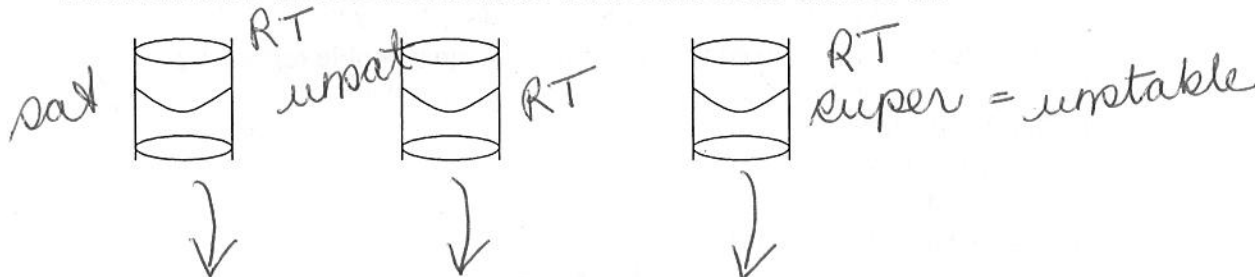
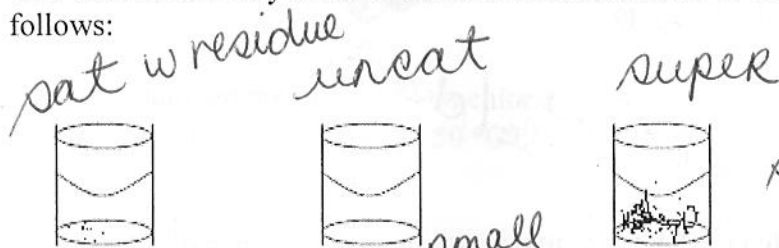


Saturation and Unsaturated Diagram Warm Up

A student has 3 different solutions all of the same solute and solvent



She then adds a very small amount of the same solute to each solution with the results as follows:

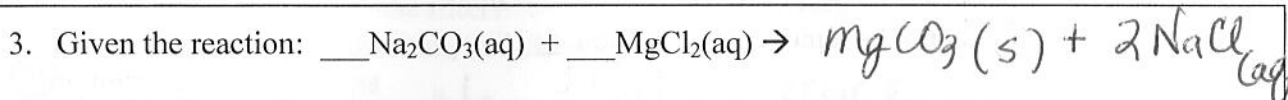


the small amt added drops to bottom

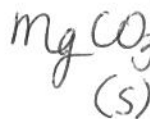
small amt dissolves

small amt added causes the extra solute that went into soln at a higher I to rapidly come out of soln when disturbed

1. Classify the first three solutions in terms of saturation
2. Briefly explain your answers to # 1 above (ex: unsaturated b/c ...)



- a. Complete the reaction and include in parentheses (aq) or (s) as appropriate
- b. balance the reaction
- c. When the reaction above in # 3 is filtered, what will be present on the filter paper?



Solutions Regents Chemistry Review

1) Which substance yields hydroxide ion as the only negative ion in aqueous solution?

- 1) $\text{Mg}(\text{OH})_2$ *base → dissociate into ions*
 2) $\text{C}_2\text{H}_4(\text{OH})_2$ *alcohol = ∅ ionization*
 3) MgCl_2
 4) CH_3Cl *organic = not A B OR S*

*5 but
no
OH⁻*

2) Which two solutions when mixed together will undergo a double replacement reaction and form a solid substance?

- 1) $\text{NaCl}(\text{aq})$ and $\text{LiNO}_3(\text{aq})$
 2) $\text{KCl}(\text{aq})$ and $\text{AgNO}_3(\text{aq})$
 3) $\text{KCl}(\text{aq})$ and $\text{LiCl}(\text{aq})$
 4) $\text{NaNO}_3(\text{aq})$ and $\text{AgNO}_3(\text{aq})$

3) How many milliliters of 12.0 M $\text{HCl}(\text{aq})$ must be diluted with water to make exactly 500. ml of 3.00 M hydrochloric acid?

- 1) 100. ml
 2) 125. ml
 3) 200. ml
 4) 250. ml

*solubility
table / chart*

4) Based on Reference Table G, what is the maximum number of grams of $\text{KCl}(\text{s})$ 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

5) In a true solution, the dissolved particles

- 1) Are always colorless
 2) Will settle out on standing
 3) Can not be gases
 4) Can not be removed by filtration

6) In an aqueous solution of sodium chloride, the solute is

- 1) Cl^- only
 2) Na^+ only
 3) $\text{Na}^+ \text{Cl}^-$
 4) H_2O

*Na⁺ Cl⁻
research!
& know*

7) Most hydrocarbons are not soluble in water because

- 1) Water is polar and hydrocarbons are nonpolar
 2) Hydrocarbons are polar and water is polar
 3) Water is ionic and hydrocarbons are nonpolar
 4) Hydrocarbons are ionic and water is polar

8) As the temperature of a solution rises, the solubility of all gases in water

- 1) Increases
- 2) Decreases
- 3) Stays the same
- 4) Depends on the gas

think Diet Coke + depend

* 9) What happens when KCl is dissolved in water?

