Buffer worksheet

5. a) $NH_4^+ \rightleftharpoons NH_3 + H^+$ $pH = pKa$ 9.25

.100M .100M $Ka = 5.6 \times 10^{-10}$

OR

$NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$ $pOH = pKb$

.100M .100M $K_b = 1.8 \times 10^{-5}$ $4.74 = pOH$

$pH = 9.26$

b) $NH_4^+ + OH^- \rightarrow NH_3 + H_2O$ $Ka = 5.6 \times 10^{-10}$

	NH_4^+	OH^-	NH_3
HAVE	.100mol	.020mol	.100mol
NEED	.020mol	.020mol	.020mol
	.080mol	0	.120mol

$NH_4^+ + \rightleftharpoons NH_3 + H^+$

.080mol .120

$pH = pKa + \log \frac{[B]}{[A]}$

$= 9.25 + \log\left(\frac{.120}{.080}\right)$

$= 9.43$

6. a) $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$

	NH_3	NH_4^+	OH^-
	.500	0	0
	-8.9×10^{-6}	$+8.9\times10^{-6}$	$+8.9\times10^{-6}$
	.500	8.9×10^{-6}	8.9×10^{-6}

$pH = 8.95$

$pOH = 14.0 - 8.95 = 5.05$

$[OH] = 8.9\times10^{-6} M$

b) $4.00g\ NaOH \times \frac{1mol}{40.01g} = .100mol / 1.00L = .100M\ OH^-$

$NH_3 \rightleftharpoons NH_4^+ + OH^-$

NH_3	NH_4^+	OH^-
.500M	$8.9\times10^{-6}M$ + .100M	
	$-8.9\times10^{-6}M$	8.9×10^{-6}
	0	.100M

The OH^- is not reacted completely reacted and exceeds the capacity of the buffer

$pOH = -\log[.100M]$

$= 1$

$pH = 14. - 1 = 13.00$