Estimate all of the values by expressing the following in Scientific Notation

(1) $1\ \text{tsubo} \times \frac{5124\ \text{sq.inches}}{1\ \text{tsubo}} \times \frac{6.452\ \text{square cm}}{1\ \text{sq. inch}} \times \frac{0.0001\ \text{m}^2}{1\ \text{square cm}} = 3.3\ \text{m}^2$

(2) $\frac{3.0 \times 10^8\ \text{m}}{\text{s}} \times \frac{60\ \text{s}}{\text{min}} \times \frac{60\ \text{min}}{\text{h}} \times \frac{24\ \text{h}}{\text{day}} \times 365.25\ \text{day} = 9.47 \times 10^{15}\ \text{m}$

(3) $1.0\ \text{g} \times \frac{0.0010\ \text{kg}}{1\ \text{g}} \times \frac{0.001\ \text{tonne}}{1\ \text{kg}} \times \frac{0.9842\ \text{long tons}}{1\ \text{tonne}} \times \frac{2240\ \text{pounds}}{\text{long ton}} \times \frac{16\ \text{ounces}}{\text{pound}} \times \frac{138.3\ \text{carats}}{\text{ounce}} = 4.9\ \text{carats}$

(4) $1\ \text{TB} \times \frac{1024\ \text{GB}}{\text{TB}} \times \frac{1024\ \text{MB}}{\text{GB}} \times \frac{1024\ \text{kB}}{1\ \text{MB}} \times \frac{1024\ \text{bytes}}{\text{kB}} \times \frac{8\ \text{bits}}{\text{byte}} = 8.8 \times 10^{12}\ \text{bits}$

(5) $F = \frac{2\text{kg}}{\text{s}} \times \frac{50\ \text{m}}{0.01\ \text{s}} = 1 \times 10^4\ \text{N}$

(6) $F = \frac{6.67 \times 10^{-11}\ \text{N m}^2}{\text{kg}^2} \times 1.67 \times 10^{-27}\ \text{kg} \times 9.11 \times 10^{-31}\ \text{kg} \times \frac{1}{1.00 \times 10^{-20}\ \text{m}^2} = 1.01 \times 10^{-47}\ \text{N}$

(7) $F = \frac{8.987 \times 10^9\ \text{N}\cdot\text{m}^2}{\text{C}^2} \times 10^2\ \text{C} \times 10^2\ \text{C} \times \frac{1}{100\ \text{m}^2} = 9.0 \times 10^4\ \text{N}$

(1) $\frac{2500\ \text{kg}}{\text{yr}} \times \frac{1}{10\ \text{m}} \times \frac{1}{10\ \text{m}} = \frac{25\ \text{kg}}{\text{m}^2\ \text{yr}}$

(2) $100\ \text{yd} \times \frac{0.914\ \text{m}}{\text{yd}} \times \frac{\text{s}}{27.8\ \text{m}} = 3.29\ \text{s}$

(3) $\frac{\text{min}}{72\ \text{beats}} \times \frac{\text{beat}}{70\ \text{mL}} \times \frac{1000\ \text{mL}}{\text{L}} \times \frac{0.946\ \text{L}}{\text{qt}} \times \frac{\text{qt}}{2\ \text{pt}} \times 57{,}000{,}000\ \text{pt} \times \frac{\text{h}}{60\ \text{min}} \times \frac{\text{day}}{24\ \text{h}} \times \frac{\text{y}}{365\ \text{day}} = 10.2\ \text{y}$

(4) $\frac{0.002\ \text{g}\ CO_2}{1\ \text{g tissue}\cdot\text{min}} \times \frac{\text{mol}\ CO_2}{48\ \text{g}\ CO_2} \times \frac{1 \times 10^6\ \mu\text{mol}}{\text{mol}} \times \frac{\text{min}}{60\ \text{s}} = \frac{0.7\ \mu\text{mol}\ CO_2}{\text{g tissue}\cdot\text{s}}$

(5) $\frac{\text{mL}}{5.00\ \text{mg}} \times \frac{0.300\ \text{mg}}{1.00\ \text{kg}} \times \frac{\text{kg}}{2.20\ \text{lb}} \times 125\ \text{lb} = 3.41\ \text{mL}$

