Name Key

Class _____ Date _____

Chapter 15 Test

Solutions

Part I

Select the response that best completes each statement or answers each question. Write the letter of each answer in the space provided on the left.

c 1. Which of the following statements regarding a solution of sugar and water is NOT correct?
   a. Sugar and water are evenly distributed.
   b. It is a homogeneous mixture.
   c. All sugar and water solutions have the same proportions.
   d. It looks like a pure substance.

b 2. In a solution, the solute is _____.
   a. a solid
   b. present in a smaller amount than the solvent
   c. dissolved in water
   d. material that collects on the bottom of the container

d 3. What happens when an ionic solid dissolves in water?
   a. Positive ions in the crystal are attracted to the negative ends of water molecules.
   b. Ions from the crystal become hydrated.
   c. The ionic solid dissociates.
   d. All of the above occur.

c 4. Which of the following CANNOT dissociate?
   a. salt crystals
   b. calcium carbonate
   c. sugar
   d. sodium hydroxide

a 5. Sugar dissolves in water because _____.
   a. polar sugar molecules are attracted to water molecules
   b. water and sugar are immiscible
   c. sugar molecules dissociate quickly
   d. All of the above occur.

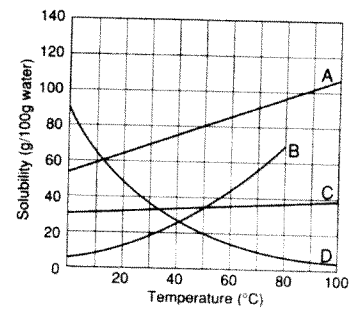
d 6. If 20 mL of water and 20 mL of ethanol are mixed, the resulting volume will be _____.
   a. exactly 40 mL because the ethanol will form a layer above the water
   b. exactly 40 mL because the water and alcohol molecules will mix evenly
   c. greater than 40 mL because the water and ethanol molecules will repel each other
   d. less than 40 mL because the ethanol and water molecules will take positions between each other

c 7. Oil and water are _____.
   a. miscible because both are polar molecules
   b. miscible because both are nonpolar molecules
   c. immiscible because water is polar and oil is nonpolar
   d. immiscible because water is nonpolar and oil is polar

a 8. About 12 g of potassium dichromate, $K_2Cr_2O_7$, are dissolved in 100 g of water at 20°C. As more solute is added it falls to the bottom of the container. What term describes this solution?
   a. saturated
   b. unsaturated
   c. supersaturated
   d. Question cannot be answered from the data given.

d 9. About 20 g of $K_2Cr_2O_7$ are dissolved in 100 g of water at 40°C. What term describes this solution?
   a. saturated
   b. unsaturated
   c. supersaturated
   d. Question cannot be answered from the data given.

Refer to the figure below to answer questions 10–14. Write the correct answer in the space provided. Show your work for solutions to problems.



10. How many grams of substance A can be dissolved in 100 g of water at 50°C?

80g

11. How many grams of substance B can be dissolved in 500 g of water at 80°C? (Show Your Work)

$\frac{70 g B}{100 g H_2O} \times 500 g H_2O = 350 g B$

90gC − 70gC (No − 20g excess solute)

12. If 90 g of substance C are added to 200 g of water at 20°C, will all of the solid dissolve? If not, how much excess will there be?

35gC / 100g H_2O × 200g H_2O = 70g C

13. Which curve on the graph represents a gas? How can you tell?

Curve D reps a gas − only graph w/ downward slope − indicates a ↓ in sol w/ ↑ temp

Critical Thinking

14. If you wanted to grow crystals by supersaturating and then cooling a solution, which curve on the graph represents the solid substance that would give the LEAST success with this technique? Explain your answer.

