1. A saturated solution forms when a $0.10\,\text{mol}$ of salt is added to $1.0\,\text{L}$ of water. The salt is

   A. Li_2S
   B. $CuBr_2$
   C. $Zn(OH)_2$
   D. $(NH_4)_2CO_3$

2. Consider the following equilibrium:

$$Ca(OH)_{2(s)} \rightleftarrows Ca^{2+}_{(aq)} + 2\,OH^-_{(aq)}$$

   Adding which of the following could cause the equilibrium $\left[Ca^{2+}\right]$ to increase?

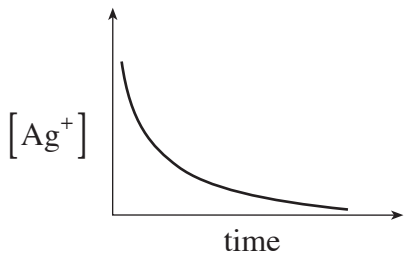
   A. $H_2O_{(\ell)}$
   B. $HCl_{(aq)}$
   C. $KOH_{(s)}$
   D. $Ca(OH)_{2(s)}$

3. Consider the following solubility equilibrium:

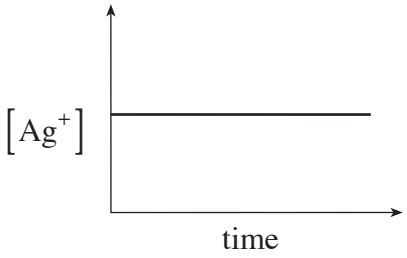
$$AgCl_{(s)} \rightleftarrows Ag^+_{(aq)} + Cl^-_{(aq)}$$

   Which of the following graphs represents the $\left[Ag^+\right]$ after equilibrium has been established?

A.



B.



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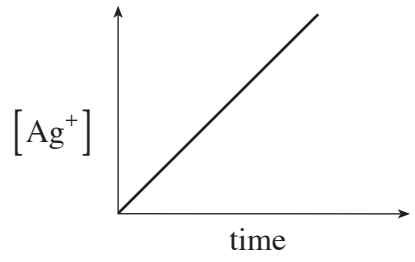
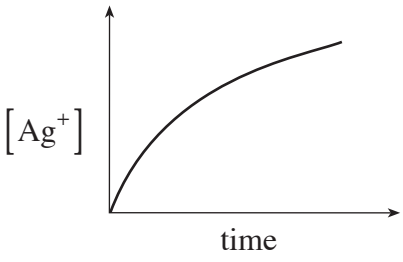


D.



4. The concentrations of the cation and anion in $0.40\ \text{M}\ (NH_4)_2Cr_2O_{7(aq)}$ are

	Cation	Anion
A.	0.40 M	0.40 M
B.	0.40 M	0.80 M
C.	0.80 M	0.40 M
D.	0.80 M	0.80 M

5. Which of the following will produce a solution with the highest $[OH^-]$?

A. $AgOH$
B. $Sr(OH)_2$
C. $Fe(OH)_3$
D. $Mg(OH)_2$

6. When equal volumes of $0.20\ \text{M}\ ZnSO_4$ and $0.20\ \text{M}\ SrS$ are combined

A. a precipitate does not form.
B. a precipitate of only ZnS forms.
C. a precipitate of only $SrSO_4$ forms.
D. precipitates of both ZnS and $SrSO_4$ form.

7. What is the concentration of Pb^{2+} in a saturated solution of $Pb(IO_3)_2$?

A. $9.0 \times 10^{-5}\ \text{M}$
B. $5.7 \times 10^{-5}\ \text{M}$
C. $4.5 \times 10^{-5}\ \text{M}$
D. $1.1 \times 10^{-4}\ \text{M}$

8. Which of the following dissolves in water to form a molecular solution?

A. KCl
B. Na_2O
C. NH_4Br
D. C_2H_5OH

9. A saturated solution is formed by adding $10.0\ \text{g}\ PbI_{2(s)}$ to $10.0\ \text{mL}$ of water in a beaker. Describe the situation which exists in the beaker. **(1**

A. $[Pb^{2+}] = [I^-]$
B. moles $PbI_{2(s)}$ = moles $Pb^{2+}_{(aq)}$
C. mass of $PbI_{2(s)}$ = mass of $PbI_{2(aq)}$
D. rate of crystalization = rate of dissociation

