

## APES Math Review Notes: Significant Figures, Scientific Notation, SI/Metric System

### SIGNIFICANT FIGURES: “Sig.Fig” Review

#### General Rules

- 1) ALL NONZERO DIGITS ARE ALWAYS SIGNIFICANT.  
4.2 and 27 both have two sig.figs.
- 2) ZEROES BETWEEN TWO NONZERO DIGITS ARE ALWAYS SIGNIFICANT.  
ZEROES BETWEEN TWO SIGNIFICANT DIGITS ARE ALWAYS SIGNIFICANT.  
 (“Sig. Fig. Sandwich”) 8.909 and 1005 both have four sig.figs.
- 3) ZEROES TO THE LEFT OF NONZERO DIGITS ARE NOT SIGNIFICANT.  
0.0006 and 0.06 both have only one sig.fig.
- 4) TERMINAL ZEROES AFTER THE DECIMAL POINT ARE ALWAYS SIGNIFICANT. 1.000 and 9.820 both have four sig.figs.
- 5) TERMINAL ZEROES NOT INVOLVING A DECIMAL POINT ARE NOT SIGNIFICANT... UNLESS WRITTEN IN SCIENTIFIC NOTATION FOR CLARIFICATION or UNLESS A DECIMAL POINT IS PLACED AFTER THE LAST ZERO.  
1230 written as  $1.23 \times 10^3$  has three sig.figs.  
1230 written as 1230. or  $1.230 \times 10^3$  has four sig.figs.

#### Rounding Rules

- 1) Round up if the number after the last sig.fig. is 5 or greater 4.26 → 4.3
- 2) Round down if the number after the last sig.fig. is less than 5 4.21 → 4.2

#### Addition, subtraction, multiplication, and division rules

- 1) IN ADDITION AND SUBTRACTION, THE ANSWER MAY CONTAIN ONLY AS MANY DECIMAL PLACES AS THE LEAST ACCURATE VALUE.  
 $5.2208 + 0.1 = 5.3208$  5.3 adjusted
- 2) IN MULTIPLICATION AND DIVISION, THE ANSWER MAY CONTAIN ONLY AS MANY DECIMAL PLACES AS THE LEAST ACCURATE VALUE USED.  $49.600 / 47.40 = 1.0464135$  1.046 adjusted

### SCIENTIFIC NOTATION: $M \times 10^n$ format

#### Exponent examples

$$\begin{array}{llll} 10^0 = 1 & 10^1 = 10 & 10^2 = 100 & 10^3 = 1000 \\ 10^{-1} = 0.1 (1/10) & 10^{-2} = 0.01 (1/100) & 10^{-3} = 0.001 (1/1000) & \end{array}$$

#### Scientific notation rules

- 1) POSITIVE EXPONENTS INDICATE MAKING A NUMBER LARGER.  
MOVE DECIMAL POINT TO THE RIGHT.  $3.11 \times 10^2 = 311$
- 2) NEGATIVE EXPONENTS INDICATE MAKING A NUMBER SMALLER.  
MOVE DECIMAL POINT TO THE LEFT.  $3.11 \times 10^{-2} = 0.0311$

**THE METRIC SYSTEM** (from <http://physics.nist.gov/cuu/> )  
 SI = The International System of Units

<u>SI BASE UNIT</u>	<u>NAME</u>	<u>SYMBOL</u>
length	meter	m
mass	kilogram	kg
time	second	s
temperature	Kelvin	K
amount of substance	mole	mol
electric current	ampere	A
luminous (light) intensity	candela	cd

<u>Common SI DERIVED UNITS</u>	<u>NAME</u>	<u>SYMBOL</u>
area	square meter	m <sup>2</sup>
volume	cubic meter	m <sup>3</sup> (L)
		1L = 1 m <sup>3</sup> & 1 mL = 1 cm <sup>3</sup> = 1 cc
speed	meter per second	m/s
velocity	meter per second	m/s (with direction)
acceleration	meter per second squared	m/s <sup>2</sup>
density	kilogram per cubic meter	kg/m <sup>3</sup> (mass/volume)

**METRIC PREFIXES**

Factor	Name	Symbol
10 <sup>24</sup>	yotta	Y
10 <sup>21</sup>	zetta	Z
10 <sup>18</sup>	exa	E
10 <sup>15</sup>	peta	P
10 <sup>12</sup>	tera	T
10 <sup>9</sup>	giga	G
10 <sup>6</sup>	mega	M
10 <sup>3</sup>	kilo	k
10 <sup>2</sup>	hecto	h
10 <sup>1</sup>	deka	da

Factor	Name	Symbol
10 <sup>-1</sup>	deci	d
10 <sup>-2</sup>	centi	c
10 <sup>-3</sup>	milli	m
10 <sup>-6</sup>	micro	μ
10 <sup>-9</sup>	nano	n
10 <sup>-12</sup>	pico	p
10 <sup>-15</sup>	femto	f
10 <sup>-18</sup>	atto	a
10 <sup>-21</sup>	zepto	z
10 <sup>-24</sup>	yocto	y