- 1) Both K^+ ions and Cl^- are attracted to the oxygen atom of water
- 2) Both K^+ ions and Cl^- are attracted to the hydrogen atoms of water
- 3) K^+ ions are attracted to oxygen atom in water and Cl^- ions are attracted to hydrogen atoms in water
- 4) K^+ ions are attracted to hydrogen atoms in water and Cl^- ions are attracted to oxygen atom in water

polar covalent water molecule

10) Which of the following substances is least soluble in 100 g of water at 40 °C?

- 1) $KClO_3$
- 2) HCl
- 3) NH_4Cl
- 4) NaCl

look at K_{sp} s OR solubility curves

11) How many grams of potassium chloride must be dissolved in 50 grams of water to make a saturated solution at 50 °C?

- 1) 21 g
- 2) 37 g
- 3) 42 g
- 4) 75 g

solubility curve.

12) Which of the following is insoluble in water?

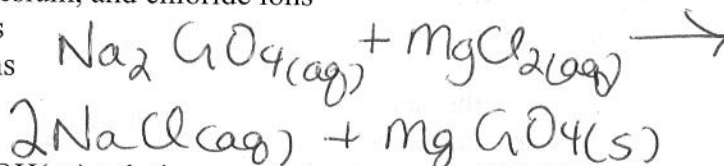
- 1) Calcium chloride
- 2) Ammonium phosphate
- 3) Barium sulfate
- 4) Potassium chromate

group 1A BCE

13) If solutions of sodium chromate and magnesium chloride are mixed and poured into a filter, what will pass through the filter?

- 1) Sodium, chromate, magnesium, and chloride ions
- 2) Sodium and chloride ions
- 3) Magnesium chromate ions
- 4) Water only

↓ water



14) What is the molarity of a NaOH(aq) solution containing 4 grams of NaOH in 100 ml of solution?

- 1) 0.001 M
- 2) 0.04 M
- 3) 1 M
- 4) 25 M

$$\frac{1000 \cancel{ml}}{1L} \times \frac{4g NaOH}{100 \cancel{ml}} \times \frac{1 \text{ mol NaOH}}{40g NaOH} =$$

15) If 100 ml of a 1.0 M solution is evaporated to 20 ml, what will be the concentration of the resulting solution?

- 1) 0.2 M
- 2) 1.0 M
- 3) 5.0 M
- 4) 10.0 M

$$C_1 V_1 = C_2 V_2$$
$$\frac{(100 \cancel{ml})(1.0 M)}{20 \cancel{ml}} = C_2$$

16) The drinking fountain in the hallway outside Commons contains 0.0015 g of zinc in a sample of 1 kg of water. What is the approximate concentration of zinc in parts per million (ppm)?

- 1) 0.0015
- 2) 0.015
- 3) 1.5
- 4) 15

Grade 10 ppm
0.001

$$= \frac{0.0015 \text{ g Zn}}{1000 \text{ g}} = 1000 \text{ mL}$$

$$\text{ppm} = \frac{\text{mg}}{\text{L}}$$

17) Which substance increases its solubility in water as the temperature increases?

- 1) HCl
- 2) NH₃
- 3) SO₂
- 4) NaCl

research

*18) Which substance will dissolve best in CCl₄?

- 1) I₂
- 2) NaOH
- 3) H₂S
- 4) Methanol

19) A student adds a crystal of CaCl₂ into a test tube of CaCl₂(aq) and the crystal does not dissolve. The original solution must have been

- 1) Saturated
- 2) Supersaturated
- 3) Unsaturated
- 4) Heterogeneous

depends on # of particles

20) Which solution will have the highest boiling point?

- 1) 1.0 M CO₂
- 2) 1.0 M NaCl
- 3) 1.0 M MgCl₂
- 4) 1.0 M C₆H₁₂O₆

research

21) An unsaturated solution of magnesium bromide at 20 °C is heated to 40 °C. As the solution is heated in a closed container, the concentration of the solution

- 1) Decreases
- 2) Increases
- 3) Remains the same
- 4) Depends on the pressure

Ksp table = lowest Ksp (usually)

22) According to Table F, which of the following compounds is least soluble in water?

- 1) Copper (II) chloride
- 2) Aluminum acetate
- 3) Iron (III) acetate
- 4) Calcium sulfate

solubility graph

23) According to Table G, which solution is saturated at 30 °C?

- 1) 6 grams of KClO₃ in 50 grams of water
- 2) 12 grams of KClO₃ in 200 grams of water
- 3) 15 grams of NaCl in 50 grams of water
- 4) 30 grams of NaCl in 200 grams of water

24) What is the molarity of a solution that contains 0.50 mole of NaCl in 0.25 liter of solution?