10. What is the concentration of barium ions in a 1.00 L solution containing 2.08 g of $BaCl_2$?

A. 1.00×10^{-2} M
B. 1.21×10^{-2} M
C. 2.00×10^{-2} M
D. 2.08 M

11. Which of the following salts has low solubility?

A. MgS
B. $ZnCl_2$
C. $SrSO_4$
D. $AgNO_3$

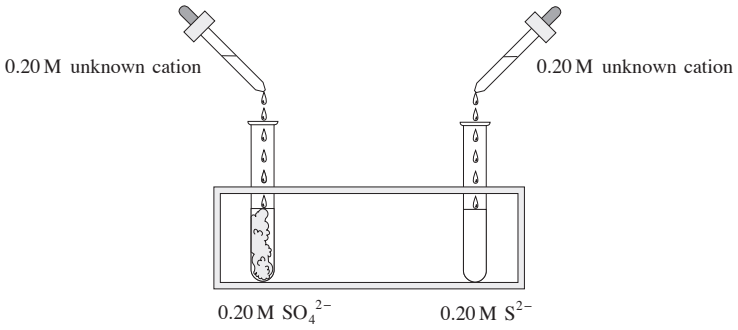
12. Consider the following solubility equilibrium:

$$AgCl_{(s)} \rightleftarrows Ag^+_{(aq)} + Cl^-_{(aq)}$$

Some $NaCl_{(s)}$ is added to the equilibrium. When equilibrium is reestablished, how have the ion concentrations changed from the original equilibrium?

	$[Ag^+]$	$[Cl^-]$
A.	decreased	increased
B.	decreased	decreased
C.	increased	decreased
D.	increased	increased

13. A precipitate forms when a 0.20 M solution containing an unknown cation is added to SO_4^{2-}, but not when an equal volume is added to S^{2-}.



The unknown cation is

A. Na^+
B. Ca^{2+}
C. Pb^{2+}
D. Zn^{2+}

14. The K_{sp} expression for a saturated solution of $Ni_3(PO_4)_2$ is

A. $K_{sp} = \left[Ni^{2+}\right]^3 \left[PO_4{}^{3-}\right]^2$

B. $K_{sp} = \left[Ni^{2+}\right]^2 \left[PO_4{}^{3-}\right]^3$

C. $K_{sp} = \left[3Ni^{2+}\right]\left[2PO_4{}^{3-}\right]$

D. $K_{sp} = \left[3Ni^{2+}\right]^3 \left[2PO_4{}^{3-}\right]^2$

15. Consider the following equilibrium:

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

Adding which of the following will cause more solid $BaSO_4$ to form?

A. $CaCl_{2(s)}$

B. $K_2CO_{3(s)}$

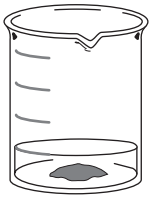
C. $Na_2SO_{4(s)}$

D. $Mg(NO_3)_{2(s)}$

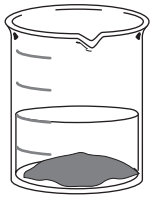
16. Which of the following could **not** be used to represent solubility?

A. g/mL
B. mL/L
C. mol/L
D. g/min

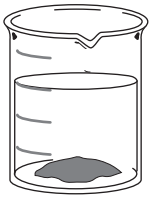
17. The following three beakers each contain different volumes of a saturated solution of PbI_2 and different masses of solid PbI_2 :



Beaker I



Beaker II



Beaker III

What is the relationship for the $\left[Pb^{2+}\right]$ in the solution in the three beakers?

