

Name: Kry Number: _____ Class: _____ Date: 18 pts

1. Complete the chart

Compound	Molar Mass (g/mol)	Mass of Solute (g)	Moles of Solute	Volume of solution	Molarity (M)
HCl	36.46	26.0	0.71	600 mL	1.18
H ₂ SO ₄	98.07	62.0	0.63	1.00 L	0.63
H ₃ PO ₄	98.00	75.0	0.77	0.750 L	1.03
CaO	56.08	48.0	0.86	0.250 L	3.44
NaOH	40.00	80.0	2.00	0.606 L	3.30
KOH	56.11	25.20	0.450	0.549 L	0.82
Al ₂ (SO ₄) ₃	342.17	171.09	0.500	1.00 L	0.500
K ₂ Cr ₂ O ₇	294.18	88.25	0.300	375 mL	0.800

2. Complete the chart

Compound	Molar Mass (g/mol)	Mass of Solute (g)	Moles of Solute	Mass of solvent (kg)	Molality (m)
HC ₂ H ₃ O ₂	60.05	100	1.67	1.20	1.39
Mg(OH) ₂	58.33	25.0	0.43	0.10	4.30
HBr	80.91	80.10	0.990	0.50	1.98
Na ₂ CrO ₄	161.98	22.0	0.136	0.34	0.400
KMnO ₄	158.04	118.53	0.75	2.50	0.30
CuNH ₄ (NO ₃) ₃	267.163	125.0	0.467	1.24	0.375
NaHCO ₃	84.01	126.02	1.50	2.86	0.525
(NH ₄) ₂ SO ₄	132.17	66.09	0.500	0.525	0.952

3. If I make a solution by adding 83.0 grams of sodium hydroxide to 750 mL of water. What is the mass percent of sodium hydroxide in this solution?

83.0g NaOH
750 mL H₂O
x = mass %

$$\frac{83.0}{833} \times 100 = 9.96\% \text{ NaOH}$$

4. How many grams of LiOH are needed to make a 25 g of a 4% solution?

x = g LiOH
25g solution
4% solution

$$4 = \frac{x}{25} \times 100$$

$$0.04 = \frac{x}{25}$$

$$x = 1.00 \text{ g LiOH}$$

5. An 800 g solution of Kool-Aid contains 780 g of water. What is the mass percent of solute in this solution?

800g solution
780g H₂O
mass % = x
20g solute

$$\frac{20}{800} \times 100 = 2.50\%$$

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6. If a 4000 g solution of salt contains 40 g of salt, what is its mass percent?

4000g solution
40g NaCl
x = mass %

$$\frac{40}{4000} \times 100 = 1.00\% \text{ NaCl}$$

7. A solution of 1.00 M NaCl is available. How many milliliters of this solution are needed to make a total of 100 mL of 0.70 M NaCl solution?

1.00 M NaCl = M_1
x = mL solution = V_1
100. mL NaCl = V_2
0.70 M = M_2

$$1.00(x) = 0.70(100.0)$$

$$x = 70$$

$$x = 70.00 \text{ mL}$$

8. You have 5.00 mL of a solution labeled 6.00 M HCl and you add enough water to give a total volume of 14.00 mL. What is the concentration of the new solution.

$V_1 = 5.00 \text{ mL}$
 $M_1 = 6.00 \text{ M}$
 $V_2 = 14.00 \text{ mL}$
 $M_2 = x$

$$(6.00)(5.00) = 14.00 x$$

$$30.00 = 14.00 x$$

$$x = 2.14 \text{ M}$$

9. Concentrated HCl is 12 M. What volume of 12 M solution is needed to make 2 L of 1.00 M HCl solution?

$V_1 = x$
 $M_1 = 12 \text{ M}$
 $M_2 = 1.0$
 $V_2 = 2 \text{ L}$

$$12x = (1.0)(2)$$

$$x = 0.167 \text{ L or } 166.67 \text{ mL}$$

10. How would you prepare 25 mL of 0.010 M NaCl starting with 0.500 M NaCl solution?

$V_1 = 25 \text{ mL}$
 $M_1 = 0.010 \text{ M}$
 $V_2 = x$
 $M_2 = 0.500 \text{ M}$

$$(0.010)(25) = (0.500)x$$

$$0.25 = 0.500 x$$

$$x = 0.50 \text{ mL}$$

11. What mass of NaOH is needed to Precipitate the Cd^{+2} ions from 35.0 mL of 0.500 M $\text{Cd}(\text{NO}_3)_2$ solution?

