1) The first thing we need is to find the molar mass of NaCl. Using the periodic table, we find that Na is 22.99 and Cl is 35.453, so the molar mass is $58.443 \text{ g/mol}$. So for the first solution, we have \[ \frac{29 \text{ g}}{58.443 \text{ g/mol}} = 0.50 \text{ moles} \] (significant digits!) dissolved in 250 mL ($= 0.250 \text{ L}$) or \[ M = \frac{0.50 \text{ mole}}{0.250 \text{ L}} = 2.0 \text{ M} \]; for the second solution, we have \[ M = \frac{0.60 \text{ mole}}{0.200 \text{ L}} = 3.0 \text{ M} \]; thus the second solution is more concentrated.

2) For each pair of compounds given below, identify the more polar bonds, based on electronegativities. (I have bold-faced the correct answer)
   a) H-F vs. H-Cl
   b) N-H vs. O-H
   c) N-O vs. S-O
   d) C-H vs Si-H (but not by much!)

3) Provide the correct name for each formula and the correct formula for each name.
   a) NaHCO$_3$ → sodium bicarbonate
   b) lithium carbonate → Li$_2$CO$_3$
   c) Mg$_3$(PO$_4$)$_2$ → magnesium phosphate
   d) barium sulfate → BaSO$_4$
   e) calcium hypochlorite → Ca(OCl)$_2$

4) As long as X and Y are different elements, there is going to be an electronegativity difference and therefore a polar bond. Since two points define a line, a linear dipole requires a polar molecule. For example, H-Cl or H-I. In the case of a triatomic molecule, however, with the same assumption that X and Y are different, these three atoms can either line in a plane (and not be co-linear) e.g. H$_2$O (which is an example of a polar triatomic molecule fitting this description) or can be co-linear e.g. CO$_2$. The C=O bonds are certainly polar; however, the dipoles are equal in magnitude (= strength) and opposite in direction, thereby cancelling out, leading to a non-polar molecule. [You can have other examples, so long as they describe the phenomenon requested.]

5) If a soap looks like:
and detergents look like:

\[
\text{Detergents}
\]

then we have two very different ends to the molecules. Looking at them above, the left-hand ends look a lot like oil or grease i.e a hydrocarbon chain, whereas the right-hand end (the one with the Na\(^+\)) looks somewhat like a sodium carbonate (or sodium bicarbonate), sodium sulfate, or sodium phosphate ‘molecule’. Proceeding from the dictum that “like dissolves like”, the hydrocarbon end will dissolve in the grease (or vice versa) and the sodium end will dissolve in water. When the water is flushed away, the sodium end follows, dragging the rest of the molecule with it and along with that, some of the grease.