

Name:

Chapter 4 Review Quiz

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- ☐ 1. The bonding present between water molecules is:
- covalent.
 - dipole–dipole.
 - dispersion.
 - hydrogen.
- ☐ 2. A student performed an investigation to determine the formula for the hydrated salt for zinc sulfate. The student collected the following data:
Mass of empty evaporating basin = 42.56 g
Mass of evaporating basin with hydrated salt = 48.06 g
Mass of evaporating basin with anhydrous salt = 45.66 g
- What is the formula for the hydrated salt of zinc sulfate?
- $\text{ZnSO}_4 \cdot 6\text{H}_2\text{O}$
 - $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$
 - $\text{ZnSO}_3 \cdot 8\text{H}_2\text{O}$
 - $\text{ZnSO}_4 \cdot 8\text{H}_2\text{O}$
- ☐ 3. When an ionic compound dissolves:
- the negative part of the water is attracted to the anion. This only occurs if the energy required to separate the ions is less than the energy released when the ions are hydrated.
 - the negative part of the water is attracted to the anion. This only occurs if the energy required to separate the ions is more than the energy released when the ions are hydrated.
 - the negative part of the water is attracted to the cation. This only occurs if the energy required to separate the ions is less than the energy released when the ions are hydrated.
 - the negative part of the water is attracted to the cation. This only occurs if the energy required to separate the ions is more than the energy released when the ions are hydrated.
- ☐ 4. The solubility of a solute is:
- the mass of solute dissolved in an unsaturated solution.
 - the mass of solute dissolved in a saturated solution.
 - the mass of solute dissolved in a supersaturated solution.
 - the mass of solute that precipitates when a supersaturated solution is bumped.
- ☐ 5. How much potassium dichromate would dissolve at 50°C in 50 mL of water?
- 72 g
 - 36 g
 - 30 g
 - 15 g
- ☐ 6. Which salt has a solubility closest to 25 g / 50 mL water at 30°C?
- NaCl
 - KCl
 - KNO_3

d. $\text{Pb}(\text{NO}_3)_2$

- ▼ 7. Which of the following salts is least soluble when the temperature is less than 90°C ?
- Potassium chlorate
 - Potassium chloride
 - Potassium chromate
 - Potassium nitrate
- ▼ 8. Australia's first peoples used a variety of ways to process food. Complex processing is commonly associated with which of the following types of processing?
- cutting
 - cooking
 - leaching
 - pounding
- ▼ 9. What criteria is required for the removal of a substance by leaching?
- The substance must have a high solubility in water.
 - The substance must have a high molar mass.
 - There must be a flowing creek nearby.
 - The substance must have a large surface area.
- ▼ 10. Sparingly soluble refers to compounds whose solubility is:
- $< 0.1 \text{ g/L}$.
 - $0.1 - 5 \text{ g/L}$.
 - $1 - 10 \text{ g/L}$.
 - $> 10 \text{ g/L}$.
- ▼ 11. When a sodium chloride solution is added to a silver nitrate solution, a precipitate forms. Which of the following represents the net ionic equation for this reaction?
- $\text{Ag}^+ (\text{aq}) + \text{Cl}^- (\text{aq}) \rightarrow \text{AgCl} (\text{s})$
 - $\text{Na}^+ (\text{aq}) + \text{NO}_3^- (\text{aq}) \rightarrow \text{NaNO}_3 (\text{s})$
 - $\text{NaCl} (\text{aq}) + \text{AgNO}_3 (\text{aq}) \rightarrow \text{NaNO}_3 (\text{s}) + \text{AgCl} (\text{aq})$
 - $\text{NaCl} (\text{aq}) + \text{AgNO}_3 (\text{aq}) \rightarrow \text{NaNO}_3 (\text{aq}) + \text{AgCl} (\text{s})$
- ▼ 12. $\text{MgCO}_3 (\text{s}) \rightleftharpoons \text{Mg}^{2+} (\text{aq}) + \text{CO}_3^{2-} (\text{aq})$
The equilibrium expression for magnesium carbonate is written as:
- $$\frac{[\text{Mg}^{2+}][\text{CO}_3^{2-}]}{[\text{MgCO}_3]}$$
 - $$\frac{[\text{Mg}^{2+}][\text{CO}_3^{2-}]}{[\text{MgCO}_3]}$$
 - $$\frac{[\text{Mg}^{2+}][\text{CO}_3^{2-}]}{[\text{MgCO}_3]}$$
 - $$[\text{Mg}^{2+}][\text{CO}_3^{2-}]^{-1}$$
- ▼ 13. Write the equilibrium expression for the insoluble salt, magnesium phosphate.
- $[\text{Mg}^{2+}][\text{PO}_4^{3-}]$
 - $[\text{Mg}^{2+}][\text{PO}_4^{3-}]^6$
 - $[\text{Mg}^{2+}]^2[\text{PO}_4^{3-}]^3$
 - $[\text{Mg}^{2+}]^3[\text{PO}_4^{3-}]^2$
- ▼ 14. Which of the following hydroxides is most soluble?

