

Name: _____

Solutions Review

1. Which barium salt is *insoluble* in water?

- 1) **BaCO₃** 3) Ba(ClO₄)₂
2) BaCl₂ 4) Ba(NO₃)₂

2. Based on Reference Table F, which of these saturated solutions has the lowest concentration of dissolved ions?

- 1) NaCl(aq) 3) NiCl₂(aq)
2) MgCl₂(aq) 4) **AgCl(aq)**

3. According to Reference Table F, which substance is most soluble?

- 1) AgI 3) PbCl₂
2) CaSO₄ 4) **(NH₄)₂CO₃**

4. Which compound becomes *less* soluble in water as the temperature of the solution is increased?

- 1) **HCl** 3) NaCl
2) KCl 4) NH₄Cl

5. According to Table F which compound is soluble in water?

- 1) barium phosphate
2) calcium sulfate
3) silver iodide

4) **sodium perchlorate**

6. Which compound is *least* soluble in water at 60. °C?

- 1) **KClO₃** 3) NaCl
2) KNO₃ 4) NH₄Cl

7. According to your Reference Tables, which substance forms an unsaturated solution when 80 grams of the substance is dissolved in 100 grams of H₂O at 10°C?

- 1) **KI** 3) NaNO₃
2) KNO₃ 4) NaCl

8. The solubility of KClO₃(s) in water increases as the

- 1) **temperature of the solution increases**
2) temperature of the solution decreases
3) pressure on the solution increases
4) pressure on the solution decreases

9. According to Reference Table G, how many grams of KNO₃ would be needed to saturate 200 grams of water at 70°C?

- 1) 43 g 2) 86 g 3) 134 g 4) **268 g**

10. Based on Reference Table G, what is the maximum number of grams of KCl(s) that will dissolve in 200 grams of water at 50°C to produce a saturated solution?

- 1) 38 g 2) 42 g 3) 58 g 4) **84 g**

11. The solubility of KCl(s) in water depends on the

- 1) pressure on the solution
2) rate of stirring
3) size of the KCl sample
4) **temperature of the water**

12. Under which conditions of temperature and pressure is a gas most soluble in water?

- 1) high temperature and low pressure
2) high temperature and high pressure
3) low temperature and low pressure
4) **low temperature and high pressure**

13. A student prepares four aqueous solutions, each with a different solute. The mass of each dissolved solute is shown in the table below.

Mass of Dissolved Solute
for Four Aqueous Solutions

Solution Number	Solute	Mass of Dissolved Solute (per 100. g of H ₂ O at 20.°C)
1	KI	120. g
2	NaNO ₃	88 g
3	KCl	25 g
4	KClO ₃	5 g

Which solution is saturated?

- 1) 1 2) **2** 3) 3 4) 4

14. What is the total mass of KNO₃ that must be dissolved in 50. grams of H₂O at 60.°C to make a saturated solution?

- 1) 32 g 2) **53 g** 3) 64 g 4) 106 g

15. When 5 grams of KCl are dissolved in 50. grams of water at 25°C, the resulting mixture can be described as

- 1) heterogeneous and unsaturated
2) heterogeneous and supersaturated
3) **homogeneous and unsaturated**
4) homogeneous and supersaturated

16. A solution contains 35 grams of KNO₃ dissolved in 100 grams of water at 40°C. How much *more* KNO₃ would have to be added to make it a saturated solution?