Curve C is least successful choice − Sol changes very little w/ temp − Deposits v. little excess solute when cooled

Part II

Select the response that best completes each statement or answers each question. Write the letter of each answer in the space provided on the left.

c 15. When solutions of aluminum bromide ($AlBr_3$) and calcium hydroxide [$Ca(OH)_2$] are mixed in a test tube, a white precipitate forms. Later testing shows that many bromide ions remain in solution. What is the precipitate?

a. $AlBr_3$ b. $Ca(OH)_2$ c. $Al(OH)_3$ d. $CaBr_2$

b 16. When solutions of lead nitrate [$Pb(NO_3)_2$] and sodium iodide (NaI) are mixed, a yellow precipitate forms. The precipitate is lead iodide, PbI_2. Which equation represents this reaction?

a. $Pb(NO_3)_2(aq) + 2\ NaI(aq) \rightarrow PbI_2(aq) + 2\ NaNO_3(aq)$
b. $Pb(NO_3)_2(aq) + 2\ NaI(aq) \rightarrow PbI_2(s) + 2\ NaNO_3(aq)$
c. $Pb(NO_3)_2(aq) + 2\ NaI(aq) \rightarrow PbI_2(aq) + 2\ NaNO_3(s)$
d. $Pb(NO_3)_2(aq) + 2\ NaI(aq) \rightarrow Pb^{2+}(aq) + 2I^-(aq) + 2\ NaNO_3(aq)$

c 17. What is the ionic equation for this reaction?

a. $Pb^{2+}(aq) + 2NO_3^-(aq) + 2Na^+(aq) + 2I^-(aq) \rightarrow Pb^{2+}(aq) + 2NO_3^-(aq) + 2Na^+(aq) + 2I^-(aq)$
b. $Pb^{2+}(aq) + 2NO_3^-(aq) + 2Na^+(aq) + 2I^-(aq) \rightarrow Pb(NO_3)(s) + 2Na^+(aq) + 2I^-(aq)$
c. $Pb^{2+}(aq) + 2NO_3^-(aq) + 2Na^+(aq) + 2I^-(aq) \rightarrow PbI_2(s) + 2NO_3^-(aq) + 2Na^+(aq)$
d. $Pb^{2+}(aq) + 2NO_3^-(aq) + 2Na^+(aq) + 2I^-(aq) \rightarrow PbI_2(s) + 2NaNO_3(aq)$

c 18. What is the net ionic equation for this reaction?

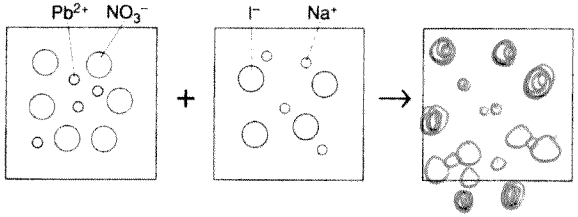
a. $Pb^{2+}(aq) + 2NO_3^-(aq) + 2Na^+(aq) + 2I^-(aq) \rightarrow Pb^{2+}(aq) + 2NO_3^-(aq) + 2Na^+(aq) + 2I^-(aq)$
b. $Pb^{2+}(aq) + 2NO_3^-(aq) + 2Na^+(aq) + 2I^-(aq) \rightarrow PbI_2(s) + 2NO_3^-(aq) + 2Na^+(aq)$
c. $Pb^{2+}(aq) + 2I^-(aq) \rightarrow PbI_2(s)$
d. $Na^+(aq) + NO_3^-(aq) \rightarrow NaNO_3(s)$

a 19. Which ions are spectator ions?

a. Na^+ and NO_3^- b. Na^+ and Pb^{2+} c. Pb^{2+} and NO_3^- d. Pb^{2+} and I^-

Write the correct answer in the space provided.

20. Complete this submicroscopic drawing to represent what happens after the solutions of lead nitrate and sodium iodide are mixed.



Critical Thinking

21. In the reaction between lead nitrate and sodium iodide, would the amount of precipitate change significantly if the solutions were hot when mixed, instead of being at room temperature? Explain your answer.

No − the amt of ppt would not change − if a compound is insoluble in H_2O @ Rm temp − incr. temp does NOT significantly incr amt dissolved

Part III

Select the response that best completes each statement or answers each question. Write the letter of each answer in the space provided on the left.

c 22. If solution A contains 5 g of NaCl in 100 g of water and solution B contains 10 g of NaCl in 100 g of water, which of the following comparisons is true?

a. A has a higher boiling point and a higher freezing point than B.
b. A has a lower boiling point and a lower freezing point than B.
c. A has a lower boiling point and a higher freezing point than B.
d. A has a higher boiling point and a lower freezing point than B.

d 23. Which of the following solutes would have the greatest effect on the freezing point of water, if dissolved to form solutions of equal molality?

a. $C_{12}H_{22}O_{11}$ b. NaCl c. $BaCl_2$ d. $AlBr_3$