

ACID BASE HANDOUT 1

NAME: PRINT _____

First Letter of Last Name [_]

1. Arrhenius Concept:

Acids are substances that when dissolved in water increases the concentration of H_3O^+ ions. Bases are substances that increase the concentration of OH^- ions.

2) Bronsted-Lowry Concept:

Acids are substances that donate a proton to another substance

Bases are substances that accept a proton to another substance

3) Name the following acids: HF , H_2CO_3 , H_3PO_4 , H_2SO_4 , H_2SO_3 ,

Hydrofluoric Acid, Carbonic Acid, Phosphoric Acid, Sulfuric Acid, Sulfurous Acid

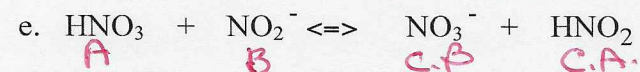
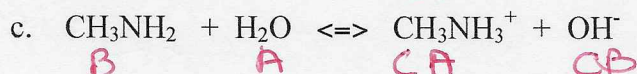
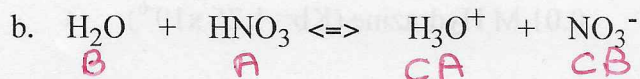
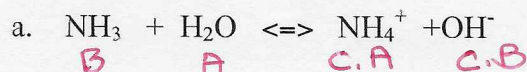
Name the following salts: Na_2CO_3 , $NaHCO_3$, $KHSO_3$, and NaH_2PO_4

Sodium Carbonate Sodium Bicarbonate
Potassium Hydrogen Sulfite, Sodium dihydrogen phosphate

What are the parent acids and bases of the above salts?

Carbonic(2) Sulfurous(1), Phosphoric Acid

4) Identify the two conjugate acid-base pairs:



5) Conjugate Pairs:

Write the conjugate acids for each of the following: Cl^- , HCl HSO_4^- , H_2SO_4 CN^- , H-CN

Write the conjugate base for each of the following: H_2O , OH^- H_2CO_3 , HCO_3^- H_3PO_4 , $H_2PO_4^-$

Given: HCN and HCl

a) Which is the strong acid and write a chemical equation to show that it is a strong acid.



b. Which is a weak acid and write the chemical equation to express this.



5. Decide which species are favored at the completion of the following reaction:



W.B. Strong Acid

6) What is the $[H^+]$ and $[OH^-]$ in a solution whose pH = 4.40 and what is the pOH?

$$[H^+] = 10^{-4.40} = 3.98 \times 10^{-5}$$

$$pOH = 14 - 4.40 = 9.6$$

$$[OH^-] = 10^{-9.6} = 2.5 \times 10^{-10}$$

7. What is the pH of a 0.02 M nitric acid solution

strong Acid $[H^+] = 0.02$ $pH = -\log[0.02] = 1.70$

8. Calculate the $[H^+]$ /pH and $[OH^-]$ /pOH for 0.015 M HBr, (assume 100% dissociation)

$$1.82$$

0.02 M NaOH.

$$pOH = 1.70 \rightarrow pH = 12.30$$

0.02 M $Ba(OH)_2$. (assume 100% dissociation)

(2 OH^-)
 $pOH = 1.40 \rightarrow pH = 12.6$

0.03 M H_2SO_4 (2 protons)

$$pH = -\log(0.06) = 1.22$$

9) What is the H_3O^+ and pH concentration in a solution labeled:

0.1 M HClO, Hypochlorous acid ($K_a = 3.0 \times 10^{-8}$)

$$pH = \frac{1}{2}(7.52 - \log(0.1))$$

$$= 4.26$$

0.1M $HC_2H_3O_2$, Acetic Acid ($K_a = 1.8 \times 10^{-5}$)

$$pH = \frac{1}{2}(4.74 - \log(0.1))$$

$$= 2.87$$

0.1 M $NH_3(aq)$, Ammonia Solution ($K_b = 1.8 \times 10^{-5}$)

$$pOH = \frac{1}{2}(4.74 - \log(0.1))$$

$$= 2.87 \Rightarrow pH = 11.13$$

0.01 M Hydrazine ($K_b = 1.26 \times 10^{-6}$)

$$pOH = \frac{1}{2}(5.90 - \log(0.01))$$

$$pOH = 3.95$$

$$pH = 10.05$$

ACID	FORMULA	K_a	pK_a
acetic acid	$H(C_2H_3O_2)$	1.74×10^{-5}	4.76
butanoic acid	$H(C_4H_7O_2)$	1.48×10^{-5}	4.83
formic acid	$H(CHO_2)$	1.78×10^{-4}	3.75
heptanoic acid	$H(C_7H_{13}O_2)$	1.29×10^{-5}	4.89
hexanoic acid	$H(C_6H_{11}O_2)$	1.41×10^{-5}	4.84
hydrocyanic acid	HCN	6.17×10^{-10}	9.21
hydrofluoric acid	HF	6.31×10^{-4}	3.2
lactic acid	$H(C_3H_5O_3)$	8.32×10^{-4}	3.08
nitrous acid	HNO_2	5.62×10^{-4}	3.25
propanoic acid	$H(C_3H_5O_2)$	1.38×10^{-5}	4.86
uric acid	$H(C_5H_3N_4O_3)$	1.29×10^{-4}	3.89

BASE	FORMULA	K_b	pK_b
alanine	$C_3H_5O_2NH_2$	7.41×10^{-5}	4.13
ammonia (water)	$NH_3 (NH_4OH)$	1.78×10^{-5}	4.75
dimethylamine	$(CH_3)_2NH$	4.79×10^{-4}	3.32
ethylamine	$C_2H_5NH_2$	5.01×10^{-4}	3.3
glycine	$C_2H_3O_2NH_2$	6.03×10^{-5}	4.22
hydrazine	N_2H_4	1.26×10^{-6}	5.9
methylamine	CH_3NH_2	4.27×10^{-4}	3.37
trimethylamine	$(CH_3)_3N$	6.31×10^{-5}	4.2