

Chapter 22

Suggestions for Studying**Section 1**

- Know that a solution is made up of a solute and solvent.
- Be able to provide an example of a solute and a solvent.
- Remember solutions can also be gaseous and solid.
- Be able to give an example of a gaseous solution.
- Know what an alloy is and be able to give an example.
- Know the three things you can do to speed up the rate of dissolving –stirring, reducing crystal size, and increasing temperature.

Section 2

- Know what solubility is.
- Know how to read a solubility curve.
- Be able to determine if a solution is saturated, supersaturated, or unsaturated.

Section 3

- Know the difference between polar and nonpolar substances.
- Know the difference between an electrolyte and a nonelectrolyte.
- Know what effect adding a solute has on the freezing point of a solvent.
- Know what effect adding a solute has on the boiling point of a solvent.

Section 4

- Be able to provide examples of polar and nonpolar substances.
- Be able to explain what is meant by “like dissolves like”.
- Be able to explain how soap works.

Practice Questions**Multiple Choice: Circle the correct answer in each set.**

1. Which of the following statements is true about how using smaller salt crystals would affect the rate of making a salt solution in water?
- Smaller crystals increase the surface area and slow down dissolving.
 Smaller crystals decrease the surface area and speed up dissolving.
 Smaller crystals increase the surface area and speed up dissolving.
 Smaller crystals decrease the surface area and slow down dissolving.

2. What characteristic of water makes it the universal solvent?

Nonpolar large molecules long-chain hydrocarbon molecules polar

3. The illustration (**Figure 1**) indicates what effect of solutes on freezing point?

Freezing point is lower because the freezing point of the solute is lower than that of water.
 Freezing point is lower because solute particles interfere with crystal formation.
 Freezing point is raised because solute particles aid crystal formation.
 Freezing point is raised because solute freezing point is higher than that of water.

4. Which of the following statements is true?

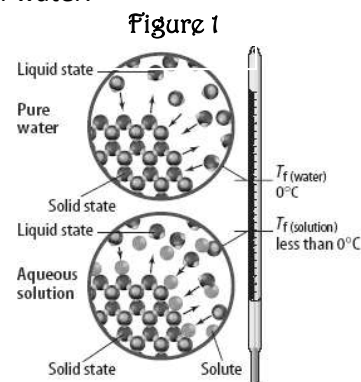
Nonpolar solvents are useful for dissolving polar solutes.
 Polar solvents are useful for dissolving nonpolar solutes.
 Nonpolar solvents are not useful because they do not form solutions with water.
 Nonpolar solvents are useful for dissolving nonpolar solutes.

5. Which of the following is the most precise term?

supersweet dilute concentrated 40 percent juice by volume

6. Which of the following actions increases the rate of dissolving?

decreasing the pressure decreasing the temperature stirring the solution using larger-sized crystals



7. Which of the following is a solution?

Salt water 14K gold Carbonated water All of the above None of the above

8. In forming a water solution, what process does an ionic compound undergo?

neutralization ionization dissociation displacement

9. In soda pop, the solvent would be the _____.

carbon dioxide water sugar flavoring

10. A molecule that is positively charged on one end and negatively charged on the other end is _____.

polar nonpolar both polar and nonpolar neither

Fill in the blank:

11. Adding a solute to a solvent _____ the freezing point of the solvent.

12. A solution of one solid metal in another is called a(n) _____.

13. Vitamin C is a(n) _____ compound and dissolves readily in water.

14. Substances that do not ionize in water and cannot conduct electricity are called _____.

15. The process in which water molecules draw ions away from a crystalline solid and into solution is _____.

16. A mixture that appears to have the same composition, color, and density and is mixed at the molecular level is called a(n) _____.

17. _____ is the maximum amount of a solute that can be dissolved in a given amount of solvent at a given temperature.

18. A solution that contains all the solute it can hold at a given temperature is _____.

19. _____ are compounds that form charged particles.

20. In lemonade, sugar is the _____ and water is the _____.

21. When a solid is being dissolved in a liquid, stirring _____ the dissolving process.

22. _____ the surface area of a solid will increase the rate at which a solute dissolves.