x = g NaOH
 $V = 35.0 \text{ mL } \text{Cd}(\text{NO}_3)_2$
 $M = 0.500 \text{ M } \text{Cd}(\text{NO}_3)_2$

② $0.500 = \frac{x}{0.035}$
 $x = 0.0175 \text{ mol } \text{Cd}(\text{NO}_3)_2$
③ limiting

④ $1 \text{ mol } \text{Cd}(\text{NO}_3)_2 = 2 \text{ mol NaOH}$
 $0.0175 = 0.035$

⑤ $0.035 \text{ mol} \left| \frac{40.0 \text{ g NaOH}}{1 \text{ mol NaOH}} \right| = 1.40 \text{ g NaOH}$

add volume of NaOH

12. 50.0 mL of 0.100 M Na_3PO_4 is mixed with 150.0 mL of 0.250 M $\text{Pb}(\text{NO}_3)_2$ to produce a solid precipitate of lead (II) phosphate. What mass of this precipitate will be produced?

x = g $\text{Pb}_3(\text{PO}_4)_2$
 $V_1 = 50 \text{ mL } \text{Na}_3\text{PO}_4$
 $M_1 = 0.100 \text{ M } \text{Na}_3\text{PO}_4$
 $V_2 = 150.0 \text{ mL } \text{Pb}(\text{NO}_3)_2$
 $M_2 = 0.250 \text{ M } \text{Pb}(\text{NO}_3)_2$

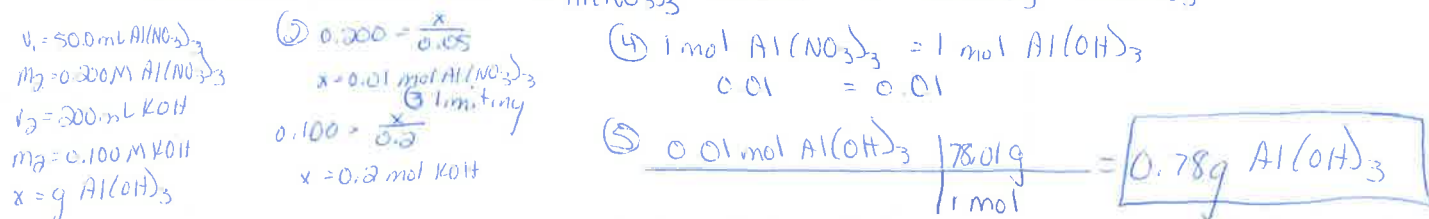
② $0.100 = \frac{x}{0.05}$
 $x = 0.005 \text{ mol } \text{Na}_3\text{PO}_4$
③ limiting
 $0.250 = \frac{x}{0.150}$
 $x = 0.0375 \text{ mol } \text{Pb}(\text{NO}_3)_2$

④ $2 \text{ mol } \text{Na}_3\text{PO}_4 = 1 \text{ mol } \text{Pb}_3(\text{PO}_4)_2$
 $0.01 = 0.005 \text{ mol}$

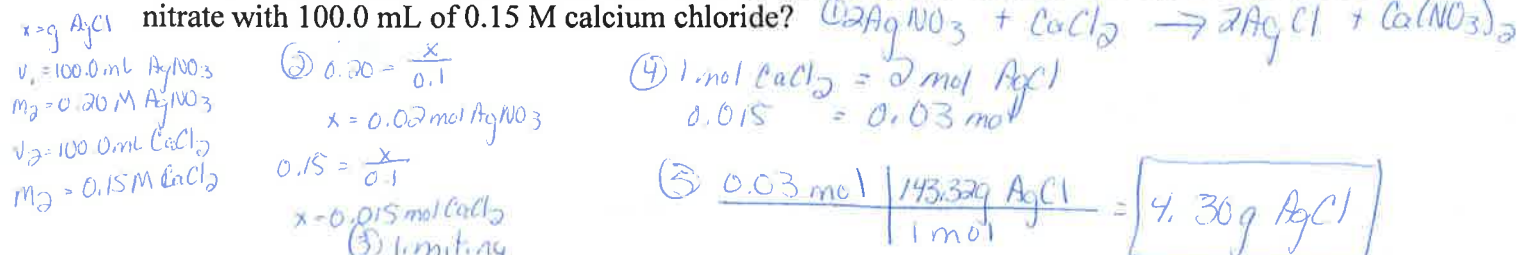
⑤ $0.005 \text{ mol} \left| \frac{813.74 \text{ g}}{1 \text{ mol}} \right| = 4.07 \text{ g } \text{Pb}_3(\text{PO}_4)_2$

