# CHAPTER ONE SOLUTIONS

**1.3** Substituting in dimensions, we have

$$(T) = \sqrt{\frac{(L)}{(L/T^2)}} = \sqrt{T^2} = (T)$$

Thus, the dimensions are consistent.

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**1.7** (a) 78.9 ± 0.2 has 3 significant figures.
(b) $3.788 \times 10^9$ has 4 significant figures.
(c) $2.46 \times 10^{-6}$ has 3 significant figures.
(d) $0.0032 = 3.2 \times 10^{-3}$ has 2 significant figures.

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**1.23** Volume of cube = $L^3$ = 1 quart (Where $L$ = length of one side of the cube.)

Thus, $L^3 = (1 \text{ quart})\left(\frac{1 \text{ gallon}}{4 \text{ quarts}}\right)\left(\frac{3.786 \text{ liters}}{1 \text{ gallon}}\right)\left(\frac{1000 \text{ cm}^3}{1 \text{ liter}}\right) = 946.5 \text{ cm}^3$,

and $L = 9.82$ cm

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**1.25** (a) mass = (density)(volume) $= \left(\frac{1.0 \times 10^{-3} \text{ kg}}{1.0 \text{ cm}^3}\right)(1 \text{ m}^3)$

$= (1.0 \times 10^{-3} \text{ kg/cm}^3)(1 \text{ m}^3)\left(\frac{10^2 \text{ cm}}{1 \text{ m}}\right)^3 = 1000 \text{ kg}$

(b) As rough calculation, treat as if 100% water.

cell: mass = density x volume $= \left(\frac{10^3 \text{ kg}}{1 \text{ m}^3}\right)\frac{4}{3}\pi(0.5 \times 10^{-6} \text{ m})^3 = 5.2 \times 10^{-16}$ kg

kidney: mass = density x volume $= \left(\frac{10^3 \text{ kg}}{1 \text{ m}^3}\right)\frac{4}{3}\pi(4 \times 10^{-2} \text{ m})^3 = 0.27$ kg

fly: mass = density x vol = (density)$(\pi r^2 h)$

$= \left(\frac{10^3 \text{ kg}}{1 \text{ m}^3}\right)\pi(10^{-3} \text{ m})^2(4 \times 10^{-3} \text{ m}) = 1.3 \times 10^{-5}$ kg

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**1.26** number of pounds = (number of burgers)(weight/burger)

$= (5 \times 10^{10} \text{ burgers})(0.25 \text{ lb/burger}) = 1.25 \times 10^{10}$ lb

number of head of cattle = (weight needed)/(weight per head)

$= (1.25 \times 10^{10} \text{ lb})/(300 \text{ lb/head}) = 4.17 \times 10^7$ head

Assumptions are 0.25 lb of meat per burger and 300 lb of meat per head of cattle

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**1.29** The x coordinate is found as $x = r\cos\theta = (2.5 \text{ m})(\cos 35°) = 2.1$ m

and the $y$ coordinate is $y = r\sin\theta = (2.5 \text{ m})(\sin 35°) = 1.4$ m

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**1.34** (a) $\sin\theta = \dfrac{\text{side opposite}}{\text{hypotenuse}}$ so, side opposite = (sin 30.0°)(3.00 m) = 1.5 m.

(b) $\cos\theta = \dfrac{\text{adjacent side}}{\text{hypotenuse}}$ so, adjacent side = (cos 30.0°)(3.00 m) = 2.6 m.

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**1.48** The volume of oil equals $V = \dfrac{9.00 \text{ X } 10^{-7} \text{ kg}}{918 \text{ kg/m}^3} = 9.8 \text{ X } 10^{-10} \text{ m}^3$.

If the diameter of a molecule is $d$, then that same volume must equal $d(\pi r^2)$ = (thickness of slick)(area of oil slick) where $r$ = 0.418 m. Thus, $d = \dfrac{9.80 \text{ x } 10^{-10} \text{ m}^3}{\pi(0.418 \text{ m})^2} = 1.78 \text{ X } 10^{-9}$ m.