

## Strengths of Acids and Bases Worksheet

 Name: Key  
 Date:  
 Block:

 1. For the following, determine which species would have the **higher**  $[H_3O^+]$  in water:
a) 10.0 M HClO<sub>4</sub> or 1.0 M HClO<sub>4</sub>c) 1.0 M HIO<sub>3</sub> or 1.0 M H<sub>2</sub>SO<sub>3</sub>b) 10.0 M HClO<sub>4</sub> or 10.0 M HNO<sub>2</sub>d) 1.0 M NH<sub>4</sub><sup>+</sup> or 1.0 M HF

2. Which is the stronger acid?

a) HSO<sub>3</sub><sup>-</sup> or HC<sub>2</sub>O<sub>4</sub>b) HSO<sub>3</sub><sup>-</sup> or HSO<sub>4</sub><sup>-</sup>c) HPO<sub>4</sub><sup>2-</sup> or HSO<sub>3</sub><sup>-</sup>

3. Which is the stronger base?

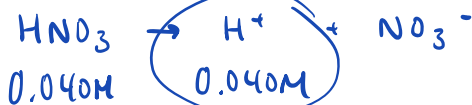
a) HPO<sub>4</sub><sup>2-</sup> or HSO<sub>3</sub><sup>-</sup>b) HSO<sub>3</sub><sup>-</sup> or HSO<sub>4</sub><sup>-</sup>c) HCO<sub>3</sub><sup>-</sup> or HCOO<sup>-</sup>?

4. Classify each of the following as: a strong acid (SA), weak acid (WA), strong base (SB), weak base (WB) or a spectator ion (S).

a)	F <sup>-</sup>	<u>WB</u>	f)	Cl <sup>-</sup>	<u>S</u>
b)	HIO <sub>3</sub>	<u>WA</u>	g)	NH <sub>3</sub>	<u>WB</u>
c)	NO <sub>3</sub> <sup>-</sup>	<u>S</u>	h)	O <sup>2-</sup>	<u>SB</u>
d)	HClO <sub>4</sub>	<u>SA</u>	i)	CH <sub>3</sub> COOH	<u>WA</u>
e)	C <sub>2</sub> O <sub>4</sub> <sup>2-</sup>	<u>WB</u>	j)	ClO <sub>4</sub> <sup>-</sup>	<u>S</u>

 5. What is the  $[H_3O^+]$  in a solution made by adding 0.020 moles of nitric acid to 500.mL of water?

$$[HNO_3] = \frac{0.020 \text{ mol}}{0.500 \text{ L}} = 0.040 \text{ M}$$



6. For the following combinations, determine which species will donate a proton:

a) HSO<sub>3</sub><sup>-</sup> and HC<sub>2</sub>O<sub>4</sub>b) HSO<sub>4</sub><sup>-</sup> and HC<sub>6</sub>H<sub>5</sub>O<sub>7</sub><sup>2-</sup>c) HSO<sub>3</sub><sup>-</sup> and HC<sub>6</sub>H<sub>5</sub>O<sub>7</sub><sup>2-</sup>

7. For the following combinations, determine which species will accept a proton:

a) HCO<sub>3</sub><sup>-</sup> and HC<sub>2</sub>O<sub>4</sub><sup>-</sup>b) HS<sup>-</sup> and NO<sub>2</sub><sup>-</sup>c) H<sub>2</sub>SO<sub>4</sub> and HPO<sub>4</sub><sup>2-</sup>

8. a) Write the balanced equation which describes the equilibrium present when 0.1 M  $\text{H}_2\text{SO}_3$  is mixed with 0.1 M  $\text{NO}_2^-$ .



- b) For this reaction, equilibrium tends to favour the (~~reactants~~/products) and the value of  $K_{\text{eq}}$  is (<1, >1 or about =1)

9. a) Write the balanced equation which describes the equilibrium present when 0.1 M  $\text{HSO}_3^-$  is mixed with 0.1 M  $\text{HC}_2\text{O}_4^-$ .



- b) For this reaction, equilibrium tends to favour the (~~reactants~~/products) and the value of  $K_{\text{eq}}$  is (<1, >1 or about =1)

10. a) Write the balanced equation which describes the equilibrium present when 0.1 M  $\text{HPO}_4^{2-}$  is mixed with 0.1 M  $\text{H}_2\text{C}_6\text{H}_5\text{O}_7^-$ .



- b) For this reaction, equilibrium tends to favour the (~~reactants~~/products) and the value of  $K_{\text{eq}}$  is (<1, >1 or about =1)

11. The  $K_{\text{eq}}$  for the reaction:  $\text{HA}_2\text{B} + \text{CD}^- \rightleftharpoons \text{HCD} + \text{A}_2\text{B}^-$  is **0.0020**

- a) Which is the stronger conjugate acid in the above equilibrium?



- b) Which is the stronger conjugate base in the above equilibrium?



12. The  $K_{\text{eq}}$  for the reaction:  $\text{H}_2\text{X} + \text{YZ}^- \rightleftharpoons \text{HYZ} + \text{HX}^-$  is  **$3.4 \times 10^5$**

- a) Which is the stronger conjugate acid in the above equilibrium?



- b) Which is the stronger conjugate base in the above equilibrium?



13. Equilibrium always favours the (~~stronger~~/weaker) \_\_\_\_\_ acid

14. Equilibrium always favours the (~~stronger~~/weaker) \_\_\_\_\_ base