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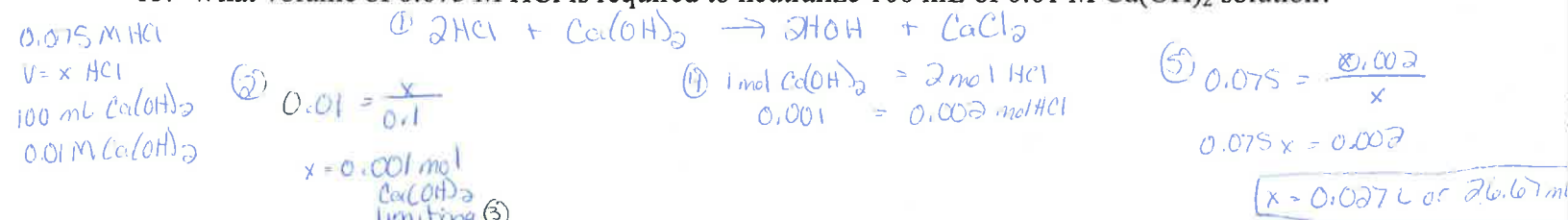
13. What mass of solid aluminum hydroxide is produced when 50.0 mL of 0.200 M $\text{Al}(\text{NO}_3)_3$ is added to 200.0 mL of 0.100 M KOH?



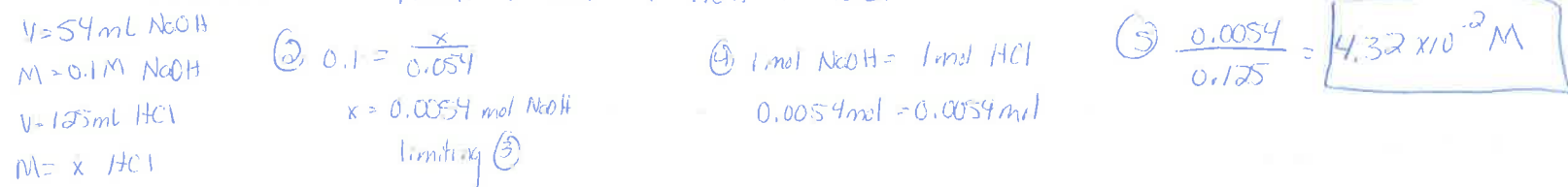
14. How many grams of silver chloride can be prepared by the reaction of 100.0 mL of 0.20 M silver nitrate with 100.0 mL of 0.15 M calcium chloride?



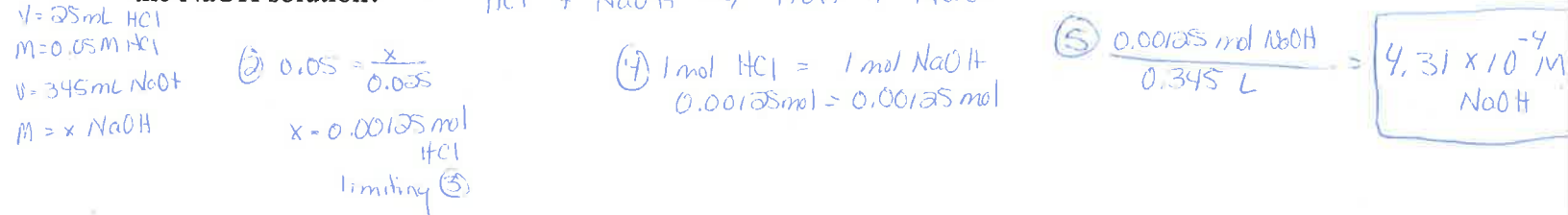
15. What volume of 0.075 M HCl is required to neutralize 100 mL of 0.01 M $\text{Ca}(\text{OH})_2$ solution?



