

Worksheet 4.2

Conjugate Acid-Base Pairs

Complete each reaction. Label each reactant or product as an acid or base.

1. $\text{HCN} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{CN}^-$
2. $\text{HCl} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{Cl}^-$
3. $\text{HF} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{F}^-$
4. $\text{F}^- + \text{H}_2\text{O} \rightleftharpoons \text{HF} + \text{OH}^-$
5. $\text{HSO}_4^- + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{SO}_4^{2-}$
(acid)
6. $\text{NH}_4^+ + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{NH}_3$
7. $\text{HPO}_4^{2-} + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{PO}_4^- + \text{OH}^-$
(base)

<u>Acid</u>	<u>Conjugate Base</u>	<u>Base</u>	<u>Conjugate Acid</u>
8. HCO_3^-	CO_3^{2-}	9. CH_3COO^-	CH_3COOH
10. HPO_4^{2-}	PO_4^{3-}	11. IO_3^-	HIO_3
12. H_2O	OH^-	13. NH_2^-	NH_3
14. HS^-	S^{2-}	15. $\text{C}_2\text{H}_5\text{SO}_7^{3-}$	$\text{HC}_2\text{H}_5\text{SO}_7^{2-}$

16. Circle the strong bases.

$\text{Fe}(\text{OH})_3$	NaOH	CsOH	KOH
$\text{Zn}(\text{OH})_2$	$\text{Sr}(\text{OH})_2$	$\text{Ba}(\text{OH})_2$	$\text{Ca}(\text{OH})_2$

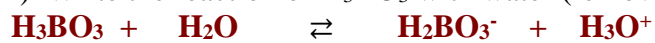
17. Rank the following acids from strongest to weakest.

H_2S	CH_3COOH	H_2PO_4^-	HI	HCl	HF
5	4	6	1	1	3

18. Rank the following bases from the strongest to weakest.

H_2O	F^-	NH_3	SO_3^{2-}	HSO_3^-	NaOH
6	4	2	3	5	1

19. i) Write the reaction of H_3BO_3 with water (remove one H^+ only because it is a weak acid).



ii) Write the K_a expression for the above.

$$K_a = \frac{[\text{H}_3\text{O}^+][\text{H}_2\text{BO}_3^-]}{[\text{H}_3\text{BO}_3]}$$

iii) What is the ionization constant for the acid (use your table). $K_a = 7.3 \times 10^{-10}$

20. List six strong acids.



21. List six strong bases.



22. List six weak acids in order of decreasing strength (use your acid/base table).



23. List six weak bases in order of decreasing strength (use your acid/base table).