A. I = II = III
B. I > II > III
C. II > III > I
D. III > II > I

18. The equation that describes the solubility equilibrium of Ag_2CrO_4 is

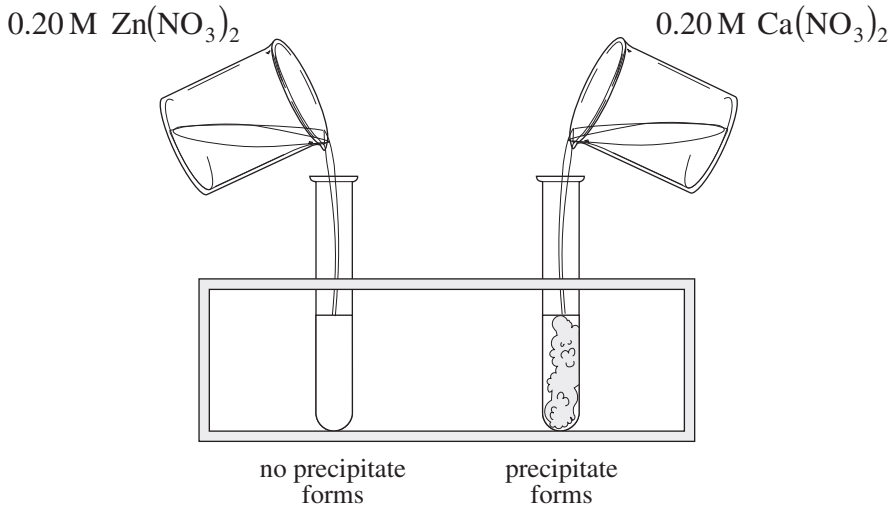
A. $Ag_2CrO_{4(s)} \rightleftarrows Ag_2{}^{2+}_{(aq)} + CrO_4{}^{2-}_{(aq)}$

B. $Ag_2CrO_{4(s)} \rightleftarrows 2Ag^{+}_{(aq)} + CrO_4{}^{2-}_{(aq)}$

C. $Ag_2CrO_{4(s)} \rightleftarrows 2Ag_{(s)} + Cr_{(s)} + 2O_{2(g)}$

D. $Ag_2CrO_{4(s)} \rightleftarrows 2Ag^{+}_{(aq)} + Cr^{6+}_{(aq)} + 4O^{2-}_{(aq)}$

19. When 10.0 mL of 0.20 M $Zn(NO_3)_2$ is added to a 10.0 mL sample of 0.20 M unknown solution, no precipitate forms. When the same volume of 0.20 M $Ca(NO_3)_2$ is added to a separate 10.0 mL sample of the unknown solution, a precipitate does form. **(2 marks)**



The identity of the unknown solution could be

A. NaCl

B. Na_2S

C. Na_2SO_4

D. Na_2CO_3

20. The solubility of PbS is 1.8×10^{-14} M. The value of K_{sp} is

A. 3.2×10^{-28}

B. 1.8×10^{-14}

C. 3.6×10^{-14}

D. 1.3×10^{-7}

21. At 25°C, which of the following compounds has a low solubility when added to water?

A. FeS

B. $CuCl_2$

C. $ZnSO_4$

D. NH_4CH_3COO

22. Which of the following forms a molecular solution?

A. KCl
B. NaOH
C. CH_3OH
D. NH_4CH_3COO

23. List the compounds AgI, KBr and $MgCO_3$ in order of solubility from lowest to highest.

A. AgI, $MgCO_3$, KBr
B. KBr, AgI, $MgCO_3$
C. KBr, $MgCO_3$, AgI
D. $MgCO_3$, AgI, KBr

24. Consider the following K_{sp} expression:

$$K_{sp} = \left[Cu^{2+}\right]\left[IO_3^{-}\right]^2$$

Which of the following does this equilibrium expression represent?

A. $CuIO_{3(s)} \rightleftarrows Cu^{+}_{(aq)} + IO_3^{-}{}_{(aq)}$
B. $CuIO_{3(s)} \rightleftarrows Cu^{2+}_{(aq)} + IO_3^{2-}{}_{(aq)}$
C. $CuIO_{3(s)} \rightleftarrows Cu^{2+}_{(aq)} + IO_3^{-}{}_{(aq)}$
D. $Cu(IO_3)_{2(s)} \rightleftarrows Cu^{2+}_{(aq)} + 2IO_3^{-}{}_{(aq)}$

25. The solubility of $NiCO_3$ is 3.8×10^{-4} mol/L. The K_{sp} value is

A. 1.4×10^{-7}
B. 3.8×10^{-4}
C. 7.6×10^{-4}
D. 1.9×10^{-2}

26. The $\left[Ag^{+}\right]$ in a saturated solution of $AgBrO_3$ is

A. 2.8×10^{-9} M
B. 2.6×10^{-5} M
C. 5.3×10^{-5} M
D. 7.3×10^{-3} M

27. When solutions of $AgNO_3$ and NaCl are combined, the Trial K_{sp} for AgCl is 5.6×10^{-11}. Predict what will be observed.