(6) $\frac{8.00\ \text{mg calcium ions}}{\text{dL blood}} \times \frac{\text{dL}}{0.1\ \text{L}} \times \frac{0.946\ \text{L}}{\text{qt}} \times 6.00\ \text{qts blood} \times \frac{\text{g}}{1000\ \text{mg}} = 0.454\text{g calcium ions}$

(7) $\frac{\text{min}}{3.00\ \text{mL solution}} \times \frac{\text{mL solution}}{20.0\ \text{mg drug}} \times \frac{50.0\ \text{mg drug}}{\text{kg body wt}} \times 190\ \text{lb body wt.} \times \frac{0.454\ \text{kg}}{1.00\ \text{lb}} = 71.9\ \text{min}$

(1) $\frac{1.0\ \text{km}}{\text{s}} \times \frac{60\ \text{s}}{\text{min}} \times \frac{60\ \text{min}}{\text{hr}} \times \frac{24\ \text{hr}}{\text{day}} \times \frac{365\ \text{day}}{\text{y}} = \frac{3.1 \times 10^7\ \text{km}}{\text{y}}$

(2) $\frac{4.13\ \text{g}}{1.5\ \text{mL}} \times \frac{\text{mL}}{\text{cm}^3} = \frac{2.8\ \text{g}}{\text{cm}^3}$ *it is probably granite*

(3) $\frac{\text{y}}{1\ \text{in}} \times \frac{\text{in}}{2.54\ \text{cm}} \times \frac{100\ \text{cm}}{\text{m}} \times 1\ \text{m} = 39\ \text{y}$

(4) $93{,}000{,}000\ \text{miles} \times \frac{5280\ \text{ft}}{\text{mile}} \times \frac{12\ \text{in}}{\text{ft}} \times \frac{2.54\ \text{cm}}{\text{in}} = 1.4 \times 10^{13}\ \text{cm}$

(5) $\frac{12.4\ \text{g}}{1.64\ \text{cm}^3} \times \frac{1\text{cm}^3}{1\ \text{mL}} = \frac{7.56\ \text{g}}{\text{mL}}$ *galena* *galena will float in mercury*

$\frac{13{,}600\ \text{kg}}{\text{m}^3} \times \frac{\text{m}^3}{1.0 \times 10^6\text{cm}^3} \times \frac{1\ \text{cm}^3}{1\text{mL}} \times \frac{1000\text{g}}{\text{kg}} = \frac{13.6\text{g}}{\text{mL}}$ *mercury*

(6) $50\ \text{GL concrete} \times \frac{1 \times 10^9\ \text{L}}{\text{GL}} \times \frac{1000\ \text{cm}^3}{\text{L}} \times \frac{\text{m}^3}{1 \times 10^6\ \text{cm}^3} = 50{,}000{,}000\ \text{m}^3$ concrete

(7) $5.97 \times 10^{24}\ \text{kg} \times \frac{3}{4\pi(6378\ \text{km})^3} \times \frac{\text{km}}{1000\ \text{m}} \times \frac{\text{km}}{1000\ \text{m}} \times \frac{\text{km}}{1000\ \text{m}} \times \frac{\text{m}^3}{1.0 \times 10^6\text{cm}^3} \times \frac{1\ \text{cm}^3}{\text{mL}} \times \frac{1000\ \text{g}}{\text{kg}} = \frac{5.5\ \text{g}}{\text{mL}}$

(1) $\frac{21.4\ \text{g}}{1\ \text{mL}} \times \frac{1\ \text{mL}}{1\ \text{cm}^3} \times 5.90\ \text{cm}^3 = 126\ \text{g}$

(2) $1.67272 \times 10^{-27}\ \text{kg} \times \frac{1000\ \text{g}}{\text{kg}} \times \frac{1{,}000{,}000\ \mu\text{g}}{\text{g}} = 1.67272 \times 10^{-18}\ \mu\text{g}$

(3) $\frac{170\ \text{g}\ AgNO_3}{\text{mole}\ AgNO_3} \times \frac{1.00\ \text{mole}\ AgNO_3}{\text{L}} \times \frac{1\ \text{L}}{1\ \text{dm}^3} \times 2.00\ \text{dm}^3 = 340\ \text{g}\ AgNO_3$

