Phys 4A Chapter 1 Solutions

Chpt 1 : 1, 7, 20, 29, 33, 43, 50, 58

Chapter 1

(1) Convert weight in pounds to mass :

(a) $170 \text{ lbs} \left(\frac{.454 \text{ kg}}{1 \text{ lb}} \right) = 77.2 \text{ kg}$

(b) $77.2 \text{ kg} = 77.2 \text{ kg} \left(\frac{1000 \text{ g}}{1 \text{ kg}} \right)$

$= 7.72 \times 10^4 \text{ g}$

(c) $7.72 \times 10^4 \text{ g} = 7.72 \times 10^4 \text{ g} \left(\frac{1 \text{ Gg}}{1 \times 10^9 \text{ g}} \right)$

$= 7.72 \times 10^{-5} \text{ Gg}$

(d) $7.72 \times 10^{4}\ g \left(\frac{1\ fg}{1 \times 10^{-15}\ g}\right) = 7.72 \times 10^{-11}\ fg$

(7) # ATOMS = $\frac{\text{LENGTH OF LINE}}{\text{DIAMETER OF ATOM}}$

$= \frac{1\ cm}{.1\ nm} = \frac{1 \times 10^{-2}\ m}{1 \times 10^{-10}\ m}$

$= 1 \times 10^{8}$ ATOMS

(20) (a) $550 \times 10^{9} \frac{\text{BARRELS}}{\text{YEAR}} \left(\frac{42\ \text{gallons}}{\text{barrel}}\right) \cdot (\quad)$

$\cdot \left(\frac{\text{YEAR}}{365\ d}\right)\left(\frac{1\ d}{24\ hr}\right)\left(\frac{1\ hr}{3600\ s}\right)$

$= 7.32 \times 10^{5} \frac{\text{gallons}}{s}$

(b) $7.32 \times 10^{5} \frac{\text{gallons}}{s} \left(\frac{.1590\ m^3}{\text{gallon}}\right)\left(\frac{1\ L}{10^{-3}\ m^3}\right)$

$= 1.16 \times 10^{8} \frac{L}{s}$

(29) $3.6 \times 10^5 \text{ m} + 2.1 \times 10^3 \text{ km}$

$= 3.6 \times 10^5 \text{ m} + 2.1 \times 10^6 \text{ m}$

$= 2.5 \times 10^6 \text{ m}$

$= 2.5 \times 10^3 \text{ km}$

(33) Area per component

$= \frac{\text{TOTAL AREA}}{\#\ \text{COMPONENTS}}$

$= \frac{(5.0 \text{ mm})^2}{1 \times 10^6} = 2.5 \times 10^{-5} \text{ mm}^2$

(43) # of EARTHS $= \frac{\text{Volume of SUN}}{\text{Volume of EARTH}}$

$= \frac{\frac{4}{3}\pi R_{SUN}^3}{\frac{4}{3}\pi R_{EARTH}^3} = \left(\frac{R_{SUN}}{R_{EARTH}}\right)^3$

$= \left(\frac{6.96 \times 10^8 \text{ m}}{6.37 \times 10^6 \text{ m}}\right)^3 \approx 1 \times 10^6$

(50) # lightbulbs = $\frac{\text{Sun's total power output}}{\text{bulb power output}}$

$$= \frac{\left(\text{Intensity of Sunlight at Earth}\right)\left(\text{Surface area of sphere surrounding Sun}\right)}{\left(\text{bulb power output}\right)}$$

$$= \frac{\left(\frac{10.100\ W}{m^2}\right)\left(4\pi (1.50\times10^{9}\ m)^2\right)}{100\ W}$$

$$= 2.83\times10^{20}\ \text{lightbulbs}$$

(58) Rate of fingernail growth
= Drift Rate

$$= \frac{3\ mm}{month} = \frac{3.0\times10^{-3}\ m}{month}$$

$$= \frac{3.0\times10^{-3}\ m}{month}\left(\frac{12\ months}{year}\right)$$

$$= \frac{3.6\times10^{-2}\ m}{year}$$

Age of Atlantic

$$= \frac{\text{Distance across Atlantic}}{\text{Drift rate}}$$

$$= \frac{3 \times 10^{6}\ m}{3.6 \times 10^{-2}\ m/\text{year}} \approx 83 \text{ million years}$$