

1) ALL SUBSTANCES HAVE DIFFERENT BOILING POINTS. GASES CAN BE SEPARATED BY CONDENSING THE GAS WITH THE HIGHER BOILING POINT LEAVING THE OTHER SUBSTANCE STILL IN ITS GAS STATE.

2) PARTICLES ARE MORE SPREAD OUT IN A GAS.

$$13.25 \frac{\text{lbs}}{\text{gal}} \times \frac{1 \text{ gal}}{4 \text{ qts}} \times \frac{1.06 \text{ qt}}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1 \text{ kg}}{2.2 \text{ lbs}} \times \frac{1000 \text{ g}}{1 \text{ kg}} = 1.596 \frac{\text{g}}{\text{mL}}$$

3) 7.81% C = 7.81g C IN A 100g SAMPLE
92.19% Cl = 92.19g Cl

$$\frac{7.81 \text{ g C}}{1} \times \frac{1 \text{ mole C}}{12.01 \text{ g C}} = 0.65029 \text{ mole C}$$

$$\frac{92.19 \text{ g Cl}}{1} \times \frac{1 \text{ mole Cl}}{35.45 \text{ g Cl}} = 2.60056 \text{ mole Cl}$$

Dividing
Both
by Smallest
(0.65029)
Gives a 1:4 Ratio

EMPIRICAL
FORMULA

CCl₄

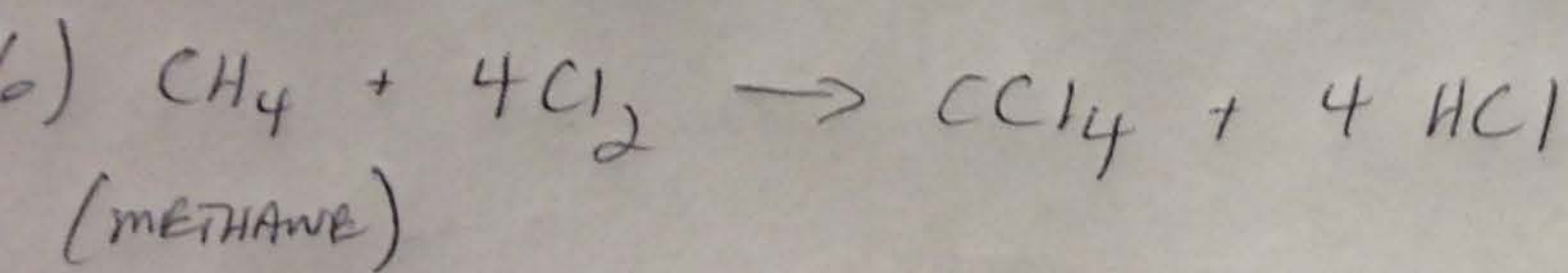
mass = 153.81

$$\text{EMPIRICAL MASS} = 153.81$$

$$\text{MOLECULAR MASS (GIVEN)} = 153.8$$

= 1:1 Ratio ∴ LIQUID IS CCl₄

5) HCl → DOESN'T CONTAIN C AND REACTS WITH METALS TO MAKE H₂(g)



7) CH₄ → PV = nRT

$$(1.30 \text{ atm})(210.5 \text{ L}) = n \left(0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mole} \cdot \text{K}} \right) / (298 \text{ K}) = 11.18 \text{ mole CH}_4$$

$$\text{Cl}_2 \rightarrow \frac{1000.2 \text{ L Cl}_2}{1} \times \frac{1 \text{ mole Cl}_2}{22.4 \text{ L Cl}_2} = 44.65 \text{ mole Cl}_2$$

SINCE I NEED CCl₄ TO ANSWER 8 I'LL GO THERE!

$$11.18 \text{ mole CH}_4 \times \frac{1 \text{ mole CCl}_4}{1 \text{ mole CH}_4} = 11.18 \text{ mole CCl}_4$$

$$44.65 \text{ mole Cl}_2 \times \frac{1 \text{ mole CCl}_4}{4 \text{ mole Cl}_2} = \boxed{11.16 \text{ mole CCl}_4}$$