23. Adding antifreeze to a car radiator increases the _____ of the water in the radiator.

24. In a solution, the _____ does the dissolving.

25. The air that you breath is an example of a(n) _____ solution.

26. Identify each of the following as polar (P), nonpolar (NP), or both (B)

___ Salad oil

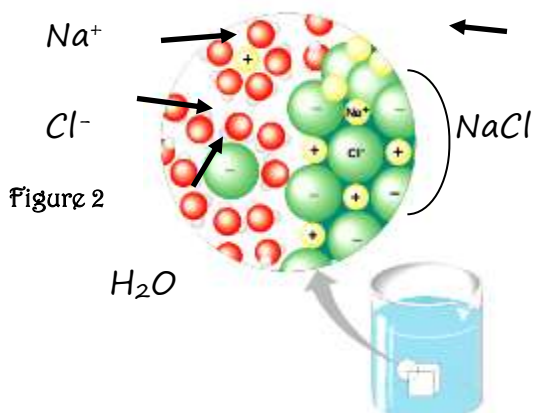
___ Oil-based paint

___ Water

___ Vinegar

___ Vitamin C

___ Soap



27. What is the name of the process taking place in the diagram (Figure 2)? _____

28. What is the solvent in the diagram (Figure 2)? _____

29. What is the solute in the diagram (Figure 2)? _____

30. Is the solute an electrolyte or nonelectrolyte? _____

31. Will the solution conduct an electric current? _____

Data Table 1

Solubility of Substances in 100 grams of water at 20°C	
Barium Sulfate	0.00025 grams
Lithium Carbonate	1.3 grams
Lithium Bromide	166.0 grams
Sodium Nitrate	87.6 grams
Potassium Chloride	34.0 grams
Ammonium Chlorate	28.7 grams

32. According to the table above (Data Table 1), how would you classify each of the following solutions? (saturated, unsaturated, supersaturated)

_____ A solution that contains 1.8 g of lithium carbonate in 100 grams of water at 20°C

_____ A solution that contains 0.00025 g of barium sulfate in 100 g of water at 20°C

_____ A solution that contains 25.8 g of ammonium chlorate in 100 g of water at 20°C

_____ A solution that contains 86.7 g of sodium nitrate in 100 g of water at 20°C

Refer to the Solubility Graph for #33-40.

33. Classify each of the following solutions (saturated, unsaturated, supersaturated) if the solute is dissolved in 100 grams of water.

_____ 75 g of potassium bromide at 50°C

_____ 40 g of NaCl if the water is 50°C

_____ 100 g of KBr if the water is 90°C

_____ 80 g of NaClO₃ if the water is 30°C

_____ 60 g of KNO₃ if the water is 30°C

34. Which salt is least soluble at 50°C? _____

35. Which salt is most soluble at 50°C? _____

36. At what temperature does the solubility of KNO₃ equal the solubility for the following solutions?

_____ NaClO₃ _____ KBr _____ NaCl

37. How much sodium chlorate would need to be added to 100 g of H₂O at 50°C to make a saturated solution? _____

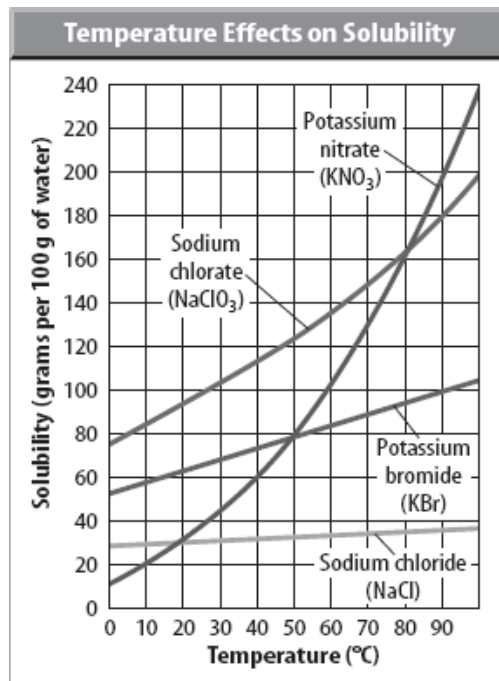
38. How much potassium bromide would need to be added to 100 g of H₂O at 50°C to make a saturated solution? _____

39. How much sodium chloride would need to be added to 100 g of H₂O at 50°C to make a saturated solution? _____

40. How many additional grams of sodium chlorate would need to be added to keep the solution saturated during the indicated temperature changes?

0°C to 20°C _____ 20°C to 60°C _____ 80°C to 90°C _____

41. Explain in detail, how soap works (be sure to include terms from Chapter 22).



True/False: Think about the results of Milk Kaleidoscope Lab when answering the following questions.

