

Part 1 - Role of water in Chemical & biological systems.

1. Draw a Lewis structure of water molecule.
2. Water is polar. What makes it polar?
3. Explain “Like dissolves like” rule.
4. Which of the following elements is more electronegative, C or O?
5. What intermolecular force holds water molecules together?
6. Why is water called the “universal solvent”?
7. Water has a high heat capacity. Explain what it means and give an example.
8. What property of water is responsible for delivering water and nutrients dissolved in it to the leaves and flowers?
9. Compare and contrast cohesion and adhesion. Give an example of each.
10. Surface tension is the result of _____ (cohesion, adhesion). Give an example of cohesion.
11. Capillary Action is the result of _____ (cohesion, adhesion). Give an example of adhesion.

Part 2 – Factors affecting dissolution and solubility - Types of solutions.

12. What is a solvent? Give an example. What is a solute? Give an example.
13. Homogeneous mixture is also called a _____.
14. Give an example of a substance soluble in water. Give an example of a substance insoluble in water.
15. Give an example of a miscible mixture Give an example of an immiscible mixture.

16. **Matching:**

- | | |
|---|-------------------|
| _____ a. A solution that contains more solute than it can normally hold at a given temperature. | A. saturated |
| _____ b. A solution that cannot dissolve any more solute at a given temperature | B. supersaturated |
| _____ c. The substance that dissolves another substance to form a solution. | C. unsaturated |
| _____ d. This solution can be made by heating it first then cooling it slowly. | D. solution |
| | E. solute |
| | F. solvent |

17. **True or false. If false, write the correct answer.:**

- a. A saturated solution must be heated to get all the solute to dissolve.
- b. A dilute solution contains more solute than a concentrated solution.
- c. Sugar is the solvent in Kool-aid.

18. Explain how a supersaturated solution is formed.

19. Sketch the process of the dissolution of NaCl and the dissolution of Sucrose (table sugar). What is the difference?

20. What are the 3 factors that increase the rate of dissolution of a solid solute?

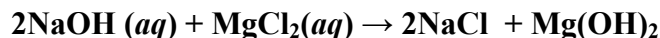
21. What is solubility?

22. Use the Solubility Rules (refer to the Solubility chart in your notes) to determine if the following compounds are soluble or INSoluble in water.

- A. NaNO₃ b. Ca(OH)₂ c. PbCl₂ d. K₂CO₃ e. Al₂S₃

23. What is a precipitate?

24. Does this reaction form a precipitate?



25. What are the 3 factors that increase the solubility of a solid?

26. What are the 2 factors that increase the solubility of a gaseous solute?

27. What is the difference between an electrolyte and a nonelectrolyte? Give one example of each.

Part 3 – Calculations

28. What is concentration?

29. How does a dilute solution differ from a concentrated solution?

30. Write the formulas for molarity and dilutions.
31. A solution contains 1.6g CuSO_4 per 400ml of solution. Calculate the molarity.
32. How many moles of solute are present in 3.5L of a 3.0M solution of CuCl_2 ?
33. How many grams of solute are present in 800ml of a 1.5M NaCl solution?
34. Calculate the # of ml of solution needed to dissolve 5.0g of NaBr to make a 0.1M solution.
35. To 225 ml of 0.80 M KI , a student adds enough water to make 1L of a new diluted KI solution. What is the molarity of the new solution?
36. How would you prepare 100 ml of 0.6 M CaCl_2 from a stock solution that is 2.0 M CaCl_2 ?
37. What volume of a 12M stock solution would be needed to make 2L of a 4M dilute solution?

Part 4 – Reading the Solubility Curve

Use the graph below, answer questions 38-46.

38. What type of solution is formed when 54g of KCl is added to 100g of water at 30°C ?
39. How many grams of NH_4Cl should be added to 300 g of water at 70°C to make a saturated solution?
40. If 90g of NaNO_3 is added to 100 g of water at 10°C will it all dissolve? If not, what is the minimum temperature at which all 90g will dissolve?
41. If 42 g of NaCl is dissolved in 200 g of water at 50°C , the solution must be _____.
42. Which salt on the graph has the greatest increase in solubility from 50°C to 60°C ?
43. Name one salt that has a decrease in solubility as temperature increases.
44. If you add 60 g of NaNO_3 to 100g of water at 10°C , what type of solution is it?
45. How would you make a saturated solution of KCl at 10°C ?
46. Which salt is the most soluble at 60°C : NaCl , NH_4Cl , KCl , or NaNO_3 ?