A. a precipitate will form because Trial $K_{sp} < K_{sp}$
B. a precipitate will form because Trial $K_{sp} > K_{sp}$
C. a precipitate will not form because Trial $K_{sp} < K_{sp}$
D. a precipitate will not form because Trial $K_{sp} > K_{sp}$

28. Calculate the maximum $\left[CO_3^{2-}\right]$ that can exist in a solution without forming a precipitate when $\left[Mg^{2+}\right] = 0.20\,M$.

A. $1.4 \times 10^{-6}\,M$
B. $3.4 \times 10^{-5}\,M$
C. $2.6 \times 10^{-3}\,M$
D. $5.8 \times 10^{-3}\,M$

29. In a saturated solution of $Ag_2C_2O_4$, the $\left[Ag^+\right] = 2.2 \times 10^{-4}\,M$. What is the solubility of $Ag_2C_2O_4$ in this solution?

A. $4.3 \times 10^{-11}\,M$
B. $1.1 \times 10^{-4}\,M$
C. $2.2 \times 10^{-4}\,M$
D. $4.4 \times 10^{-4}\,M$

30. When equal volumes of $0.2\,M$ solutions are mixed, which of the following combinations forms a precipitate?

A. CaS and $Sr(OH)_2$
B. H_2SO_4 and $MgCl_2$
C. $(NH_4)_2SO_4$ and K_2CO_3
D. H_2SO_3 and $NaCH_3COO$

31. A solution contains $0.2\,M$ Zn^{2+} and $0.2\,M$ Sr^{2+}. An equal volume of a second solution was added, forming a precipitate with Sr^{2+} but not with Zn^{2+}. What is present in the second solution?

A $0.2\,M$ Cl^-
B. $0.2\,M$ OH^-
C. $0.2\,M$ SO_4^{2-}
D. $0.2\,M$ PO_4^{3-}

32. The K_{sp} expression for a saturated solution of $Ba_3(AsO_4)_2$ is

A. $K_{sp} = \left[Ba^{2+}\right]\left[AsO_4{}^{3-}\right]$

B. $K_{sp} = \left[Ba^{2+}\right]^3\left[AsO_4{}^{3-}\right]^2$

C. $K_{sp} = \left[3Ba^{2+}\right]\left[2AsO_4{}^{3-}\right]$

D. $K_{sp} = \left[3Ba^{2+}\right]^3\left[2AsO_4{}^{3-}\right]^2$

33. The solubility of $NiCO_3$ is 4.4×10^{-2} g/L . Determine the K_{sp} value of $NiCO_3$.

A. 1.4×10^{-7}

B. 3.7×10^{-4}

C. 1.9×10^{-3}

D. 2.1×10^{-1}

34. Calculate the solubility of $PbSO_4$.

A. 3.2×10^{-16} M

B. 1.8×10^{-8} M

C. 3.6×10^{-8} M

D. 1.3×10^{-4} M

35. When a solution containing Ag^+ is mixed with a solution containing $BrO_3{}^-$, the trial ion product is determined to be 2.5×10^{-7} . What would be observed?

A. A precipitate would form since trial ion product $< K_{sp}$.

B. A precipitate would form since trial ion product $> K_{sp}$.

C. A precipitate would not form since trial ion product $< K_{sp}$.

D. A precipitate would not form since trial ion product $> K_{sp}$.

36. Which of the following will dissolve in water to form an ionic solution?

A. O_2

B. CH_4

C. NH_4Cl

D. CH_3OH

37. The solubility of $SrCO_3$ is 2.4×10^{-5} M . How many moles of dissolved solute are present in 100.0 mL of saturated $SrCO_3$ solution?

A. 5.6×10^{-10} mol

B. 2.4×10^{-6} mol

C. 2.4×10^{-5} mol

D. 2.4×10^{-4} mol

38. What are the ion concentrations in $0.30\,\text{M}\ CuCl_2$?

	$[Cu^{2+}]$	$[Cl^-]$
A.	0.10 M	0.20 M
B.	0.20 M	0.10 M
C.	0.30 M	0.30 M
D.	0.30 M	0.60 M

39. What is the net ionic equation for the reaction that occurs when equal volumes of $0.20\,\text{M}\ Ba(NO_3)_2$ and $0.20\,\text{M}\ Na_2SO_4$ are mixed together? (

