Hydrogen ion concentration - *p*H scale and Buffer solution

1. (a) pH of blood does not change because it is a buffer solution.

2. (c) 0.001 M of $NaOH$ means $[OH^-] = .001$

   $= 10^{-3}M \Rightarrow pOH = 3$

   $pH + pOH = 14 \Rightarrow pH = 14 - 3 = 11$

3. (d) $[H_3O^+]$ means $[H^+] = 6.2 \times 10^{-9} mol/l$

   $pH = -log(6.2 \times 10^{-9}) = 8.21$

4. (b) $CH_3NH_2 + HCl \longrightarrow CH_3NH_3^+Cl^-$

   0.1 0.08 0

   0.02 0 0.08

   (Basic buffer solution)

   $pOH = pK_b + \log \frac{0.08}{0.02}$

   $= pK_b + 0.602$

   $= 3.30 + 0.602 = 3.902$

   $\therefore pH = 10.09$

   $[H^+] = 7.99 \times 10^{-11} \approx 8 \times 10^{-11}\ M$

5. (b) $pH + pOH = pK_w$

6. (d) $pH = -log[H^+]$

   $5.4 = -log[H^+];\ [H^+] = 3.98 \times 10^{-6}$.

7. (a) $KCN + H_2O \rightleftharpoons KOH + HCN$. KOH is a strong base and HCN is a weak acid.

8. (c) $[H^+] = 10^{-3}M, pH = -log[10^{-3}], pH = 3$

9. (b) $[H^+] = [OH^-]$

$K_w = [H^+][OH^-] = 10^{-14}$

$\therefore [H^+] = 10^{-7}, pH = -log[H^+] = 7.$

10. (d) $pH = 5$ means $[H^+] = 10^{-5}$

$pOH = 14 - pH = 14 - 5 = 9$

$[OH^-] = 10^{-pOH} = 10^{-9}$

11. (a) $pH = -log \quad [H^+]; [H^+] = 0.01N$

$\boldsymbol{pH = -log \quad [10^{-2}]; pH = 2}$

12. (d) $BOH \rightleftharpoons B^+ + OH^-$

Initial	C	0	0
At eq.	$C - C\alpha$	$C\alpha$	$C\alpha$

$K_b = \frac{C^2\alpha^2}{C(1-\alpha)} = C\alpha^2$ assuming $\alpha << 1; 1 - \alpha \tilde{-} 1$

$10^{-12} = 10^{-2} \times \alpha^2; \alpha^2 = 10^{-10}; \alpha = 10^{-5}$

$[OH^-] = C\alpha = .01 \times 10^{-5} = 10^{-7}$

13. (c) $pH = 4$ means; $[H^+] = 10^{-4} mol$

14. (a) Buffer solution is a mixture of weak acid and its conjugate base.

15. (b) Adding Na_2CO_3 to water makes the solution basic and hence a pH increases from 7.

16. (d) $NaClO_4$ is a salt of strong acid $HClO_4$. So it is a strong acid salt.

17. (b) $NaOH$ is a base, so that its $pH > 7$

18. (c) It is a strong base.

    1 M $NaOH$ has maximum $[OH^-]$ and minimum $[H^+]$ and maximum pH.

19. (c) When $pH = 7$ means neutral, $pH < 7$ means acidic, $pH > 7$ means basic.

20. (d) As the solution is acidic, $pH < 7$. This is because $[H^+]$ from $H_2O[10^{-7}M]$ cannot be neglected in comparison to 10^{-10} M