- 1) **29 g** 2) 24 g 3) 12 g 4) 4g

17. A solution is formed by dissolving 45 grams of NH_4Cl in 100 grams of H_2O at 70°C . Which statement correctly describes this solution?
- 1) NH_4Cl is the solute, and the solution is saturated.
 - 2) NH_4Cl is the solute, and the solution is unsaturated.**
 - 3) NH_4Cl is the solvent, and the solution is saturated.
 - 4) NH_4Cl is the solvent, and the solution is unsaturated.
18. The molarity of an aqueous solution of NaCl is defined as the
- 1) grams of NaCl per liter of water
 - 2) grams of NaCl per liter of solution
 - 3) moles of NaCl per liter of water
 - 4) moles of NaCl per liter of solution**
19. What is the molarity of 1.5 liters of an aqueous solution that contains 52 grams of lithium fluoride, LiF , (gram-formula mass = 26 grams/mole)?
- 1) 1.3 M**
 - 2) 2.0 M
 - 3) 3.0 M
 - 4) 0.75 M
20. Which phrase describes the molarity of a solution?
- 1) liters of solute per mole of solution
 - 2) liters of solution per mole of solution
 - 3) moles of solute per liter of solution**
 - 4) moles of solution per liter of solution
21. A 3.0 M HCl (aq) solution contains a total of
- 1) 3.0 grams of HCl per liter of water
 - 2) 3.0 grams of HCl per mole of solution
 - 3) 3.0 moles of HCl per liter of solution**
 - 4) 3.0 moles of HCl per mole of water
22. How many total moles of KNO_3 must be dissolved in water to make 1.5 liters of a 2.0 M solution?
- 1) 0.50 mol
 - 2) 2.0 mol
 - 3) 3.0 mol**
 - 4) 1.3 mol
23. What is the molarity of a solution of NaOH if 2 liters of the solution contains 4 moles of NaOH ?
- 1) 0.5 M
 - 2) 2 M**
 - 3) 8 M
 - 4) 80 M
24. What is the total number of grams of NaI (s) needed to make 1.0 liter of a 0.010 M solution?
- 1) 0.015
 - 2) 0.15
 - 3) 1.5**
 - 4) 15
25. Which unit can be used to express the concentration of a solution?
- 1) L/s
 - 2) J/g
 - 3) ppm**
 - 4) kPa
26. What is the total mass of solute in 1000. grams of a solution having a concentration of 5 parts per million?
- 1) 0.005 g**
 - 2) 0.05g
 - 3) 0.5 g
 - 4) 5g
27. What is the concentration of O_2 (g), in parts per million, in a solution that contains 0.008 gram of O_2 (g) dissolved in 1000. grams of H_2O (l)?
- 1) 0.8 ppm
 - 2) 8 ppm**
 - 3) 80 ppm
 - 4) 800 ppm
28. What is the concentration of a solution, in parts per million, if 0.02 gram of Na_3PO_4 is dissolved in 1000 grams of water?
- 1) 20 ppm**
 - 2) 2 ppm
 - 3) 0.2 ppm
 - 4) 0.02 ppm
29. How do the boiling point and freezing point of a solution of water and calcium chloride at standard pressure compare to the boiling point and freezing point of water at standard pressure?
- 1) Both the freezing point and boiling point of the solution are higher.
 - 2) Both the freezing point and boiling point of the solution are lower.
 - 3) The freezing point of the solution is higher and the boiling point of the solution is lower.
 - 4) The freezing point of the solution is lower and the boiling point of the solution is higher.**
30. Which aqueous solution of KI freezes at the lowest temperature?
- 1) 1 mol of KI in 500. g of water
 - 2) 2 mol of KI in 500. g of water**
 - 3) 1 mol of KI in 1000. g of water
 - 4) 2 mol of KI in 1000. g of water
31. Which solution has the lowest freezing point?
- 1) 10. g of KI dissolved in 100. g of water
 - 2) 20. g of KI dissolved in 200. g of water
 - 3) 30. g of KI dissolved in 100. g of water**
 - 4) 40. g of KI dissolved in 200. g of water
32. Compared to a 0.1 M aqueous solution of NaCl , a 0.8 M aqueous solution of NaCl has a
- 1) higher boiling point and a higher freezing point
 - 2) higher boiling point and a lower freezing point**
 - 3) lower boiling point and a higher freezing point
 - 4) lower boiling point and a lower freezing point

Base your answers to questions **33** and **34** on the information below and on your knowledge of chemistry.

Seawater contains dissolved salts in the form of ions. Some of the ions found in seawater are Ca^{2+} , Mg^{2+} , K^+ , Na^+ , Cl^- , HCO_3^- , and SO_4^{2-} .

An investigation was conducted to determine the concentration of dissolved salts in seawater at one location. A 300.-gram sample of the seawater was placed in an open container. After a week, all the water had evaporated and 10. grams of solid salts remained in the container.

_____ 33. At standard pressure, compare the freezing point of seawater to the freezing point of distilled water.

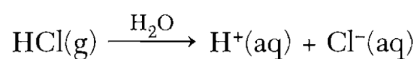
_____ 34. Determine the concentration, expressed as percent by mass, of the dissolved salts in the original sample of seawater.

_____ 35. Base your answer to the following question on the information below.

A total of 1.4 moles of sodium nitrate is dissolved in enough water to make 2.0 liters of an aqueous solution. The gram-formula mass of sodium nitrate is 85 grams per mole.

Determine the molarity of the solution.

_____ 36. A scientist makes a solution that contains 44.0 grams of hydrogen chloride gas, $\text{HCl}(\text{g})$, in 200. grams of water, $\text{H}_2\text{O}(\ell)$, at 20. °C. This process is represented by the balanced equation below.



Based on Reference Table G, identify, in terms of saturation, the type of solution made by the scientist.

Base your answers to questions **37** through **40** on the information below.

In a laboratory, a student makes a solution by completely dissolving 80.0 grams of $\text{KNO}_3(\text{s})$ in 100.0 grams of hot water. The resulting solution has a temperature of 60.°C. The room temperature in the laboratory is 22°C.

_____ 37. Describe a laboratory procedure that can be used to recover the solid solute from the aqueous solution.

_____ 38. Describe the direction of heat flow between the solution made by the student and the air in the laboratory.

_____ 39. Compare the boiling point of the solution at standard pressure to the boiling point of water at standard pressure.

_____ 40. Classify, in terms of saturation, the type of solution made by the student.

Answer Key
Solutions Review

1. 1
 2. 4
 3. 4
 4. 1
 5. 4
 6. 1
 7. 1
 8. 1
 9. 4
 10. 4
 11. 4
 12. 4
 13. 2
 14. 2
 15. 3
 16. 1
 17. 2
 18. 4
 19. 1
 20. 3
 21. 3
 22. 3
 23. 2
 24. 3
 25. 3
 26. 1
 27. 2
 28. 1
 29. 4
 30. 2
 31. 3
 32. 2
 33. –Water has a higher freezing point than seawater. –Seawater's is lower.
 34. 3.3%/3%/3.3333%
 35. 0.70 M
 36. unsaturated solution
 37. Gently heat the solution to evaporate the water until only solid KNO_3 remains. *or* Boil off the water.
 38. Heat flows from the solution to the air in the laboratory. *or* The air gains heat from the solution.
 39. –The boiling point of the solution at standard pressure is higher than the boiling point of water at standard pressure. –Water boils at a lower temperature.
 40. The solution made by the student is unsaturated.
-