- 1) 0.25 M
- 2) 0.50 M
- 3) 1.0 M
- 4) 2.0 M

$$\frac{0.50 \text{ mol}}{0.25 \text{ L}}$$

25) Which of the following will affect **both** how fast and how much sugar will dissolve in water?

- 1) Adding more water
- 2) Increasing the pressure
- 3) Breaking up the lumps of sugar
- 4) Heating the water

= faster but not more

26) A student placed a lump of sugar into a cup of tea (an aqueous solution) and the sugar did not dissolve. Since the tea was cold and the mug very full, the student transferred the mug's contents to a larger container and then heated in a microwave. When the student removed the larger container from the microwave, the sugar had dissolved into the tea.

What are the likely causes for the sugar dissolving

- 1) Transferring to a larger container, only ~~X~~
- 2) Heating the tea, only ✓
- 3) Both heating the tea and transferring to a larger container vol? X
- 4) Neither heating the tea nor transferring to a larger container would have an effect

27) 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

$$\frac{4 \text{ mol}}{2 \text{ L}} = 2 \text{ M}$$

28) One hundred grams of water is saturated with NH_4Cl at 50°C . According to Table G, if the temperature is lowered to 10°C , what is the approximate total amount of NH_4Cl that will precipitate?

- 1) 5.0 g
- 2) 17 g
- 3) 50. g
- 4) 80. g

29) The reason salt raises the boiling point of water is that

- 1) Salt raises the vapor pressure of water
- 2) Salt speeds up the water molecules
- 3) Salt strengthens the attractions between water molecules
- 4) Salt adds an attractive force between water and salt

- 30) Compared to a molecular compound, when an equal number of moles of an ionic substance is added to the same amount of water,
- 1) The ionic compound separates into more pieces and the water freezes at a lower temperature
 - 2) The ionic compound separates into fewer pieces and the water freezes at a lower temperature
 - 3) The ionic compound separates into more pieces and the water freezes at a higher temperature
 - 4) The ionic compound separates into fewer pieces and the water freezes at a higher temperature

why salt on streets in winter?

- 31) 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

$$1.0 \text{ L} \times \frac{0.010 \text{ mol}}{\text{L}} = 0.010 \text{ mol} \times \text{---}$$

- 32) How many moles of LiCl are contained in 500. ml of a 3.00 M solution?
- 1) 1.50
 - 2) 6.00
 - 3) 150.
 - 4) 167

$$\frac{3.00 \text{ mol}}{\text{L}} \times 500. \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} =$$

Part II (Show all work, use proper units as required, and box answers)

When cola, a type of soda pop is manufactured, CO₂(g) is dissolved in it.

- 33) (1 pt) A capped bottle of cola contains CO₂(g) under high pressure. When the cap is removed, how does the lower pressure affect the solubility of the dissolved CO₂(g)?

↓ solubility of gas.

- 34) (1 pt) A glass of cold cola is left to stand 5 minutes at room temperature. How does temperature affect the solubility of the CO₂(g)?

↑ T = ↓ solubility of a gas

- 35) (2 pts) Toothpaste contains a mixture of gritty cleaning abrasives, color, flavors, whiteners, and a water solution that includes sodium fluoride to help prevent tooth decay. A typical toothpaste tube of 7 ounces contains approximately .500 grams sodium fluoride dissolved in 45 ml water.

What is the molar concentration (molarity) of sodium fluoride? (1 point for showing substitutions into the correct formula and 1 point for the correct answer).

$$\frac{0.500 \text{ g NaF}}{45 \text{ mL}} \times \frac{1 \text{ mol}}{42 \text{ g}} \times \frac{1000 \text{ mL}}{1 \text{ L}} =$$

- 36) (2 pts) A saturated solution of NaNO_3 in 50 grams of water at 10.0°C is heated to 40.0°C . Approximately how much more NaNO_3 must be added to keep the solution saturated at the higher temperature?

50g at 10.0°C but solubility $\sim \frac{80.8 \text{ g}}{100 \text{ mL } 10^\circ\text{C}}$
 at 40.0°C but solubility $\sim \frac{102 \text{ g}}{100 \text{ mL } 40.0^\circ\text{C}}$

102g
 - 50g

 52g

- 37) A student combines an aqueous solution of K_2CrO_4 with an aqueous solution of $\text{Ba}(\text{NO}_3)_2$

1) (1 pt) What is the name of K_2CrO_4 potassium chromate

2) (1 pt) Predict the formulas of the products for the following reaction using the correct subscripts



3) (1 pt) Identify the formula of the precipitate that forms in this reaction



4) (1 pt) Explain your answer in terms of your knowledge of chemistry and Table F

gr IA cpds = soluble Ba^{2+} cpds = insoluble

NO_3^- cpds = "