(4) $\frac{58.4\ \text{g NaCl}}{\text{mole NaCl}} \times \frac{2.50\ \text{mole NaCl}}{\text{L}} \times \frac{\text{L}}{1000\ \text{mL}} \times 750\ \text{mL} = 110\ \text{g NaCl}$

(5) $\frac{\text{mole}\ MgCl_2}{95.1\ \text{g}\ MgCl_2} \times \frac{200.0\ \text{g}\ MgCl_2}{1.50 \times 10^3\ \text{cm}^3} \times \frac{1.00 \times 10^3\ \text{cm}^3}{\text{L}} = \frac{1.40\ \text{mole}\ MgCl_2}{\text{L}} = 1.40\ \text{M}$

(6) $\frac{15\ \text{g solute}}{100\ \text{g solution}} \times \frac{1.60\ \text{g}}{\text{cm}^3} \times \frac{\text{cm}^3}{\text{mL}} \times 300.0\ \text{mL solution} = 72.0\ \text{g solute}$

(7) $V = \frac{mass}{density}$ $\quad density = \frac{mass}{V}$ $\quad V_{wire} = V_{cylinder} = l(\pi r^2)$ $\quad V = l\pi r^2$ where l = length

$r = 8.25\ \text{mm} \times \frac{1\ \text{cm}}{10\ \text{mm}} \times \frac{1\ \text{inch}}{2.54\ \text{cm}} \times \frac{1\ \text{ft}}{12\ \text{inches}} = 0.0270\ \text{ft}$ $\qquad l = \frac{V}{\pi r^2} = \frac{mass}{density\ \pi r^2}$

$length = \frac{mass}{density\ \pi r^2} = 150\ \text{lb} \times \frac{\text{kg}}{2.20\ \text{lb}} \times \frac{1000\ \text{g}}{\text{kg}} \times \frac{\text{cm}^3}{8.94\ \text{g}} \times \frac{\text{in}^3}{16.4\ \text{cm}^3} \times \frac{\text{ft}^3}{1728\ \text{in}^3} \times \frac{1}{\pi \cdot 7.29 \times 10^{-4}\ \text{ft}^2} = 118\ \text{ft}$

(1) $\frac{112{,}000\ \text{miles}}{\text{s}} \times \frac{5280\ \text{ft}}{\text{mile}} \times \frac{12\ \text{in}}{\text{ft}} \times \frac{2.54\ \text{cm}}{\text{in}} = \frac{1.80 \times 10^{10}\ \text{cm}}{\text{s}}$

(2) $\frac{7500\ \text{cm}}{\text{s}} \times \frac{60\ \text{s}}{\text{min}} \times \frac{\text{m}}{100\ \text{cm}} \times \frac{\text{km}}{1000\ \text{m}} = \frac{4.5\ \text{km}}{\text{min}}$

(3) $\frac{70\ \text{miles}}{\text{h}} \times \frac{\text{h}}{60\ \text{min}} \times \frac{\text{min}}{60\ \text{s}} \times 1.5\ \text{s} \times \frac{5280\ \text{ft}}{\text{mile}} \times \frac{0.305\ \text{m}}{\text{ft}} = 47\ \text{m}$

(4) $\frac{1}{706\ \text{nm}} \times \frac{1.0 \times 10^9\ \text{nm}}{\text{m}} \times \frac{3.0 \times 10^8\ \text{m}}{\text{s}} = 4.2 \times 10^{14}\ \text{s}^{-1} = 4.2 \times 10^{14}\ \text{Hz}$

(5) $\frac{700\ \text{kg m}}{\text{s}^2} \times \frac{\text{s}^2}{9.80\ \text{m}} \times \frac{3.70\ \text{m}}{\text{s}^2} = \frac{264\ \text{kg m}}{\text{s}^2} = 264\ \text{N}$

(6) $\frac{3.0 \times 10^8\ \text{m}}{\text{s}} \times \frac{3600\ \text{s}}{\text{h}} \times \frac{24\ \text{h}}{\text{d}} \times \frac{365\ \text{d}}{\text{y}} \times 4.22\ \text{y} = 3.99 \times 10^{16}\ \text{m}$

(7) $\frac{11.2\ \text{km}}{\text{s}} \times 1.6 \times \frac{60\ \text{s}}{\text{min}} \times \frac{60\ \text{min}}{\text{h}} \times 1.0\ \text{h} = 6.5 \times 10^4\ \text{km}$