4.59a) The concentration of a solution is an intensive property, meaning concentration does not depend on how much solution you have (i.e. - dividing a solution in half does not change its concentration.

b) 0.50 mol HCl refers to the number of HCl molecules present; in this case 3.01 x 10^{23} molecules. In contrast, 0.50*M* HCl refers to the concentration of a solution; in this case 0.50 moles of molecules for every 1 liter of solution.

4.64

$$\frac{4.6\text{L} \mid 0.118 \text{ mol } Na^+}{\mid 1 \text{ L}} = 0.54 \text{ mol } Na^+$$

$$\frac{4.6\text{L} \mid 0.138 \text{ mol } Na^+}{\mid 1 \text{ L}} = 0.63 \text{ mol } Na^+$$

$$\frac{0.09 \text{ mol } Na^+ \mid 1 \text{ mol NaCl} \mid 58.5\text{g NaCl}}{\mid 1 \text{ mol } Na^+ \mid 1 \text{ mol NaCl}} = 5.27 \text{ NaCl}$$

Originally, the blood contained 0.54 moles of Na^+ ion. To correct the patient's sodium deficiency, it needs to contain 0.63 moles of Na^+ ion, or an additional 0.09 mole of Na^+ ion. Adding 5.27g NaCl will creating this change.

4.74a

$$M_iV_i = M_fV_f$$

$$6.0M \bullet X = 0.500M \bullet 100\ mL$$

$$X = 8.3\ mL$$

Steps:

1 - PPE

2 - partially fill a 100mL volumetric flask with distilled water

3 - add 8.3 mL of 6.0M HNO3 to the flask

4 - swirl to mix

5 - fill to the 100 mL line on the flask

4.74b

$$M_iV_i = M_fV_f$$

$$6.0M \bullet 10mL = X \bullet 250\ mL$$

$$X = 0.24M$$

4.80 $Cd(NO_3)_2 + 2NaOH \Rightarrow 2NaNO_3 + Cd(OH)_2$

$$\frac{35.0\ ml}{1} \left| \frac{1\ L}{1000\ ml} \right| \frac{0.500\ mol\ Cd(NO_3)_2}{1\ L} \left| \frac{2\ mol\ NaOH}{1\ mol\ Cd(NO_3)_2} \right| \frac{40.0\ g NaOH}{1\ mol\ NaOH}$$

$$= 1.40\ g\ NaOH$$

4.85

$$MeOH + HCl \Rightarrow MeCl + H_2O$$

$$\frac{17.0\ ml \mid 1\ L \mid 2.50\ mol\ HCl \mid 1\ mol\ MeOH}{\mid 1000\ ml \mid 1\ L \mid 1\ mol\ HCl} = 0.0425\ mol\ MeOH$$

$$\text{Mol Mass} = \frac{\text{Mass}}{\text{Moles}} = \frac{4.36\ g}{.0425\ mol} = 102.6\ g\ mol^{-1}$$

We know the base is a hydroxide of an alkali metal. As such, the metal must be bonded to one OH^- group. If the mass of the entire compound is 102.6 g mol^{-1} and the mass of OH^- is 17.0 g mol^{-1}, the metal must have a mass of 85.6 g mol^{-1}, making it Rubidium.