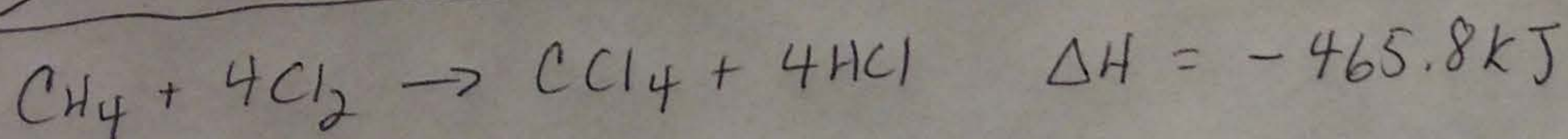
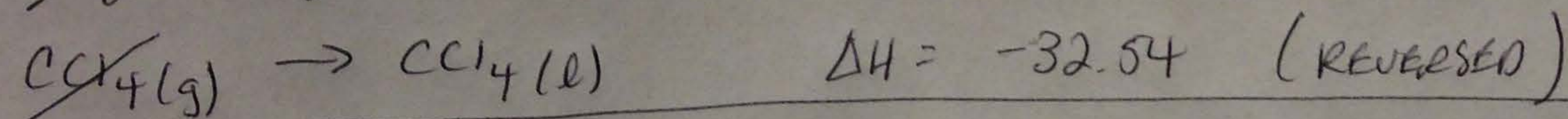
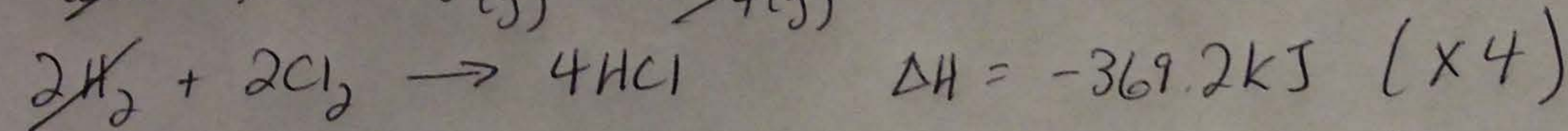
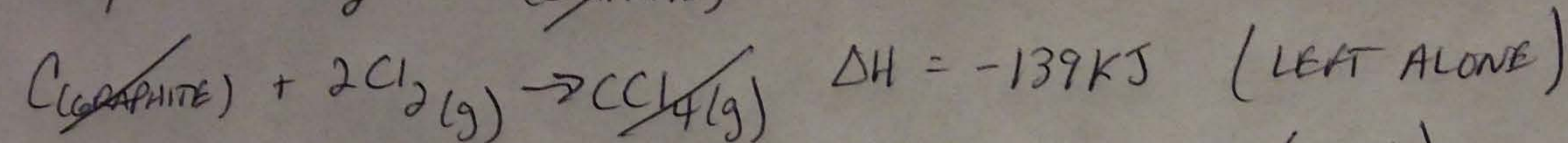
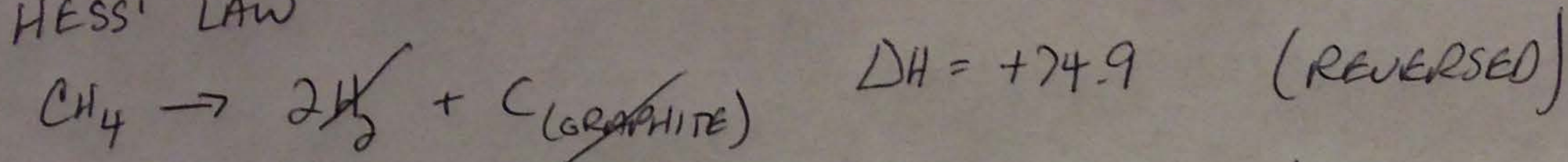
SO Cl₂ IS LIMITER!

$$8) 11.16 \text{ mL } \text{CCl}_4 \times \frac{153.8 \text{ g}}{1 \text{ mL } \text{CCl}_4} \times \frac{1 \text{ mL}}{1.596 \text{ g}} \times \frac{1 \text{ L}}{1000 \text{ mL}} = 1.075 \text{ L } \text{CCl}_4$$

$$7) 11.18 \text{ mL} - 11.16 \text{ mL} = 0.02 \text{ mL } \text{CCl}_4 \times \frac{1 \text{ mole } \text{CH}_4}{1 \text{ mole } \text{CCl}_4} = 0.02 \text{ mole } \text{CH}_4 \text{ EXCESS}$$

↑
NOT MADE

0) HESS' LAW



$$11) \frac{11.16 \text{ mole } \text{CCl}_4}{1} \times \frac{-465.8 \text{ KJ}}{1 \text{ mole } \text{CCl}_4} = -5198 \text{ KJ}$$

$$12) \Delta H_{\text{H}_2\text{O}} = +5198 \text{ KJ} \quad \Delta H = m c \Delta T$$

$$(5198 \text{ KJ}) \left(\frac{1000 \text{ J}}{1 \text{ KJ}} \right) = (1 \times 10^5 \text{ g}) \left(4.184 \frac{\text{J}}{\text{g}^\circ\text{C}} \right) (T_f - 0^\circ\text{C})$$

$$T_f = 12.42^\circ\text{C}$$

13) NEED MOLES OF HCl (g) SO...

