: space-between;"> <span style="color: orange;">■</span> Nonmetals</div>				7A	8A		
1A	2A											3A	4A	5A	6A	7A	8A	
1												5	6	7	8	9	10	
H	Be											B	C	N	O	F	Ne	
3	4											13	14	15	16	17	18	
Li	Be											Al	Si	P	S	Cl	Ar	
11	12	3B	4B	5B	6B	7B	8B		1B	2B								
Na	Mg																	
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
Cs	Ba	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
87	88	89	104	105	106	107	108	109	110	111								
Fr	Ra	Ac**	Rf	Ha	Sg	Ns	Hs	Mt										
Lanthanide*			58	59	60	61	62	63	64	65	66	67	68	69	70	71		
Series			Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu		
Actinide**			90	91	92	93	94	95	96	97	98	99	100	101	102	103		
Series			Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		

# Writing Chemical Symbols

- All symbols BEGIN with a CAPITAL letter
- Symbols with two letters are written with a capital first letter followed by a lowercase letter
- Use the Periodic table, reference Table S (or your agenda R-11)



										Metals				Metalloids				Nonmetals			
1A	2A												3A	4A	5A	6A	7A	8A			
1 H													5 B	6 C	7 N	8 O	9 F	10 Ne			
3 Li	4 Be											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar				
Zn	12 Mg	3B	4B	5B	6B	7B	8B		1B	2B	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr					
19 K	20 Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe				
37 Rb	38 Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe				
55 Cs	56 Ba	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn				
87 Fr	88 Ra	Ac**	Rf	105 Ha	106 Sg	107 Zs	108 Hs	109 Mt	110	111											
Lanthanide Series			58 Ce	59 Pr	60 Zd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu					
Actinide Series			90 Th	91 Pa	92 U	93 Zp	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr					



# Element Assignment

- **Make Flash cards for the following elements (pg 3 of your guide)**

- 1-36, 47, 50, 53, 54, 56-57, 74, 78-80, 82, 86, 90, 92, 94
- Spelling counts!

**Fe**

*front (symbol)*

**iron**

*back (name)*

- **Study Practice:**

- Complete pages 2-3 in Learning Guide
- Study flash cards

- **Quiz Tuesday** (will also include rules/procedures of the classroom and lab)

- element song #2: <https://www.youtube.com/watch?v=VgVQKCcfwnU>

# Measurement

1) **N<sup>3</sup>**: No Naked Numbers. All measurements and answers to math problems must have units written after the numbers.

2) **No Work, No Credit.** You must show the math set-up when doing math problems.





# Measurement:

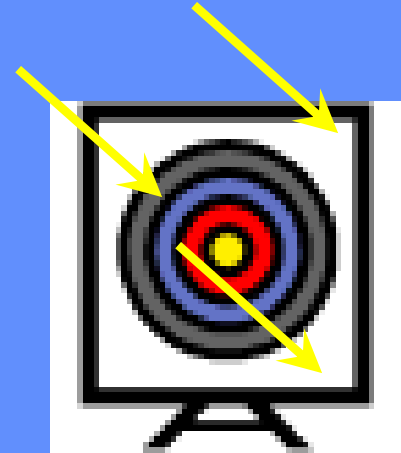
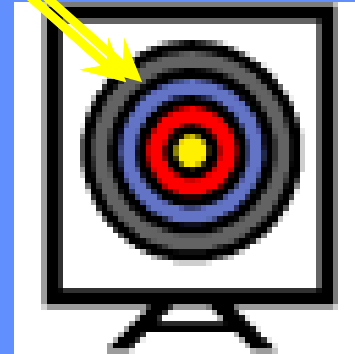
## Accuracy vs. Precision

**ACCURATE = CORRECT**

**PRECISE = CONSISTENT**

# Can you hit the bull's-eye?

Three targets with three arrows each to shoot.



How do they compare?

