Basic Laboratory Techniques Pre-Lab Questions

1. length → meter
   mass → Kilogram
   volume → meter^3
   temp → Kelvin

2. a) M → 10^6
   b) k → 10^3
   c) m → 10^{-3}
   d) n → 10^{-9}
   e) μ → 10^{-6}

3. a) 351 g → 3
   b) .0100 mL → 3
   c) 1.010 mL → 4
   d) 3.72×10^{-3} cm → 3

4. $.250 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{10 \text{ mm}}{1 \text{ cm}} = 6.35 \text{ mm}$

5. a) $72.3 \text{ mg} \times \frac{10^{-3} \text{ g}}{1 \text{ mg}} = .0723 \text{ g}$

   b) $6.0 \times 10^{-10} \text{ m} \times \frac{1000 \text{ mm}}{1 \text{ m}} = 6.0 \times 10^{-7} \text{ mm}$

   c) $325 \text{ mm} \times \frac{10^{-3} \text{ m}}{1 \text{ mm}} \times \frac{1 \text{ nm}}{10^{-9} \text{ m}} = 3.250 \times 10^5 \text{ nm}$

6. 2.5 nm = 1 DNA length

   $6 \text{ ft} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{10^{-2} \text{ m}}{1 \text{ cm}} \times \frac{1 \text{ nm}}{10^{-9} \text{ m}} \times \frac{1 \text{ DNA}}{2.5 \text{ nm}} = 7.32 \times 10^8$ DNA strands

7. $3.70 \text{ L} \times \frac{10^3 \text{ cm}^3}{1 \text{ L}} = 3.70 \times 10^3 \text{ cm}^3 = 3.70 \times 10^3 \text{ mL}$

   $1 \text{ cm}^3 = 1 \text{ mL}$

8. Hot air convection currents = friction = weighs less

9. The markings are not very accurate

10. Precision has to do with the repeatability of measurements

11. $D = \frac{m}{V} = \frac{1.6663\ g}{.2009\ mL} = 8.280\ g/mL$

12. $\text{mean} = \frac{9.2 + 9.1 + 9.3}{3} = \boxed{9.2\ g}$

$|9.2 - 9.2| = 0$
$|9.1 - 9.2| = .1$
$|9.3 - 9.2| = .1$

$\text{average deviation} = \frac{0 + .1 + .1}{3}$

$= \boxed{.07\ g}$

13. $37.0^\circ C \rightarrow ?\ ^\circ F$

$\frac{9}{5}(37.0) + 32 = \boxed{98.6^\circ F}$

14. $D = \frac{m}{V}$ $\quad m = D \cdot V$

$= .930\ \frac{g}{mL} \times 750\ mL \times \frac{1\ kg}{10^3\ g} = \boxed{.70\ kg}$ (2 s.f.)

15. $\pm .0001\ g \Rightarrow 5.0000$ (5 s.f)