Dimensional Analysis Level 2

1. 15.9 mm → km $15.9\text{ mm} \times \frac{1\text{ m}}{1000\text{ mm}} \times \frac{1\text{ km}}{1000\text{ m}} = \boxed{0.0000159\text{ km} \text{ or } 1.59 \times 10^{-5}\text{ km}}$

2. 0.0982 hg → cg $0.0982\text{ hg} \times \frac{100\text{ g}}{1\text{ hg}} \times \frac{100\text{ cg}}{1\text{ g}} = \boxed{982\text{ cg}}$

3. g → kg $13455\text{ g} \times \frac{1\text{ kg}}{1000\text{ g}} = \boxed{13.455\text{ kg}}$

4. $\frac{\text{km}}{\text{hr}} \rightarrow \frac{\text{m}}{\text{s}}$ $13.5\frac{\text{km}}{\text{hr}} \times \frac{1000\text{ m}}{1\text{ km}} \times \frac{1\text{ hr}}{60\text{ min}} \times \frac{1\text{ min}}{60\text{ sec}} = \boxed{20.4\frac{\text{m}}{\text{sec}}}$

5. $\frac{\text{g}}{\text{ml}} \rightarrow \frac{\text{kg}}{\text{L}}$ $4.52\frac{\text{g}}{\text{ml}} \times \frac{1\text{ kg}}{1000\text{ g}} \times \frac{1000\text{ ml}}{1\text{ L}} = \boxed{4.52\frac{\text{kg}}{\text{L}}}$

6. 50.00 g → ? ml $50.00\text{ g} \times \frac{1\text{ mL}}{7.80\text{ g}} = \boxed{6.361\text{ mL}}$

7. 375.0 ml → ? g $375.0\text{ ml} \times \frac{1\text{ L}}{1000\text{ ml}} \times \frac{0.178\text{ g}}{1\text{ L}} = \boxed{0.066775\text{ g}}$

8. cm → ? sec $25.0\text{ cm} \times \frac{1\text{ m}}{100\text{ cm}} \times \frac{1\text{ sec}}{45.8\text{ m}} = \boxed{0.00546\text{ sec} \text{ or } 5.46 \times 10^{-3}\text{ sec}}$

9. atoms → ? mol $25.0 \times 10^{23}\text{ atoms} \times \frac{1\text{ mol}}{6.02 \times 10^{23}\text{ atoms}} = \boxed{4.15\text{ mol}}$

10. atoms → ? mol $25\text{ atoms} \times \frac{1\text{ mol}}{6.02 \times 10^{23}\text{ atoms}} = \boxed{4.15 \times 10^{-23}\text{ mol}}$

11. $\frac{\text{cm}}{\text{s}} \rightarrow \frac{\text{km}}{\text{hr}}$ $3.0 \times 10^{10}\frac{\text{cm}}{\text{sec}} \times \frac{1\text{ m}}{100\text{ cm}} \times \frac{1\text{ km}}{1000\text{ m}} \times \frac{60\text{ sec}}{1\text{ min}} \times \frac{60\text{ min}}{1\text{ hr}} =$

$\boxed{1080000000\frac{\text{km}}{\text{hr}} \text{ or } 1.08 \times 10^{9}\frac{\text{km}}{\text{hr}}}$

12. ml → g $15.0\text{ mL} \times \frac{1\text{ L}}{1000\text{ mL}} \times \frac{6.278\text{ g}}{1\text{ L}} \times \frac{1000\text{ mg}}{1\text{ g}} = \boxed{94.2\text{ mg}}$

given: 3.68cm need: ? hr

$$\frac{3.68\text{cm}}{\text{s}} \times \frac{1\text{m}}{100\text{cm}} \times \frac{60\text{sec}}{1\text{min}} \times \frac{60\text{min}}{1\text{hr}} = \boxed{132\ \frac{\text{m}}{\text{hr}}}$$

Hmwk

4. Convert a speed of $73.5\ \frac{\text{km}}{\text{hr}}$ to $\frac{\text{m}}{\text{s}}$ (given: km, hr; need: m, s)

1 km = 1000 m
1 hr = 60 min
1 min = 60 sec

$$73.5\ \frac{\text{km}}{\text{hr}} \times \frac{1000\text{ m}}{1\text{ km}} \times \frac{1\text{ hr}}{60\text{ min}} \times \frac{1\text{ min}}{60\text{ sec}} =$$

$$(73.5 \times 1000) \div (60 \times 60)\ \frac{\text{m}}{\text{sec}} = \boxed{20.4\ \frac{\text{m}}{\text{sec}}}$$