Both accurate and precise

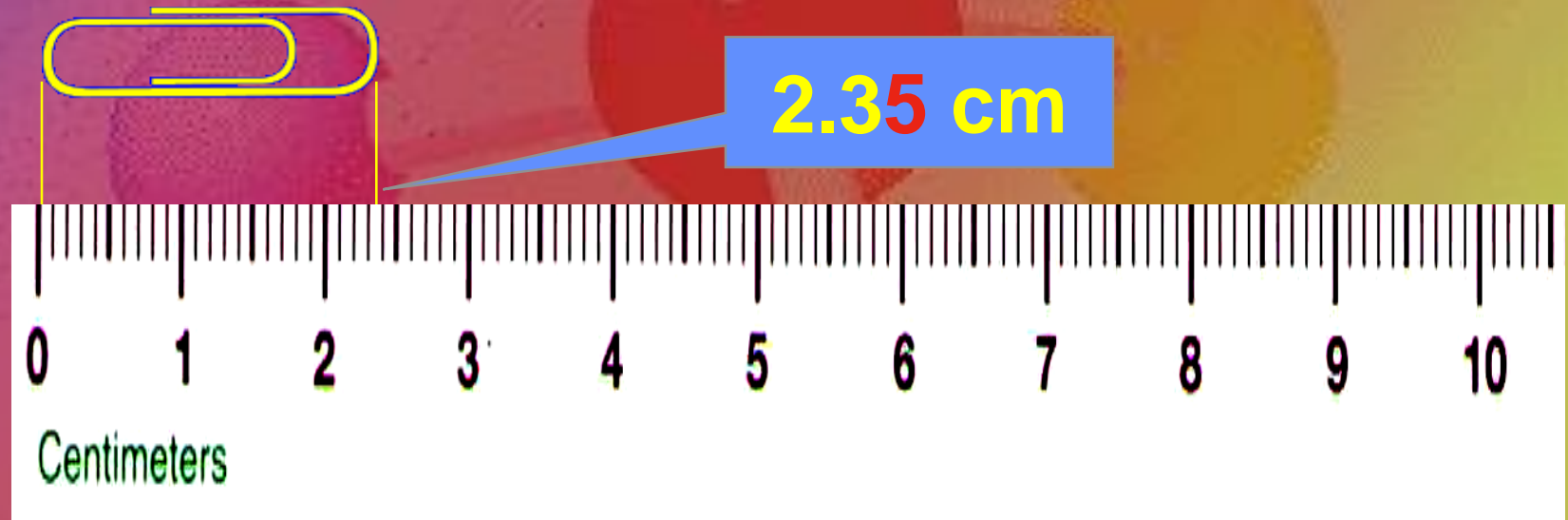
Precise but not accurate

Neither accurate nor precise

- **Accuracy** - how close a measurement is to the accepted value
- **Precision**- how close a series of measurements are to each other

# Significant Figures

- Indicate precision of a measurement.
- Includes all digits that can be known precisely **plus a last digit that must be estimated**



# Atlantic/Pacific Rule

Pacific

Decimal Present

Count toward the right  
from the first nonzero  
digit.



Atlantic

Decimal Absent

Count toward the left  
from the first nonzero  
digit.



Count from the ocean towards the coast starting with the first nonzero digit, and include *all* the digits that follow

Pacific = Decimal Present

Atlantic = Decimal Absent

## Pacific

Decimal Present

Count toward the right  
from the first nonzero  
digit.



## Atlantic

Decimal Absent

Count toward the left  
from the first nonzero  
digit.



## Let's Practice..... *Significant Figures*

1. 23.50

4 sig figs

2. 402

3 sig figs

3. 5,280

3 sig figs

4. 0.080

2 sig figs

# Significant Numbers in Calculations

**An answer cannot be more precise than the least precise measurement**



# Adding and Subtracting

The answer has the same number of decimal places as the measurement with the **fewest decimal places.**

25.2      *one decimal place*

+ 1.34      *two decimal places*

26.54

answer 26.5      *one decimal place*

# Multiplying and Dividing

- Round to the calculated answer until you have the same number of significant figures as the least precise measurement.

$$\begin{array}{ccccccc} (13.91 \text{ g/cm}^3) & (23.3 \text{ cm}^3) & = & 324.103 \text{ g} & & & \\ \text{4 SF} & \text{3 SF} & & \downarrow \text{3 SF} & & & \\ & & & 324 \text{ g} & & & \end{array}$$

# Scientific Notation

- Scientific notation is a way of expressing really big numbers or really small numbers.

$$65,000 \text{ kg} \rightarrow 6.5 \times 10^4 \text{ kg}$$

**Move decimal until there's 1 digit to its left.**

**Places moved = exponent.**

**Large # ( $>1$ )  $\Rightarrow$  positive exponent**

**Small # ( $<1$ )  $\Rightarrow$  negative exponent**

# DENSITY

Mercury



**13.6 g/cm<sup>3</sup>**

- physical property - standard values are found in reference Table S

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

*d* = density

*m* = mass

*V* = volume

- 1 ml = 1 cm<sup>3</sup>

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

Did you know.....Density usually decreases as temperature increases because volume increases making the mass more spread out, but the total mass stays the same.

- One exception is WATER .....Density decreases as the temperature decreases in water

## Density example

- An object has a volume of  $825 \text{ cm}^3$  and a density of  $13.6 \text{ g/cm}^3$ . Find its mass.