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

B. $Na^{+}_{(aq)} + NO_3{}^{-}_{(aq)} \rightarrow NaNO_{3(s)}$

C. $Ba(NO_3)_{2(aq)} + Na_2SO_{4(aq)} \rightarrow BaSO_{4(s)} + 2NaNO_{3(aq)}$

D. $Ba^{2+}_{(aq)} + 2NO_3{}^{-}_{(aq)} + 2Na^{+}_{(aq)} + SO_4{}^{2-}_{(aq)} \rightarrow BaSO_{4(s)} + 2Na^{+}_{(aq)} + 2NO_3{}^{-}_{(aq)}$

40. Consider the following equilibrium:

$$AgIO_{3(s)} \rightleftarrows Ag^{+}_{(aq)} + IO_3{}^{-}_{(aq)}$$

A few crystals of $NaIO_3$ are added to the above equilibrium. When equilibrium is re-established, how do the new ion concentrations compare with the original equilibrium concentrations?

	$[Ag^+]$	$[IO_3{}^-]$
A.	decreased	decreased
B.	decreased	increased
C.	increased	decreased
D.	increased	increased

41. The K_{sp} expression for $Zn(OH)_2$ is

A. $K_{sp} = [Zn^{2+}][OH^-]^2$

B. $K_{sp} = [Zn^{2+}]^2[OH^-]$

C. $K_{sp} = [Zn^{2+}][2\,OH^-]$

D. $K_{sp} = [Zn^{2+}][2\,OH^-]^2$

42. The solubility of $CdCO_3$ is 2.5×10^{-6} M . Calculate the K_{sp} value for $CdCO_3$.

A. 6.3×10^{-12}
B. 2.5×10^{-6}
C. 5.0×10^{-6}
D. 1.6×10^{-3}

43. At 25°C, what is the $\left[Cl^-\right]$ in a saturated solution of $PbCl_2$?

A. 1.4×10^{-2} M
B. 2.3×10^{-2} M
C. 2.9×10^{-2} M
D. 4.6×10^{-2} M

44. In every solubility equilibrium, the rate of dissolving is

A. equal to zero.
B. equal to the rate of crystallization.
C. less than the rate of crystallization.
D. greater than the rate of crystallization.

45. A 3.0 L solution of $BaCl_2$ has a chloride ion concentration of 0.20 M. The barium ion concentration in this solution is

A. 0.067 M
B. 0.10 M
C. 0.20 M
D. 0.60 M

46. Which of the following has the lowest solubility?

A. CaS
B. CuS
C. FeS
D. MgS

47. What is the formula equation for the reaction that occurs when equal volumes of 0.20 M K_3PO_4 and 0.20 M $ZnCl_2$ are mixed together?

A. $K^+_{(aq)} + Cl^-_{(aq)} \rightarrow KCl_{(s)}$

B. $3Zn^{2+}_{(aq)} + 2PO_4{}^{3-}_{(aq)} \rightarrow Zn_3(PO_4)_{2(s)}$

C. $2K_3PO_{4(aq)} + 3ZnCl_{2(aq)} \rightarrow Zn_3(PO_4)_{2(s)} + 6KCl_{(aq)}$

D. $2K_3PO_{4(aq)} + 3ZnCl_{2(aq)} \rightarrow 3Zn_3(PO_4)_{2(aq)} + 6KCl_{(s)}$

48. Which of the following could be added to a sample of hard water to remove both $0.2\,\text{M}\ \text{Ca}^{2+}$ and $0.2\,\text{M}\ \text{Mg}^{2+}$?

A. $0.2\,\text{M}\ \text{S}^{2-}$
B. $0.2\,\text{M}\ \text{Cl}^{-}$
C. $0.2\,\text{M}\ \text{OH}^{-}$
D. $0.2\,\text{M}\ \text{SO}_4^{2-}$

49. The K_{sp} expression for a saturated solution of Ag_2SO_3 is

A. $\text{K}_{sp} = \left[2\text{Ag}^{+}\right]\left[\text{SO}_3^{2-}\right]$
B. $\text{K}_{sp} = \left[\text{Ag}^{+}\right]^2\left[\text{SO}_3^{2-}\right]$
C. $\text{K}_{sp} = \left[\text{Ag}_2^{2+}\right]\left[\text{SO}_3^{2-}\right]$
D. $\text{K}_{sp} = \left[2\text{Ag}^{+}\right]^2\left[\text{SO}_3^{2-}\right]$