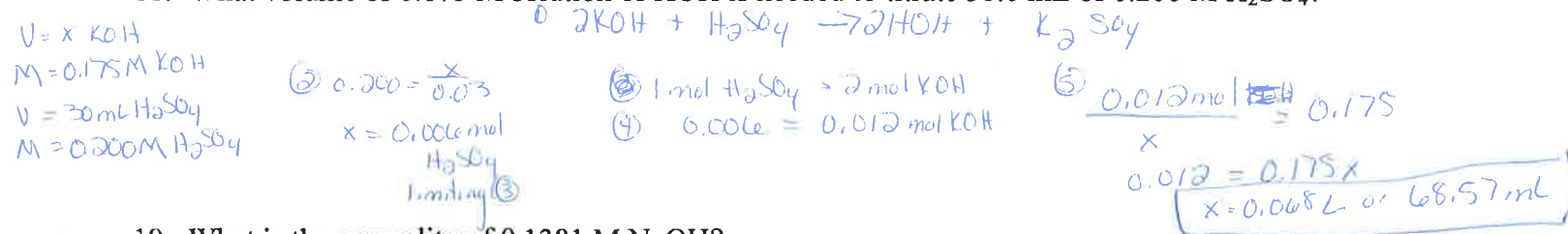
16. If it takes 54 mL of 0.1 M NaOH to neutralize 125 mL of an HCl solution what is the concentration of the HCl?



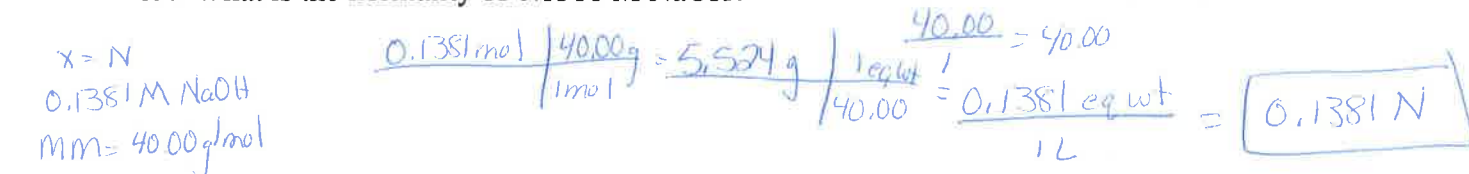
17. If it takes 25 mL of 0.05 M HCl to neutralize 345 mL of NaOH solution, what is the concentration of the NaOH solution?



18. What volume of 0.175 M solution of KOH is needed to titrate 30.0 mL of 0.200 M H_2SO_4 ?



19. What is the normality of 0.1381 M NaOH?



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20. What is the normality of 0.0521 M H_3PO_4 ?

$x = N$
 0.0521 M
 $\text{mm} = 96.99$
 1 L

$$0.0521 = \frac{x}{1 \text{ L}}$$

$$x = 0.0521 \text{ mol} \times \frac{96.99 \text{ g}}{1 \text{ mol}} = 5.05 \text{ g} \times \frac{1 \text{ eq. wt}}{48.50 \text{ g}} = 0.10 \text{ eq. wt} \times \frac{0.10}{1 \text{ L}} = \boxed{0.10 \text{ N}}$$

$$\frac{96.99}{2} = 48.50 \text{ g/eq. wt}$$

21. Calculate the normality of 6.32 g of $\text{Ca}(\text{OH})_2$ in 5.85 L of solution.

$6.32 \text{ g Ca}(\text{OH})_2$
 5.85 L
 $x = N$
 $\text{mm} = 74.10 \text{ g/mol}$

$$\frac{74.10}{2} = 37.05 \text{ eq. wt}$$

$$\frac{6.32 \text{ g}}{37.05 \text{ g}} = 0.17 \text{ eq. wt}$$

$$\frac{0.17}{5.85} = \boxed{0.03 \text{ N}}$$

or $2.91 \times 10^{-2} \text{ N}$

22. Calculate the normality of 94.21 g of $\text{Al}(\text{OH})_3$ in 2.0 L of solution.

$94.21 \text{ g Al}(\text{OH})_3$
 2.0 L
 $x = N$
 $\text{mm} = 78.01$

$$\frac{78.01}{3} = 26.00 \text{ g/eq. wt}$$

$$\frac{94.21 \text{ g}}{26.00 \text{ g}} = 3.62 \text{ eq. wt}$$

$$\frac{3.62}{2.0} = \boxed{1.81 \text{ N Al}(\text{OH})_3}$$

Home work

- Complete 4 compounds for questions 1 + 2^M
- Complete 2 questions from each of the following groups^m

- 3 - 6 = mass %

- 7 - 10 = dilution

- 11 - 14 = solution stoic.

- 15 - 18 = Acid-base

- 19 - 22 = Normality