$$\frac{44.65 \text{ mole } \text{Cl}_2}{1} \times \frac{4 \text{ mole } \text{HCl}}{4 \text{ mole } \text{Cl}_2} = 44.65 \text{ mole } \text{HCl}$$

$$+ 0.02 \text{ mole } \text{CH}_4$$

$$\hline 44.67 \text{ mole TOTAL}$$

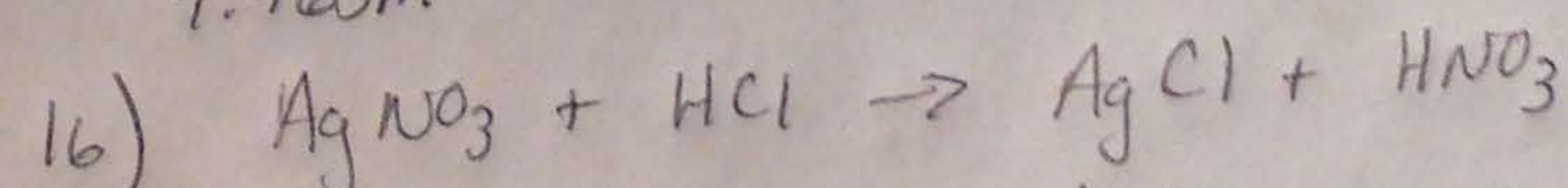
$$PV = nRT$$

$$P(2000 \text{ L}) = (44.67 \text{ mole}) \left(\frac{0.0821 \text{ L atm}}{\text{mole K}} \right) (453 \text{ K})$$

$$P = 0.831 \text{ atm}$$

$$14) \frac{44.65 \text{ mole } \text{HCl}}{1 \times 10^4 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}}} = 4.465 \text{ M}$$

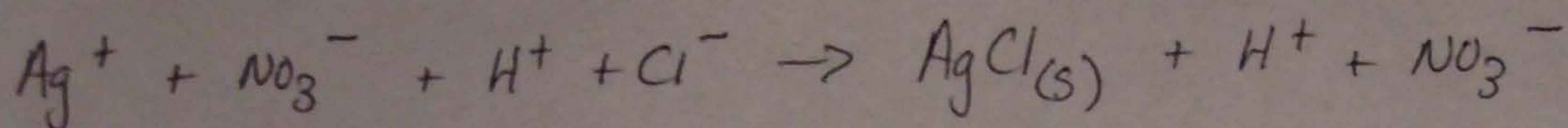
$$15) \frac{4.13 \text{ M}}{4.465 \text{ M}} \times 100\% = 92.4\%$$



$$\frac{5130 \text{ g } \text{AgNO}_3}{1} \times \frac{1 \text{ mole } \text{AgNO}_3}{169.88 \text{ g } \text{AgNO}_3} \times \frac{1 \text{ mole } \text{AgCl}}{1 \text{ mole } \text{AgNO}_3} \times \frac{143.32 \text{ g } \text{AgCl}}{1 \text{ mole } \text{AgCl}} = \boxed{4328 \text{ g } \text{AgCl}}$$

$$\frac{4.13 \text{ M } \text{HCl SOLN}}{1} \times \frac{10 \text{ L}}{1} \times \frac{1 \text{ mole } \text{AgCl}}{1 \text{ mole } \text{HCl}} \times \frac{143.32 \text{ g } \text{AgCl}}{1 \text{ mole } \text{AgCl}} = 5919 \text{ g } \text{AgCl}$$

7) IONIC EQUATION



SINCE AgNO_3 IS LIMITER AND ALL Ag IS IN AgCl , THEN THERE ARE ~~ARE~~ ON SILVER IONS

ALL OF H^+ IONS FROM HCl IS IN HNO_3 , SO H^+ CONCENTRATION DID NOT CHANGE.

$$\frac{4.13 \text{ M HCl}}{1} \times \frac{1 \text{ mole H}^+ \text{ ions}}{1 \text{ mole HCl}} = 4.13 \text{ M H}^+$$

Cl^- IS EXCESS SO...

$$5919 \text{ g AgCl} - 4328 \text{ g AgCl} = 1591 \text{ g AgCl NOT MADE FROM HCl}$$

$$\frac{1591 \text{ g AgCl}}{1} \times \frac{1 \text{ mole AgCl}}{143.32 \text{ g AgCl}} \times \frac{1 \text{ mole HCl}}{1 \text{ mole AgCl}} \times \frac{1}{10 \text{ L}} = 1.11 \text{ M HCl} \times \frac{1 \text{ mole Cl}^-}{1 \text{ mole HCl}} = 1.11 \text{ M Cl}^-$$

↑
SOLUTION

NO_3^- CAME FROM AgNO_3

$$\frac{5130 \text{ g AgNO}_3}{1} \times \frac{1 \text{ mole AgNO}_3}{169.88 \text{ g AgNO}_3} \times \frac{1 \text{ mole NO}_3^-}{1 \text{ mole AgNO}_3} \times \frac{1}{10 \text{ L}} = 3.02 \text{ M NO}_3^-$$