

# UNIT 2: MEASUREMENT

## Topics Covered:

- Qualitative and Quantitative
- Dimensional Analysis
- SI System
- Scientific Notation
- Significant Figures
- Density

# SCIENTIFIC NOTATION

# SCIENTIFIC NOTATION

- Basic form:  $n \times 10^n$   
where  $10 > n \geq 1$

- ✓ a.  $3.57 \times 10^{-8}$
- ✓ b.  $4.23 \times 10^{-2}$
- c.  ~~$75.3 \times 10^2$~~

- ✓ d.  $2.92 \times 10^9$
- e.  ~~$0.000354 \times 10^4$~~
- ✓ f.  $9.1 \times 10^4$

# SCIENTIFIC NOTATION

When the exponent is positive...

- $45,000,000,000,000,000 = 4.5 \times 10^{16}$

- $2.641 \times 10^{12} = 2,641,000,000,000$

- $25,310,000,000,000 = 2.531 \times 10^{13}$

- $3.215 \times 10^8 = 321,500,000$

# SCIENTIFIC NOTATION

When the exponent is negative...

•  $0.\underbrace{000000000000000000}_{\substack{| \\ | \\ | \\ | \\ |}}378 = 3.78 \times 10^{-17}$

•  $7.45 \times 10^{-8} = 0.0000000745$

•  $0.\underbrace{0000000000}_{\substack{| \\ | \\ | \\ |}}3018 = 3.018 \times 10^{-12}$

•  $8.41 \times 10^{-7} = 0.000000841$

# SCIENTIFIC NOTATION

Multiplication

- Multiply numbers like normal
- Add exponents
- $(4.6 \times 10^{34})(7.9 \times 10^{-21})$

$$4.6 \times 7.9 = 36.34 \quad 34 + (-21) = 13$$

\*left = larger

$$36.34 \times 10^{13}$$
$$3.634 \times 10^{14}$$

# SCIENTIFIC NOTATION

Multiplication

- Multiply numbers like normal
- Add exponents
- $(1.24 \times 10^{12})(3.31 \times 10^{20})$

$$1.24 \times 3.31 = 4.1044$$

$$12 + 20 = 32$$

$$4.1044 \times 10^{32}$$

$$4.1044 \times 10^{32}$$

# SCIENTIFIC NOTATION

Division

- Divide numbers like normal
- Subtract exponents

- $(8.4 \times 10^{-5}) \div (4.1 \times 10^{17})$

$$8.4 \div 4.1 = 2.05 \quad -5 - 17 = -22$$

$$2.05 \times 10^{-22}$$

$$2.05 \times 10^{-22}$$



# SCIENTIFIC NOTATION

Division

- Divide numbers like normal
- Subtract exponents
- $(5.4 \times 10^{32}) \div (7.3 \times 10^{14})$   
 $5.4 \div 7.3 = 0.74$        $32 - 14 = 18$

\*Right-Reduce  $0.74 \times 10^{18}$

$7.4 \times 10^{17}$

# SCIENTIFIC NOTATION

\* left = larger

\* Right = Reduce

Addition and Subtraction

- Make the exponents the same
- Add/Subtract numbers like normal

•  $(4.25 \times 10^{13}) + (2.10 \times 10^{14})$

$$(4.25 \times 10^{14}) + (2.10 \times 10^{14})$$

$$2.525 \times 10^{14}$$

$$2.525 \times 10^{14}$$

$$(4.25 \times 10^{13}) + (2.10 \times 10^{14})$$

$$(4.25 \times 10^{13}) + (21.0 \times 10^{13})$$

$$25.25 \times 10^{13}$$

$$2.525 \times 10^{14}$$

$$2.525 \times 10^{14}$$

# SCIENTIFIC NOTATION

\*left=larger

\*Right=Reduce

Addition and Subtraction

- Make the exponents the same
- Add/Subtract numbers like normal

•  $(6.4 \times 10^{-18}) - (3 \times 10^{-19})$

$$(6.4 \times 10^{-18}) - (3 \times 10^{-18})$$

$$6.7 \times 10^{-18}$$

$$6.7 \times 10^{-18}$$

$$(6.4 \times 10^{-18}) - (3 \times 10^{-19})$$

$$(64. \times 10^{-19}) - (3 \times 10^{-19})$$

$$67. \times 10^{-19}$$

$$6.7 \times 10^{-18}$$

$$6.7 \times 10^{-18}$$

# SCIENTIFIC NOTATION

\* left = larger  
\* Right = Reduce

Addition and Subtraction

- Make the exponents the same
- Add/Subtract numbers like normal
- $(3.1 \times 10^{-34}) + (2.2 \times 10^{-33})$

$$(3.1 \times 10^{-33}) + (2.2 \times 10^{-33})$$
$$2.51 \times 10^{-33}$$

$$2.51 \times 10^{-33}$$

$$(3.1 \times 10^{-34}) + (2.2 \times 10^{-33})$$
$$(3.1 \times 10^{-34}) + (22. \times 10^{-34})$$
$$25.1 \times 10^{-34}$$
$$2.51 \times 10^{-33}$$

$$2.51 \times 10^{-33}$$