Multiple Choice Response Sheet

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

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1. $BaSO_4$ is the precipitate

$$Ba^{+2}_{(aq)} + SO_{4(aq)}^{-2} \rightarrow BaSO_{4(s)}$$

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2. $$\underset{x}{Ca(OH)_{2(s)}} \rightleftharpoons \underset{x}{Ca^{+2}_{(aq)}} + \underset{2x}{2OH^-_{(aq)}}$$

$$K_{sp} = [Ca^{+2}][OH^-]^2 = 1.3 \times 10^{-6}$$

$$1.3 \times 10^{-6} = (x)(2x)^2$$

$$x = \sqrt[3]{\frac{1.3 \times 10^{-6}}{4}}$$

$$x = 6.87\ldots \times 10^{-3} \text{ mol/L} = [Ca(OH)_2]$$

$$6.87\ldots \times 10^{-3} \frac{\text{mol}}{\text{L}}\ Ca(OH)_2 \times \frac{74.1\ \text{g}}{1\ \text{mol}} \times 5.0\ \text{L}$$

$$= 2.5\ \text{g}\ Ca(OH)_2$$

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3. $$PbBr_{2(s)} \rightleftharpoons Pb^{+2}_{(aq)} + 2Br^-_{(aq)}$$

$$Q = [Pb^{+2}][Br^-]^2$$

$$[Pb^{+2}] = \frac{(1.0 \times 10^{-3} M)(2.0\ mL)}{5.0\ mL} = 4 \times 10^{-4} M$$

$$[Br^-] = \frac{(1.0 \times 10^{-3} M)(3.0\ mL)}{5.0\ mL} = 6 \times 10^{-4} M$$

$$Q = (4.0 \times 10^{-4} M)(6.0 \times 10^{-4} M)^2$$

$$Q = 1.44 \times 10^{-10}$$

$$K_{sp} = 6.6 \times 10^{-6}$$

$Q < K_{sp}$ $\therefore$ no precipitate will form

Multiple Choice Response Sheet

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

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Solubility

1. a) $Ag^+_{(aq)} + IO_3^-{}_{(aq)} \longrightarrow AgIO_{3(s)}$

b) $Q = [Ag^+][IO_3^-]$

$[Ag^+]$

$= \frac{(0.50M)(35.0mL)}{50.0mL}$

$= 0.35M$

$[IO_3^-]$

$= \frac{(0.50M)(15.0mL)}{50.0mL}$

$= 0.15M$

$Q = (0.35M)(0.15M)$

$Q = 5.3 \times 10^{-2}$

K_{sp} $AgIO_3$ $= 3.2 \times 10^{-8}$

$Q > K_{sp}$ ∴ a precipitate will form to reduce the amount of ions

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2. a) $Cu_{(s)} + 2Ag^+_{(aq)} + 2CH_3COO^-_{(aq)} \longrightarrow Cu^{+2}_{(aq)} + 2CH_3COO^-_{(aq)} + 2Ag_{(s)}$

$$\boxed{Cu_{(s)} + 2Ag^+_{(aq)} \longrightarrow Cu^{+2}_{(aq)} + 2Ag_{(s)}}$$

b) $AgCH_3COO_{(s)} \rightleftharpoons Ag^+_{(aq)} + CH_3COO^-_{(aq)}$

$K_{sp} = [Ag^+][CH_3COO^-]$

$$\frac{2.00\,g\,Cu}{1.00L} \times \frac{1\,mol\,Cu}{63.546\,g\,Cu} \times \frac{2\,mol\,AgCH_3COO}{1\,mol\,Cu} = 6.29\ldots \times 10^{-2}M$$

$[AgCH_3COO] = 6.29\ldots \times 10^{-2}M$

$AgCH_3COO \longrightarrow Ag^+ + CH_3COO^-$

6.29×10^{-2} $\quad 6.29 \times 10^{-2}$ $\quad 6.29 \times 10^{-2}$

$K_{sp} = (6.29\ldots \times 10^{-2}M)(6.29\ldots \times 10^{-2}M)$

$K_{sp} = 3.96 \times 10^{-3}$

Multiple Choice Response Sheet

Name: _____

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

40

Solubility

1. precipitate : $BaSO_4$

Net ionic:

$$Ba^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow BaSO_{4(s)}$$

OR

$$BaSO_{4(s)} \rightleftharpoons Ba^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)}$$

