1. Calculate the following with your scientific calculator:

   (a) $(3.21 \times 10^{-4})(5.6 \times 10^{-2}) = 1.8 \times 10^{-5}$ (2 sig. figs.)

   (b) $\frac{1.2 \times 10^{5}}{5.21 \times 10^{-3}} = 2.3 \times 10^{7}$ (2 sig. figs.)

   (c) $-log(2.1 \times 10^{-7}) = 6.7$

   (d) $10^{-4.23} = 5.9 \times 10^{-5}$

2. The concentration of ethanol in gasoline is 0.22 M.

   (a) Calculate the molar mass of ethanol (C_2H_5OH).

   $2(12.0107\ \frac{g}{mol}) + 5(1.00794\ \frac{g}{mol}) + 15.9994\ \frac{g}{mol} + 1.00794\ \frac{g}{mol} = 46.0684\ \frac{g}{mol}$

   (b) Determine how many moles of ethanol are present in 1.0 L of gasoline.

   $(1\ L)(0.22\ \frac{mol}{L}) = 0.22\ mol$

   (c) Determine how many moles of ethanol are present in 15.0 mL of gasoline.

   $(0.22\ \frac{mol}{L})(15.0\ mL)(\frac{10^{-3}\ L}{1\ mL}) = 3.3 \times 10^{-3}\ mol$

   (d) Determine how many grams of ethanol are present in 15.0 mL of gasoline.

   $(3.3 \times 10^{-3}\ mol)(46.0684\ \frac{g}{mol}) = 0.15\ g$

3. Determine the number of grams of KCl in 350 mL of a 0.25 M solution of potassium chloride.

   Molar mass: $39.0983\ \frac{g}{mol} + 35.4527\ \frac{g}{mol} = 74.5510\ \frac{g}{mol}$

   $(350\ mL)(\frac{10^{-3}\ L}{1\ mL})(0.25\ \frac{mol}{L})(74.5510\ \frac{g}{mol}) = 6.5\ g$

4. Calculate the concentration (in M) of a salt solution that was prepared by adding water to 18.65 g of NaCl to give a final volume of 250.0 mL.

   $NaCl\ molar\ mass = 22.9898\ \frac{g}{mol} + 35.4527\ \frac{g}{mol} = 58.4425\ g/mol$

   $(18.65\ g\ NaCl)\left(\frac{1\ mol\ NaCl}{58.4425\ g\ NaCl}\right) = 0.3191\ mol\ NaCl$

   $\frac{0.3191\ mol\ NaCl}{(250.0\ mL\ soln)(10^{-3}\ L/mL)} = 1.276\ M$

5. 100.0 mL of a 0.22 M solution was diluted to 500.0 mL. What is the concentration of the new solution?

   $M_1V_1 = M_2V_2$

   $M_2 = \frac{M_1V_1}{V_2} = \frac{(0.22\ M)(100.0\ mL)}{500.0\ mL} = 0.044\ M$

6. If a solution is diluted, say by adding 100 mL of solvent, does the number of moles of solute change? Does the concentration increase, decrease, or stay the same?

   The number of moles stays the same (note: $M_1V_1 = moles$). The concentration decreases because you have the same number of moles of solute in a larger solution volume.