50. The solubility of CaF_2 is $3.3 \times 10^{-4}\,\text{M}$. Determine the K_{sp} value of CaF_2 .

A. 3.6×10^{-11}
B. 1.4×10^{-10}
C. 1.1×10^{-7}
D. 3.3×10^{-4}

51. What is the maximum $\left[\text{Ag}^{+}\right]$ that can exist in a solution of $0.010\,\text{M}\ \text{NaIO}_3$?

A. $3.2 \times 10^{-10}\ \text{M}$
B. $3.2 \times 10^{-8}\ \text{M}$
C. $3.2 \times 10^{-6}\ \text{M}$
D. $1.8 \times 10^{-4}\ \text{M}$

52. Which of the following could be used to express solubility?

A. mol
B. M/s
C. g/mL
D. mL/min

53. When $100.0\,\text{mL}$ of a saturated solution of BaF_2 is heated and all the water is evaporated, 3.6×10^{-4} mol of solute remains. The solubility of BaF_2 is

A. $1.9 \times 10^{-10}\,\text{M}$
B. $1.3 \times 10^{-5}\ \text{M}$
C. $3.6 \times 10^{-4}\ \text{M}$
D. $3.6 \times 10^{-3}\ \text{M}$

54. A solution contains both $0.2\,M\ Mg^{2+}_{(aq)}$ and $0.2\,M\ Sr^{2+}_{(aq)}$. These ions can be removed separately through precipitation by adding equal volumes of $0.2\,M$ solutions of

A. OH^-, and then S^{2-}

B. Cl^-, and then OH^-

C. CO_3^{2-}, and then SO_3^{2-}

D. SO_4^{2-}, and then PO_4^{3-}

55. Consider the following equilibrium:

$$CaSO_{4(s)} \rightleftarrows Ca^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)}$$

Which of the following would shift the above equilibrium to the left?

A. adding $CaSO_{4(s)}$

B. adding $MgSO_{4(s)}$

C. removing some $Ca^{2+}_{(aq)}$

D. removing some $SO_4^{2-}{}_{(aq)}$

56. Calculate the solubility of CaC_2O_4.

A. $2.3 \times 10^{-9}\,M$

B. $1.2 \times 10^{-5}\,M$

C. $4.8 \times 10^{-5}\,M$

D. $8.3 \times 10^{-4}\,M$

57. How many moles of dissolved solute are present in $100.0\,mL$ of a saturated $SrCO_3$ solution?

A. $5.6 \times 10^{-11}\,mol$

B. $2.4 \times 10^{-6}\ mol$

C. $2.4 \times 10^{-5}\ mol$

D. $2.4 \times 10^{-4}\ mol$

58. What happens when equal volumes of $0.2\,M\ AgNO_3$ and $0.2\,M$ NaCl are combined?

A. A precipitate forms because the trial ion product $> K_{sp}$

B. A precipitate forms because the trial ion product $< K_{sp}$

C. No precipitate forms because the trial ion product $> K_{sp}$

D. No precipitate forms because the trial ion product $< K_{sp}$

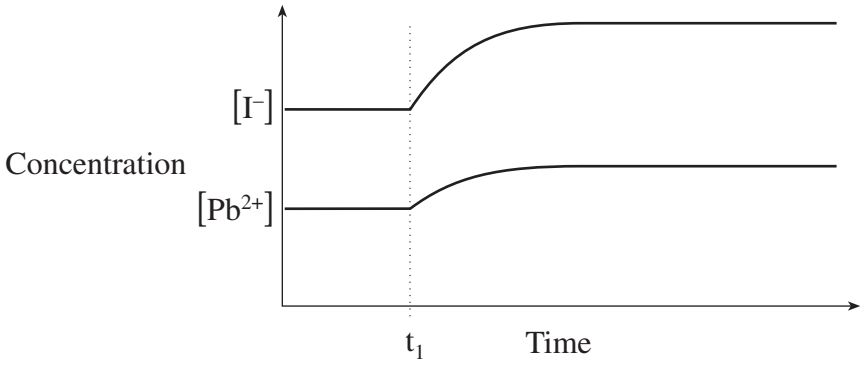
59. Determine the maximum $[Na_2CO_3]$ that can exist in 1.0 L of 0.0010 M $Ba(NO_3)_2$ without forming a precipitate.

