Perform the following calculations.

1) Calculate the volume (in mL) of 1.50 M NaCl solution required to provide 0.500 moles of NaCl.

Solve by using the concentration as a conversion factor to convert from moles to L, then convert from L to mL.

$1\ mL = 10^{-3}\ L \qquad 1.50\ mol\ NaCl = 1\ L$

$$0.500\ mol\ NaCl \times \frac{1\ L}{1.50\ mol\ NaCl} \times \frac{mL}{10^{-3}\ L} =$$

$$= \boxed{333\ mL\ of\ 1.50\ M\ NaCl}$$

2) Calculate the number of moles of KCl present in 125 mL of 0.250 M KCl solution.

Solve by converting mL to L, then using the concentration as a conversion factor to convert L to moles.

$1\ mL = 10^{-3}\ L \qquad 0.250\ mol\ KCl = 1\ L$

$$125\ mL \times \frac{10^{-3}\ L}{mL} \times \frac{0.250\ mol\ KCl}{1\ L} = \boxed{0.0313\ mol\ KCl}$$

3) Calculate the mass of 0.777 moles of KNO_3.

Use the formula weight to convert from moles to grams.

KNO_3 : K: 39.10 x 1
N: 14.01 x 1
O: 16.00 x 3
101.11 g KNO_3 = 1 mol KNO_3

$$0.777 \text{ mol } KNO_3 \times \frac{101.11 \text{ g } KNO_3}{1 \text{ mol } KNO_3} = 78.6 \text{ g } KNO_3$$

4) Calculate the number of moles present in 75.0 kg of $NaNO_3$.

First, convert kilograms to grams, then using the formula weight to convert from grams to moles.

$kg = 10^3 g$ $NaNO_3$: Na: 22.99 x 1
N: 14.01 x 1
O: 16.00 x 3
85.00 g $NaNO_3$ = 1 mol $NaNO_3$

$$75.0 \text{ kg } NaNO_3 \times \frac{10^3 \text{ g}}{\text{kg}} \times \frac{1 \text{ mol } NaNO_3}{85.00 \text{ g } NaNO_3} =$$

$$= 882 \text{ mol } NaNO_3$$