GIVEN:	WORK:
$V = 825 \text{ cm}^3$ $D = 13.6 \text{ g/cm}^3$ $M = ?$ <div data-bbox="115 1082 633 1392" style="background-color: yellow; border-radius: 15px; padding: 10px; display: inline-block;"><math display="block">D = \frac{M}{V}</math></div>	$M = DV$ $M = (13.6 \text{ g/cm}^3)(825 \text{ cm}^3)$ $M = 11,200 \text{ g}$

# Percent Error

- Indicates accuracy of a measurement
- Formula on Reference Table T

$$\% \text{ error} = \frac{\text{measured value} - \text{accepted value}}{\text{accepted value}} \times 100$$

---

- A student determines the density of a substance to be 1.40 g/mL. Find the % error if the accepted value of the density is 1.36 g/mL.

$$\% \text{ error} = \frac{|1.40 \text{ g/mL} - 1.36 \text{ g/mL}|}{1.36 \text{ g/mL}} \times 100$$

$$\% \text{ error} = 2.9 \%$$

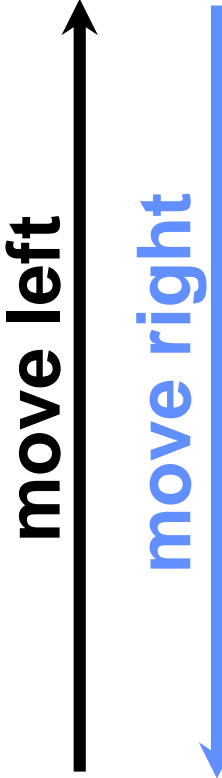


## **SI Base Units**

<b><i>Physical Quantity (Dimension)</i></b>	<b><i>Unit Name</i></b>	<b><i>Unit Abbreviation</i></b>
<b><i>mass</i></b>	<b><i>kilogram</i></b>	<b><i>kg</i></b>
<b><i>length</i></b>	<b><i>meter</i></b>	<b><i>m</i></b>
<b><i>time</i></b>	<b><i>second</i></b>	<b><i>s</i></b>
<b><i>temperature</i></b>	<b><i>kelvin</i></b>	<b><i>K</i></b>
<b><i>electric current</i></b>	<b><i>ampere</i></b>	<b><i>A</i></b>
<b><i>amount of substance</i></b>	<b><i>mole</i></b>	<b><i>mol</i></b>
<b><i>luminous intensity</i></b>	<b><i>candela</i></b>	<b><i>cd</i></b>

# SI Prefix Metric Conversions

(based on powers of 10)



Prefix	Symbol	Factor
Kilo-	k	$10^3$
Hecto-	h	$10^2$
Deka-	da	$10^1$
<b>BASE UNIT</b>	<b>g, l, m, s</b>	$10^0$
deci-	d	$10^{-1}$
centi-	c	$10^{-2}$
milli-	m	$10^{-3}$
micro-	$\mu$	$10^{-6}$
nano-	n	$10^{-9}$
pico-	p	$10^{-12}$

# The “Factor Label” Method

aka Dimensional Analysis

## Steps:

1. Identify starting & ending units.
2. Line up conversion factors so units cancel.
3. Larger metric unit gets a value of 1
4. Multiply all top numbers & divide by each bottom number.
5. Check units & answer.

## set up:

known value with unit    x     $\frac{\text{unknown unit}}{\text{known unit}}$

$$\cancel{\text{cm}} \times \frac{\text{m}}{\cancel{\text{cm}}} = \text{m}$$

Table C  
Selected Prefixes

Factor	Prefix	Symbol
$10^3$	kilo-	k
$10^{-1}$	deci-	d
$10^{-2}$	centi-	c
$10^{-3}$	milli-	m
$10^{-6}$	micro-	$\mu$
$10^{-9}$	nano-	n
$10^{-12}$	pico-	p

**Ex. A rattlesnake is 2.44 m long. How long is the snake in cm?**

**set up:** known value with unit x unknown unit  
known unit

$$2.44 \text{ m} \times \frac{\text{cm}}{\text{m}} = \text{cm}$$

*\*Larger metric unit gets a value of 1*

$$2.44 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} = ? \text{ cm}$$

$$= 244 \text{ cm}$$

Table C  
Selected Prefixes

Factor	Prefix	Symbol
$10^3$	kilo-	k
$10^{-1}$	deci-	d
$10^{-2}$	centi-	c
$10^{-3}$	milli-	m
$10^{-6}$	micro-	$\mu$
$10^{-9}$	nano-	n
$10^{-12}$	pico-	p

**Practice:**     *set up: known value with unit*    $\times$     $\frac{\textit{unknown unit}}{\textit{known unit}}$

1) 20 cm to m

2) 500 ml to L

3) 0.032 L to mL

4) 45 m to km

5) 805 dm to km

6) 81 cm to mm

7) 5.29 cs to s

8) 3.78 kg to g

# Graphs should contain the following features:

- Independent variable in the X axis (with units)
- Dependent variable on the Y axis (with units).
- Uniform numerical scale
- Include a title: (Dependent Variable) vs. (Independent Variable)
- Data points, circled with "point protectors".
- Data points connected with a line or a best fit line

**Done on  
graph paper  
in pencil or  
on the  
computer**