9. 1 mole = a mole of Na atoms contains 6.02×10^{23} atoms.
How many moles (needed) would be needed in order to have 25.0×10^{23} atoms? (given)

$$25.0 \times 10^{23}\text{ atoms} \times \frac{1\text{ mole}}{6.02 \times 10^{23}\text{ atoms}} = \boxed{4.15\text{ mol}}$$

12. A sample of seawater contains 6.277g of NaCl per liter of soln.
6.277g = 1L
How many mg of NaCl would be contained in 15.0mL of soln.
given: 15.0mL need: mg (L → g → mg)

$$15.0\text{mL} \times \frac{1\text{ L}}{1000\text{ mL}} \times \frac{6.277\text{ g}}{1\text{ L}} \times \frac{1000\text{ mg}}{1\text{ g}} = \boxed{94.2\text{ mg}}$$

Practice: 3.0×10^8 m = 1 sec

The speed of light is $3.0 \times 10^8\ \frac{\text{m}}{\text{s}}$ If Mars is (given) 2.3×10^9 km from the sun how many hours (need) will light take to travel?

Km → m → sec → min → hr.

$$2.3 \times 10^9\text{ km} \times \frac{1000\text{ m}}{1\text{ km}} \times \frac{1\text{ sec}}{3.0 \times 10^8\text{ m}} \times \frac{1\text{ min}}{60\text{ sec}} \times \frac{1\text{ hr}}{60\text{ min}} = \boxed{2.1\text{ hr}}$$

If the density of copper is $8.93\ \text{g/mL}$, what is the density in kg/L?

$$\frac{8.93\text{ g}}{1\text{ mL}} \times \text{——}$$

How many ML (Megaliters) are in 386 cm^3?

Hmwk:

8. moving at $\frac{45.8\text{ m}}{\text{sec}}$ (conversion factor) | 25.0cm away (given) | How long did it take? need = ? sec

$45.8\text{ m} = 1\text{ sec}$

map it out: cm → m → sec

$$250\text{ cm} \times \frac{1\text{ m}}{100\text{ cm}} \times \frac{1\text{ sec}}{45.8\text{ m}} = \boxed{5.46\times10^{-3}\text{ sec} \quad 0.00546\text{ sec}}$$

(11) The speed of light 3.0×10^{10} cm/s. Express as km/hr

$\frac{3.0\times10^{10}\text{ cm}}{1\text{ sec}}$ → m → $\frac{\text{Km}}{\text{hr}}$ ✓ ; sec → min → $\frac{\text{Km}}{\text{hr}}$ ✓

$$\frac{3.0\times10^{10}\text{ cm}}{1\text{ sec}} \times \frac{1\text{ m}}{100\text{ cm}} \times \frac{1\text{ km}}{1000\text{ m}} \times \frac{60\text{ sec}}{1\text{ min}} \times \frac{60\text{ min}}{1\text{ hr}} = 1.1\times10^{9}\ \frac{\text{Km}}{\text{hr}}$$

$(3.0\text{E}10 \times 60\times60)\div(100\times1000) = 1100000000$

(12) (6.277g = 1L) given: 15.0ml need: ? mg NaCl

ml → L → g → mg

$$15.0\text{ ml} \times \frac{1\text{ L}}{1000\text{ ml}} \times \frac{6.277\text{ g}}{1\text{ L}} \times \frac{1000\text{ mg}}{1\text{ g}} = 94.2\text{ mg}$$

How many liters would 76.8 moles of neon gas fill?

Conversion factor needed is 1 mole = 22.4L

$$76.8\text{ mol} \times \frac{22.4\text{ L}}{1\text{ mol}} = \boxed{1720\text{ L}}$$

How many grams of He would be needed to fill 11.2L?

Conversion factor is 4.00g = 22.4L

$$11.2\text{ L} \times \frac{4.00\text{ g}}{22.4\text{ L}} = \boxed{2.00\text{ g}}$$

If sun light travels at (conversion factor) $3.0\times10^{8}\frac{\text{m}}{\text{s}}$ and Mars is (given) 2.3×10^{8} Km away from the sun, how long will it take for a ray of light to arrive?

given = 2.3×10^{8} Km → m → need: ? sec

→ 3.0×10^{8} m = 1 sec

$$2.3\times10^{8}\text{ km} \times \frac{1000\text{ m}}{1\text{ km}} \times \frac{1\text{ sec}}{3.0\times10^{8}\text{ m}} = \boxed{7.7\times10^{2}\text{ sec} \quad \text{or} \quad 770\text{ sec}}$$