A. 2.6×10^{-12} M
B. 2.6×10^{-9} M
C. 2.6×10^{-6} M
D. 5.1×10^{-5} M

60. Solid $Ba(OH)_2$ is added to water to prepare a saturated solution. Which of the following is true for this equilibrium system?

A. [anion] = [cation]
B. trial K_{sp} is less than K_{sp}
C. blue litmus paper would turn red
D. the rate of dissolving = the rate of crystallization

61. A saturated solution of PbI_2 was subjected to a stress and the following graph was obtained.



Which stress was applied at time t_1 ?

A. the addition of PbI_2
B. a temperature change
C. an increase in volume
D. the evaporation of water

62. Which of the following would be true when equal volumes of 0.2 M NaBr and 0.2 M $AgNO_3$ are combined?

A. No precipitate forms.
B. A precipitate of AgBr forms.
C. A precipitate of $NaNO_3$ forms.
D. Precipitates of both $NaNO_3$ and AgBr form.

63. Using the solubility table, determine which of the following ions could **not** be used to separate S^{2-} from SO_4^{2-} by precipitation?

A. Be^{2+}
B. Ca^{2+}
C. Ba^{2+}
D. Sr^{2+}

64. Which of the following is true when solid Na_2S is added to a saturated solution of CuS and equilibrium is reestablished?

A. $\left[S^{2-}\right]$ increases.
B. $\left[Cu^{2+}\right]$ increases.
C. $\left[S^{2-}\right]$ does not change.
D. $\left[Cu^{2+}\right]$ does not change.

65. Which of the following describes the relationship between the solubility product constant $\left(K_{sp}\right)$ and the solubility (s) of PbI_2?

A. $K_{sp} = s^2$

B. $K_{sp} = 4s^3$

C. $s = \dfrac{\sqrt[3]{K_{sp}}}{4}$

D. $s = \sqrt{K_{sp}}$

66. Which of the following saturated solutions will have the lowest $\left[S^{2-}\right]$?

A. BaS
B. CaS
C. CuS
D. ZnS

67. What is the solubility of SrF_2?

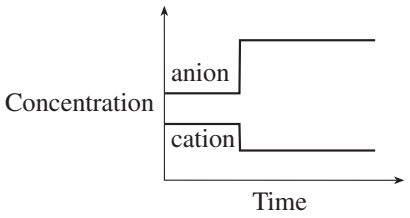
A. 3.2×10^{-25} M
B. 1.8×10^{-17} M
C. 4.3×10^{-9} M
D. 1.0×10^{-3} M

68. Which of the following is a suitable term for representing solubility?

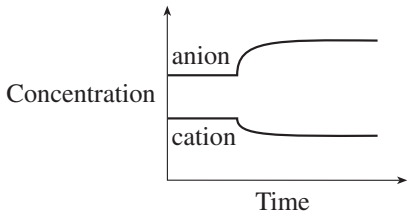
A. grams
B. moles
C. molarity
D. millilitres per second

69. A saturated solution is prepared by dissolving a salt in water. Which of the following graphs could represent the ion concentrations as the temperature is changed?

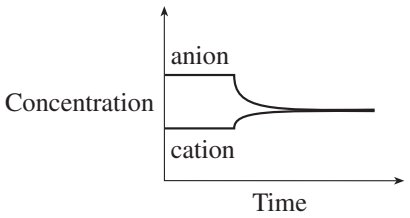
A.



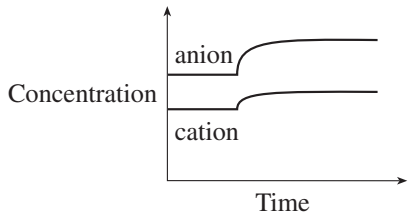
B.



C.



D.



70. What is the concentration of OH^- ions in 250 mL of 0.20 M $Sr(OH)_2$?

A. 0.050 M
B. 0.10 M
C. 0.20 M
D. 0.40 M

71. What happens when 10.0 mL of 0.2 M KOH is added to 10.0 mL of 0.2 M $CuSO_4$?

A. No precipitate forms.
B. A precipitate of K_2SO_4 forms.
C. A precipitate of $Cu(OH)_2$ forms.
D. Precipitates of K_2SO_4 and $Cu(OH)_2$ form.

72. Solid NaCl is added to a saturated AgCl solution. How have the $[Ag^+]$ and $[Cl^-]$ changed when equilibrium has been reestablished?