_____ 42. Milk with a higher fat content (like whole milk) is more polar than milk with a lower fat content (like 1%).

_____ 43. Dawn dishwashing soap is only able to dissolve polar substances.

_____ 44. Food coloring is more like skim milk than whole milk.

_____ 45. The fat in the milk is a nonpolar substance.

Chapter 23 Review

- ✓ Compare and contrast acids and bases. Identify the characteristics of each.
- ✓ Be able to provide some examples of common acids and bases
- ✓ Determine what is responsible for the strength of acid or a base.
- ✓ Be able to describe the pH scale.
- ✓ Be able to describe a neutralization reaction. (What are the products?)

Sample Questions

True/False: Change the wording of the false statements to make them true.

1. Solutions with a pH above 7 are acidic.
2. Phenolphthalein turns bright pink in the presence of an acid.
3. Antacids work by neutralizing excess stomach acid.
4. A reaction between an acid and a base produces water and sugar.
5. In a titration, the point where the indicator changes color and stays that way is the endpoint
6. A neutralization reaction between an acid and a base is a double replacement reaction.
7. Acetic acid is found in the human stomach to help with digestion of food.
8. Bases are not corrosive.
9. An acid that only partly ionizes in solution is a weak acid.
10. Human blood has a neutral pH.

Multiple Choice:

11. Which of the following statements about acids is NOT true?

- Acids form hydroxide ions in solution.
- Many foods contain acids.
- Acids taste sour.
- Acids are corrosive

12. Pure water has a pH of _____.

- 0 5.2 7 14

13. Which of the following statements about bases is NOT true?

- Bases in solution feel slippery.
- Bases form hydroxide ions in solution.
- Bases form when acids react with metals.
- Pure, undissolved bases are often crystalline solids.

14. Sodium hydroxide and calcium hydroxide are _____.

- Salts bases phosphates indicators

15. The pH scale is from:

- 0-7 1-10 0-10 7-20 none of these

16. A solution has a pH of 5. It is

- acidic basic neutral not possible

17. Which of the following substances contains a base?

- Aspirin vinegar fertilizer lemon juice

18. Colored solutions used to find pH are:

- indicators weak acids fruit extracts vegetable extract all of these

19. Which of the following statements is true concerning acids and bases?

acids and bases don't react with each other
acids mixed with bases make stronger bases

acids mixed with bases neutralize each other
acids mixed with bases make stronger acids

20. The hydronium ion is a)

H⁺ OH⁻ H₃O⁺ H₂O none of these

21. When bases ionize they release

hydrogen ions sodium ions chloride ions hydroxide ions

22. A common substance that contains acetic acid is

vinegar ammonia water salad oil soap

23. Acid-base reactions are usually _____ reactions.

Synthesis combustion decomposition double-displacement

24. The sour taste of lemons and limes is due to a substance called

acetic acid citric acid hydrochloric acid carbonic acid

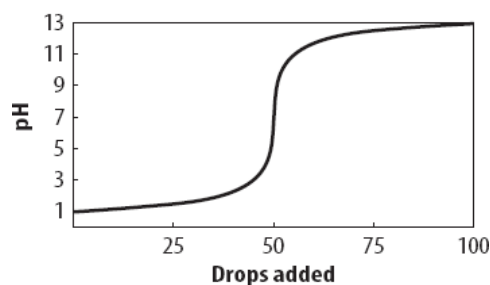
25. A(n) _____ is a substance that produces hydrogen ions in solution.

Salt base indicator acid

Acids, Bases, and Salts

26. The curve (right) shows the titration of an acid solution with a strong base solution. How many drops were required to react with all of the acid in the solution?

50 48 75 100



Identify each of the following as A) acid B) base or C) could be an acid or a base

27. _____ Sour Taste

32. _____ Gastric juices in stomach

28. _____ Slippery

33. _____ Used in soap

29. _____ Produces hydrogen ions

34. _____ Can cause skin burns

30. _____ Is corrosive (strong)

35. _____ produces hydroxide ions

31. _____ Bitter taste

36. _____ HCl is a common example



37. Which substance is a base? _____ How do you know? _____

38. In the equation above, which substance is a salt? _____

39. What factor determines the strength of an acid or a base? _____

40. What is a neutralization reaction? _____