

Acid Base Review Sheet

Molarity Calculations

molar mass  
 $2 \text{ Na} \times 22.99$   
 $1 \text{ S} \times 32.07$   
 $4 \text{ O} \times 16.00$   


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 $142.05 \text{ g/mol}$

1. Explain how to make 2L of a 0.25M Na<sub>2</sub>SO<sub>4</sub> solution from solid Na<sub>2</sub>SO<sub>4</sub>. Include calculations and description of what you would actually do.

$$? \text{ g Na}_2\text{SO}_4 = 2 \text{ L} \times \frac{0.25 \text{ mol Na}_2\text{SO}_4}{1 \text{ L}} \times \frac{142.05 \text{ g Na}_2\text{SO}_4}{1 \text{ mol Na}_2\text{SO}_4} = 71.025 \text{ g Na}_2\text{SO}_4$$

1. mass out 71.025g Na<sub>2</sub>SO<sub>4</sub> on a balance
2. Put Na<sub>2</sub>SO<sub>4</sub> into a 2L volumetric flask
3. Add water to flask until the 2L mark is reached
4. shake to mix and Enjoy!

2. What volume of a 2.5M solution can be made from 18.5 g of lithium fluoride?

$$? \text{ L LiF} = 18.5 \text{ g LiF} \times \frac{1 \text{ mol LiF}}{25.94 \text{ g LiF}} \times \frac{1 \text{ L}}{2.5 \text{ mol LiF}} = \boxed{0.285 \text{ L}} \text{ of solution}$$

285 mL

3. Calculate the concentration of a solution made with 120 g of calcium nitrate in 240mL of solution.

$$? \text{ M Ca(NO}_3)_2 = 120 \text{ g Ca(NO}_3)_2 \times \frac{1 \text{ mol Ca(NO}_3)_2}{164.10 \text{ g Ca(NO}_3)_2} \times \frac{1}{0.240 \text{ L}} = \boxed{3.05 \text{ M Ca(NO}_3)_2}$$

pH Calculations:

4. Complete the following table:

Substance	[H <sup>+</sup> ]	[OH <sup>-</sup> ]	pH	pOH	Acid, Base or Neutral
A	1 X 10 <sup>-8</sup>	1 x 10 <sup>-6</sup>	8	6	Base
B	5.0 x 10 <sup>-9</sup>	1.99 x 10 <sup>-6</sup>	8.30	5.7	Base
C	3.24 x 10 <sup>-5</sup>	3.1 x 10 <sup>-10</sup>	4.49	9.51	Acid
D	6.31 x 10 <sup>-11</sup>	1.58 x 10 <sup>-4</sup>	10.2	3.8	Base
E	7.94 x 10 <sup>-8</sup>	1.26 x 10 <sup>-7</sup>	7.1	6.9	Base

5. Rank the substances in question number 6 from most basic to most acidic.

most Basic most Acidic  
 D, B, A, E, C

6. Explain the differences between concentrated and dilute, weak and strong. You can draw pictures or give examples to support your reasoning.

- Concentrated means a high molarity (like over 6M) it has a large amount of moles of solute in a liter of solution. Dilute means a low molarity
- Strong means fully dissociated like  $\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-$ , weak means that it does not completely split apart. you can be concentrated and weak or dilute and strong.

7. Calculate the pH of a solution containing 0.34 moles of nitric acid in 0.735 L of solution.

$$? \text{ M HNO}_3 = \frac{0.34 \text{ moles HNO}_3}{0.735 \text{ L}} = 0.463 \text{ M HNO}_3$$

$$0.463 \text{ M HNO}_3 = 0.463 \text{ M [H}^+]$$

$$\text{pH} = -\log 0.463 \text{ M} = \boxed{0.334}$$

8. a.) Calculate the  $\text{OH}^-$  and  $\text{H}_3\text{O}^+$  concentration of a 0.013M solution of lithium hydroxide.

$$? \text{ M OH}^- = 0.013 \text{ M LiOH} \times \frac{1 \text{ M OH}^-}{1 \text{ M LiOH}} = 0.013 \text{ M OH}^-$$

$$[\text{H}_3\text{O}^+] \times [\text{OH}^-] = 1 \times 10^{-14}$$

$$[\text{H}_3\text{O}^+] = \frac{1 \times 10^{-14}}{0.013 \text{ M}} = 7.69 \times 10^{-13} \text{ M [H}_3\text{O}^+]$$

b.) What is the pH and pOH of the solution?

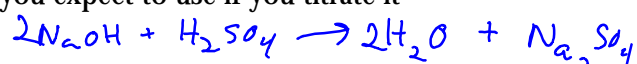
$$\text{pH} = -\log [\text{H}_3\text{O}^+] = -\log 7.69 \times 10^{-13} = \boxed{12.11}$$

$$\text{pOH} = -\log [\text{OH}^-] \text{ or } 14 - 12.11 = \boxed{1.89}$$

\* Calculations 7 & 8 are not stressed on test \*

Titration Calculations:

9. How many milliliters of a 5.45M NaOH solution would you expect to use if you titrate it to the endpoint with 50mL of a 6.0M solution of  $\text{H}_2\text{SO}_4$ ?



$$? \text{ mL NaOH} = 0.050 \text{ L H}_2\text{SO}_4 \times \frac{6.0 \text{ moles H}_2\text{SO}_4}{1 \text{ L}} \times \frac{2 \text{ mol NaOH}}{1 \text{ mol H}_2\text{SO}_4} \times \frac{1 \text{ L}}{5.45 \text{ mol NaOH}} = \boxed{0.11 \text{ L NaOH}}$$

$$= \boxed{110 \text{ mL NaOH}}$$

10. If 15 mL of a solution of hydrochloric acid are placed in a flask and titrated with 28.5 mL of a 4.0M calcium hydroxide solution, what is the concentration of the acid?

$$? \text{ M HCl} = 0.0285 \text{ L Ca(OH)}_2 \times \frac{4.0 \text{ mol Ca(OH)}_2}{1 \text{ L}} \times \frac{2 \text{ mol HCl}}{1 \text{ mol Ca(OH)}_2} \times \frac{1}{0.015 \text{ L}} = \boxed{15.2 \text{ M HCl}}$$

