Multiple Choice Response Sheet

Name: _____

Acid-Base #1

41

1. D
2. A
3. A
4. B
5. B
6. B
7. C
8. C
9. B
10. D
11. D
12. B
13. A
14. A
15. C
16. A
17. D
18. A
19. D
20. C
21. A
22. D
23. C
24. A
25. A
26. B
27. B
28. A
29. A
30. C
31. A
32. _____
33. _____
34. _____
35. _____
36. _____

1. $K_w = [H^+][OH^-] = 6.76 \times 10^{-15}$

$$H_2O + H_2O \rightleftharpoons H_3O^+ + OH^-$$
$$\qquad\qquad\quad x \qquad\quad x$$

$(x)(x) = 6.76 \times 10^{-15}$

$x = [H_3O^+] = \sqrt{6.76 \times 10^{-15}}$

$= 8.22 \times 10^{-8}$

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2. a) $NH_4^+ + H_2O \rightleftharpoons NH_3 + H_3O^+$

$F^- + H_2O \rightleftharpoons HF + OH^-$

b) $K_a(NH_4^+) = 5.6 \times 10^{-10}$

$K_b(F^-) = \dfrac{1.00 \times 10^{-14}}{3.5 \times 10^{-4}}$

$K_b = 2.86 \times 10^{-11}$

$K_a > K_b$ ∴ NH_4F is acidic

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3. $[H^+]$

$= \dfrac{(0.050\,M)(100.0\,mL)}{400.0\,mL}$

$= 0.013\,M$

$[OH^-]_{xs} = 0.076\,M - 0.013\,M$

$[OH^-]_{xs} = 0.063\,M.$ *2 S.F.

$pOH = -\log[OH^-]$

$= -\log(0.063\,M)$

$= 1.20...$

$pH = 14 - 1.20...$

$\boxed{= 12.80}$ 2 after decimal

$2[OH^-] = [Sr(OH)_2]$

$[Sr(OH)_2]$

$= \dfrac{(0.050M)(300.0\,mL)}{400.0\,mL}$

$= 0.038M$

$[OH^-] = 0.076M.$

Acid-Base #1

Multiple Choice Response Sheet

Name: Key

41

1. B
2. C
3. A
4. D
5. B
6. C
7. B
8. A
9. A
10. B
11. B
12. A
13. A
14. B
15. C
16. C
17. B
18. C
19. C
20. B
21. A
22. B
23. D
24. B
25. C
26. C
27. B
28. B
29. C
30. D
31. _____
32. _____
33. _____
34. _____
35. _____
36. _____

1. $HCO_3^- + H_2O \rightleftharpoons H_2CO_3 + OH^-$

↑ must be something with an H & a ⊖
must accept H^+
From H_2O

2. $CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H_3O^+$

must be an acid

* in order to make H_2O act only as a base, it must be paired with an acid

3. The only thing that is true of pure H_2O at any temperature is that $[H_3O^+] = [OH^-]$ (which means it is neutral)

$[H_3O^+] = 10^{-6.51}$

$[H_3O^+] = 3.09\ldots \times 10^{-7} M = [OH^-]$

$K_w = [H_3O^+][OH^-]$
$= (3.09\ldots \times 10^{-7} M)(3.09\ldots \times 10^{-7} M)$
$= 9.5 \times 10^{-14}$

4. $\frac{0.44g\ Ba(OH)_2}{0.250L} \times \frac{1\ mol\ Ba(OH)_2}{171.3g} = 0.0102\ldots\ mol/L$

$Ba(OH)_2 \rightarrow Ba^{+2} + 2OH^-$
$x \quad x \quad 2x$

$[OH^-] = 2 \times 0.01027\ldots$

$pOH = -\log[OH^-]$
$= -\log(0.0205\ldots)$

$pH = 14 - pOH$
$= 14 - 1.687\ldots$

$pH = 12.31$

Multiple Choice Response Sheet

Name: _____

Acid-Base
#1

41

1. D
2. D
3. C
4. A
5. C
6. B
7. B
8. D
9. C
10. A
11. B
12. A
13. A
14. A
15. D
16. D
17. C
18. B
19. A
20. D
21. B
22. C
23. B
24. D
25. A
26. D
27. C
28. D
29. C
30. _____
31. _____
32. _____
33. _____
34. _____
35. _____
36. _____

1. a) $HC_2O_4^- + HSO_4^- \rightleftharpoons H_2C_2O_4 + SO_4^{2-}$

b) $Ka(HSO_4^-) = 1.2 \times 10^{-2}$

$Ka(HC_2O_4^-) = 6.4 \times 10^{-5}$

HSO_4^- is a stronger acid than $HC_2O_4^-$ ∴ will able to donate more often

c) $HC_2O_4^-$ and $H_2C_2O_4$

OR

HSO_4^- & SO_4^{2-}

d) when comparing the 2 acids, $H_2C_2O_4$ is slightly stronger than HSO_4^- ∴ gets to donate/react more often. This means more reactants will be produced making their formation favoured.

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2. a) $2H_2O \rightleftharpoons H_3O^+ + OH^-$

$x \quad x$

$K_w = [H_3O^+][OH^-] = 2.95 \times 10^{-15}$

$= (x)(x) = 2.95 \times 10^{-15}$

$x = [H_3O^+] = \sqrt{2.95 \times 10^{-15}}$

$= 5.43... \times 10^{-8} M$

$pH = -\log(5.43... \times 10^{-8} M)$

$pH = 7.265$

b) Neutral. No matter what the temperature of ~~it~~ water is, $[H_3O^+] = [OH^-]$ which would make the solution neutral.

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3. $\frac{1.216\ g\ Sr(OH)_2}{0.800\ L} \times \frac{1\ mol}{121.6\ g} = 0.0125\ mol/L$ $Sr(OH)_2$

$Sr(OH)_2 \rightarrow Sr^{2+} + 2OH^-$

$0.0125M \qquad 2(0.125M)$

$[OH^-] = 0.025M$

$[OH^-]_{xs} = 0.025M - 0.010M$

$= 0.015M$

Multiple Choice Response Sheet

Name:_____

1. B
2. D
3. A
4. B
5. D
6. A
7. A
8. B
9. D
10. B
11. A
12. A
13. B
14. C
15. A
16. C
17. C
18. A
19. A
20. B
21. B
22. B
23. B
24. C
25. D
26. B
27. B
28. ~~E~~ D
29. D
30. A
31. B
32. C
33. _____
34. _____
35. _____
36. _____

Acid-Base #1

42

1. a) $N_2H_4 + H_2O \rightleftharpoons N_2H_5^+ + OH^-$

b) $N_2H_5^+$

$$K_a = \frac{1.00 \times 10^{-14}}{9.6 \times 10^{-7}} = 1.0 \times 10^{-8}$$

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2. $HC_2O_4^-$ $K_a = 6.4 \times 10^{-5}$

$$K_b = \frac{1.00 \times 10^{-14}}{5.9 \times 10^{-2}} = 1.69 \times 10^{-13}$$

$K_a > K_b$ ∴ will act as an acid predominantly

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3. $[H^+]$

$(35.0\ mL)(1.00\ M) = (210\ mL)x$

$[H^+] = 0.166\bar{6}M = 0.17M$

$[OH^-]$ $(175.0\ mL)(0.25M) = (210\ mL)x$

$[OH^-] = 0.21M$

$[OH^-] = 0.21M - 0.17M = 0.04M$

$pOH = -\log(0.04M)$

$= 1.3979....$

$pH = 14 - 1.3979....$

$pH = 12.6$