Answer Key
08/27/25

Matter, Energy, and Measurement

What is matter?

Anything that has mass & takes up space

↳ even in composition

Give an example of a heterogenous and a homogenous mixture:

↳ varies in composition

Heterogenous: wood, oil & water, pizza

Homogenous: sweet tea, steel

↳ iron + carbon

What is an intensive property? What is an extensive property?

Intensive: Does NOT depend on the amount of substance

Extensive: Depends on the amount of substance

Give an example of an intensive property and an extensive property:

Intensive: Temp, bp, mp, density, color, flammability

Extensive: Mass, volume, energy

Give an example of a physical and a chemical change: ↗ solid, liquid, gas

Physical change: cut something, change in state, malleable

Chemical: color, combustion, oxidation,

What are significant figures?

A measured quantity that shows precesion + accuracy

What are the sig fig rules?

Count #s
- All zeros after the decimal
- All nonzero digits
- zeros b/w nonzeros
  ↳ sandwich

Don't count
- All zeros to the left of the 1st nonzero #
  ↳ leading 0s

Other
- zeros @ the end of the # are significant if they have a decimal

Determine how many sig figs are in each number:

505

1,9000. = 5 sig figs

10.

$1.9 \times 10^4 \approx 19000$ → 2 sig figs	10^{-2} ≈ 0.1	295.3
2	1	4
xxx 0.0070 ≈ 7.0×10^{-3}	200	400.0
2	1	4

What is 15.0 mL + 20.0 mL + 0.45 mL?

1 1 2

+/−

↳ only look for decimals for sig figs

15.0 mL
20.0 mL
+ 0.45 mL
35.45 ≈ **35.5 mL**

What is 0.185 x (4.9×10^3)?

3 2

use whole #

for sig figs

$0.185 \times 4.9 \times 10^3$

$= 906.5$

$\approx 9.1 \times 10^2$

906.5

What is 10 x 2.08?

1 3

10×2.08

$= 20.8$

$\approx$ **20 or 2×10^1**

$1000 = 10^3$

Convert the following problems:

0.00087 liters to milliliters L → mL

$$0.00087\ \text{L} \left| \frac{10^3\ \text{mL}}{1\ \text{L}} \right. = \boxed{0.87\ \text{mL}}$$

4700 milligrams to micrograms mg → μg

$$4700\ \text{mg} \left| \frac{1\ \text{g}}{10^3\ \text{mg}} \right| \frac{10^6\ \mu\text{g}}{1\ \text{g}} = 4700000 \approx \boxed{4.7 \times 10^6\ \mu\text{g}}$$

55.0 meters to inches

$$55.0\ \text{m} \left| \frac{100\ \text{cm}}{1\ \text{m}} \right| \frac{1\ \text{in}}{2.54\ \text{cm}} = 2165 \approx \boxed{2.17 \times 10^3\ \text{in}}$$

What is 87°F in Celsius and Kelvin?

87°F → °C → K

$$\frac{°F - 32}{1.8} = °C \qquad \frac{87 - 32}{1.8} = 31°C$$

$31°C + 273 = \boxed{304\text{K}}$

What is 506K in Celsius and Fahrenheit?

506 K → °C → °F

$506\ \text{K} - 273 = 233°C$

$$1.8 \cdot °C = \frac{°F - 32}{1.8} \cdot 1.8$$

$°C \times 1.8 = °F - 32$
$+32 \qquad +32$

$°F = °C \times 1.8 + 32$
$= 233°C \times 1.8 + 32$
$= \boxed{451\ °F}$

What is the equation for density?

$$D = \frac{m}{V} \qquad \frac{m}{V}$$

Solve for density:

49.0g sample, and the level of the water goes from 24.0mL to 31.0mL.

$m = 49.0\text{g}$

$V = 7.0\text{mL}$

$31.0\text{mL} - 24.0\text{mL} = 7.0\text{mL}$

$$D = \frac{m}{V} = \frac{49.0\text{g}}{7.0\text{mL}} = \boxed{7.0\text{g/mL}}$$

$KE = \frac{mv^2}{2}$ $m = kg$ $v = m/s$ $1\,J = kg\,m^2/s^2$

A spaceship has a mass of 2.0×10^4 Kg, suppose it travels at 15m/s. Find the kinetic energy possessed by it.

$KE = ?$

$m = 2.0 \times 10^4\ kg$

$v = 15\ m/s$

$KE = \frac{(2.0 \times 10^4\ kg)(15\ m/s)^2}{2} = 2250000$

$\approx 2.3 \times 10^6\ J$

An object has a kinetic energy of 25 J and a mass of 34 kg , how fast is the object moving?

$KE = 25\ J$

$m = 34\ kg$

$v = ?$

2. $KE = \frac{mv^2}{2}$ ·2

$\frac{KE \times 2}{m} = \frac{mv^2}{m}$

$v^2 = \frac{KE \times 2}{m}$

$v^2 = \frac{(25\ J) \times 2}{34\ kg}$

$\sqrt{v^2} = \sqrt{1.47\ J/kg}$

$v = 1.2\ m/s$

Fill in the blank:

Bigger ↑

	Prefix	Symbol	Exponent
	Tera (Together)	T	10^{12}
	Giga (Get)	G	10^9
	Mega (Monkeys)	M	10^6
	Kilo (Killer)	k	10^3
X	Hecto	h	10^2
X	Deka	da	10^1
Base —	liter, gram		
X	Deci	d	10^{-1}
	Centi (Crazy)	c	10^{-2}
	Mili (Militant)	m	10^{-3}
	Micro (Microbes)	μ	10^{-6}
	Nano (Nuke)	n	10^{-9}
	Pico (Pittsburg)	p	10^{-12}

↓ Smaller

100000

0.0001