	$[Ag^+]$	$[Cl^-]$
A.	increased	increased
B.	decreased	increased
C.	increased	decreased
D.	decreased	decreased

73. Which of the following expressions represents $\left[Fe^{3+}\right]$ in a saturated $Fe(OH)_3$ solution?

A. $\dfrac{K_{sp}}{3\left[OH^-\right]}$

B. $\dfrac{K_{sp}}{\left[OH^-\right]^3}$

C. $\sqrt[3]{\dfrac{K_{sp}}{\left[OH^-\right]}}$

D. $K_{sp} \times \left[OH^-\right]^3$

74. What is the value of K_{sp} for $Zn(OH)_2$ if the solubility of $Zn(OH)_2$ is equal to 4.2×10^{-6} M ?

A. 1.0×10^{-2}
B. 4.0×10^{-3}
C. 1.8×10^{-11}
D. 3.0×10^{-16}

75. What is the maximum number of moles of Cl^- that can exist in 500.0 mL of 2.0 M $AgNO_3$?

A. 4.5×10^{-11}
B. 9.0×10^{-11}
C. 1.8×10^{-10}
D. 1.8×10^{-9}

76. What is the concentration of the ions in 3.0 L of 0.50 M $Al_2(SO_4)_3$?

	$\left[Al^{3+}\right]$	$\left[SO_4{}^{2-}\right]$
A.	0.33 M	0.50 M
B.	1.0 M	1.5 M
C.	1.5 M	1.5 M
D.	3.0 M	4.5 M

77. Consider the following equilibrium:

$$MgCO_{3(s)} \rightleftarrows Mg^{2+}_{(aq)} + CO_3{}^{2-}_{(aq)}$$

Adding which of the following would cause the solid to dissolve?

A. HCl

B. K_2CO_3

C. $MgCO_3$

D. $Mg(NO_3)_2$

78. Which of the following compounds could be used to prepare a solution with a $\left[S^{2-}\right]$ greater than $0.1\,M$?

A. ZnS
B. PbS
C. Ag_2S
D. Rb_2S

79. Which of the following will **not** form a precipitate when mixed with an equal volume of $0.2\,M$ $AgNO_3$?

A. $0.2\,M$ NaBr
B. $0.2\,M$ $NaIO_3$
C. $0.2\,M$ $NaNO_3$
D. $0.2\,M$ $NaBrO_3$

80. A solution is prepared containing both $0.2\,M$ OH^- and $0.2\,M$ $PO_4{}^{3-}$ ions. An equal volume of a second solution is added in order to precipitate only one of these two anions. The second solution must contain which of the following?

A. $0.2\,M$ Cs^+
B. $0.2\,M$ Zn^{2+}
C. $0.2\,M$ Pb^{2+}
D. $0.2\,M$ Sr^{2+}

81. Consider the following equilibrium:

$$CaS_{(s)} \rightleftarrows Ca^{2+}_{(aq)} + S^{2-}_{(aq)}$$

When $Ca(NO_3)_{2(aq)}$ is added to this solution, the equilibrium shifts to the

A. left and $\left[S^{2-}\right]$ increases.
B. left and $\left[S^{2-}\right]$ decreases.
C. right and $\left[S^{2-}\right]$ increases.
D. right and $\left[S^{2-}\right]$ decreases.

82. How many moles of Pb^{2+} are there in 500.0 mL of a saturated solution of $PbSO_4$?

A. 3.2×10^{-16}
B. 9.0×10^{-9}
C. 6.7×10^{-5}
D. 1.3×10^{-4}

83. Which of the following compounds is least soluble in water?

A. CuI
B. BeS
C. CsOH
D. $AgBrO_3$

84. Which of the following will dissolve to form a molecular solution?

A. H_2SO_4
B. $AgNO_3$
C. $Ca(OH)_2$
D. $C_6H_{12}O_6$

85. Consider the following equilibrium:

$$\text{energy} + AgCl_{(s)} \rightleftarrows Ag^+_{(aq)} + Cl^-_{(aq)}$$

Addition of which of the following will increase the solubility of AgCl ?

A. heat
B. HCl
C. $AgNO_3$
D. a catalyst

86. What is the $\left[Cl^-\right]$ when 15.0 g of NaCl is dissolved in enough water to make 100.0 mL of solution?

A. 0.150 M
B. 0.390 M
C. 2.56 M
D. 3.90 M