- a. $\text{Cd}(\text{OH})_2$ $K_{\text{sp}} = 7.2 \times 10^{-15}$
- b. $\text{Ca}(\text{OH})_2$ $K_{\text{sp}} = 5.02 \times 10^{-6}$
- c. $\text{Pb}(\text{OH})_2$ $K_{\text{sp}} = 1.43 \times 10^{-20}$
- d. $\text{Mg}(\text{OH})_2$ $K_{\text{sp}} = 5.6 \times 10^{-12}$

- ▼ 15. The K_{sp} for lithium phosphate is 2.37×10^{-11} at 298K. Calculate the solubility of lithium phosphate in g/L.
- a. 1.27×10^{-3} g/L
 - b. 2.21×10^{-3} g/L
 - c. 0.147 g/L
 - d. 0.256 g/L
- ▼ 16. In a saturated solution of nickel(II) hydroxide at 298 K, the concentration of nickel ions is 5.16×10^{-6} mol/L. What is the K_{sp} for nickel(II) hydroxide?
- a. 1.06×10^{-10}
 - b. 1.88×10^{-17}
 - c. 2.66×10^{-11}
 - d. 5.50×10^{-16}
- ▼ 17. A student added 100 mL of 0.050 mol/L $\text{Pb}(\text{NO}_3)_2$ to 40 mL of a 0.020 mol/L NaCl solution. The K_{sp} for lead chloride is 1.70×10^{-5} at 298 K. Justify whether a precipitate of lead chloride will form in this investigation.
- a. A precipitate will form because $Q_{\text{sp}} < K_{\text{sp}}$.
 - b. A precipitate will form because $Q_{\text{sp}} > K_{\text{sp}}$.
 - c. A precipitate will not form because $Q_{\text{sp}} < K_{\text{sp}}$.
 - d. A precipitate will not form because $Q_{\text{sp}} > K_{\text{sp}}$.
- ▼ 18. $\text{PbI}_2(\text{s}) \rightleftharpoons \text{Pb}^{2+}(\text{aq}) + 2\text{I}^{-}(\text{aq})$
Compare the solubility of lead(II) iodide in water with its solubility in a solution containing 0.1 mol/L potassium iodide.
- a. Solubility of lead iodide is less in the potassium iodide solution because the forward reaction is favoured.
 - b. Solubility of lead iodide is less in the potassium iodide solution because the reverse reaction is favoured.
 - c. Solubility of lead iodide is greater in the potassium iodide solution because the forward reaction is favoured.
 - d. Solubility of lead iodide is greater in the potassium iodide solution because the reverse reaction is favoured.
- ▼ 19. The K_{sp} for AgCl is 1.77×10^{-10} at 298 K. Calculate the solubility of Ag^{+} in a 0.100 mol/L solution of NaCl.
- a. 1.77×10^{-9} mol/L
 - b. 1.77×10^{-10} mol/L
 - c. 1.33×10^{-5} mol/L
 - d. 1.33×10^{-6} mol/L
- ▼ 20. The K_{sp} for NiCO_3 is 1.42×10^{-7} at 298 K. Determine how much less soluble NiCO_3 is in a 0.050 mol/L solution of Na_2CO_3 than it is in water.
- a. 53 000
 - b. 133

c. 3.77×10^{-4}

d. 7.53×10^{-3}