2. $\underset{x}{Ag_2CrO_{4(s)}} \rightleftharpoons \underset{2x}{2Ag^+_{(aq)}} + \underset{x}{CrO_4^{2-}{}_{(aq)}}$ $\quad K_{sp} = [Ag^+]^2[CrO_4^{2-}] = 1.1 \times 10^{-12}$

$$(2x)^2(x) = 1.1 \times 10^{-12}$$

$$x = \sqrt[3]{\frac{1.1 \times 10^{-12}}{4}} = 6.502... \times 10^{-5}$$

$$[Ag_2CrO_4] = 6.50... \times 10^{-5} \frac{mol}{L} \times \frac{331.8\ g}{1\ mol} \times 0.125\ L$$

$$= 2.697... \times 10^{-3}$$

mass $Ag_2CrO_4 = 2.7 \times 10^{-3}\ g$

3. $PbCl_{2(s)} \rightleftharpoons Pb^{2+}_{(aq)} + 2Cl^-_{(aq)}$ $\quad Q = [Pb^{2+}][Cl^-]^2$

$K_{sp} = 1.2 \times 10^{-5}$

$[Pb(NO_3)_2] = [Pb^{2+}]$

$$= \frac{(1.0\ M)(10.0\ mL)}{50.0\ mL}$$

$$= 0.20\ M$$

~~$[NaCl] = [Cl^-]$~~

$$\frac{(2.0 \times 10^{-2}\ M)(40.0\ mL)}{50.0\ mL}$$

$$= 0.016\ M$$

$$Q = [Pb^{2+}][Cl^-]^2$$

$$= (0.20\ M)(0.016\ M)^2$$

$$Q = 5.12 \times 10^{-5}$$

$Q > K_{sp}$ $\therefore$ a precipitate will form

Multiple Choice Response Sheet

Name: Key

1. D
2. C
3. C
4. D
5. C
6. C
7. D
8. D
9. B
10. C
11. C
12. A
13. D
14. D
15. A
16. A
17. B
18. A

temp. has → not changed.

19. A
20. D
21. C
22. A
23. B
24. ~~C~~ acid base ques.
25. C
26. B
27. B
28. _____
29. _____
30. _____
31. _____
32. _____
33. _____
34. _____
35. _____
36. _____

40

Solubility

1.

$Zn^{2+}_{(aq)} + SO_4^{2-}_{(aq)} + Ba^{2+}_{(aq)} + S^{2-}_{(aq)} \longrightarrow ZnS_{(s)} + BaSO_{4(s)}$

2. $Ca(OH)_{2(s)} \rightleftharpoons Ca^{+2}_{(aq)} + 2OH^-_{(aq)}$ $\quad Ksp = [Ca^{+2}][OH^-]^2 = ?$

$$0.125\,g\ Ca(OH)_2 \times \frac{1\ mol}{74.1\ g\ Ca(OH)_2} = 1.686\ldots \times 10^{-3}\ mol\ Ca(OH)_2$$

$$Ca(OH)_2 \longrightarrow Ca^{+2} + 2OH^-$$

$$\frac{1.69\ldots \times 10^{-3}\ mol}{0.100\,L} \qquad \frac{1.69 \times 10^{-3}\ mol}{0.100\,L} \qquad 2\left(\frac{1.69 \times 10^{-3}\ mol}{0.100\,L}\right)$$

$$Ksp = (1.69\ldots \times 10^{-2}\,M)(3.4 \times 10^{-2}\,M)^2$$
$$= 1.92\ldots \times 10^{-5}$$
$$Ksp = 1.92 \times 10^{-5}$$

3. $Cu(OH)_{2(s)} \rightleftharpoons Cu^{+2}_{(aq)} + 2OH^-_{(aq)}$

$$Ksp = [Cu^{+2}][OH^-]^2 = 1.6 \times 10^{-19}$$

$$[OH^-] = \sqrt{\frac{1.6 \times 10^{-19}}{0.20\,M}} = 8.9 \times 10^{-10}\,M$$

4. $PbBr_{2(s)} \rightleftharpoons Pb^{+2}_{(aq)} + 2Br^-_{(aq)}$ $\quad Ksp = 6.6 \times 10^{-6}$

$$Q = [Pb^{+2}][Br^-]^2$$

$$Q = \left(\frac{(1.0 \times 10^{-3}\,M)(2.0\,mL)}{5.0\,mL}\right)\left(\frac{(1.0 \times 10^{-3}\,M)(3.0\,mL)}{5.0\,mL}\right)^2$$

$$Q = 1.44 \times 10^{-10}$$

$Q < Ksp$ ∴ no ppt will form.