**Mid-Solutions Unit Review**

**Types of Matter Review**

* **Questions**:
  1. Which formula represents a mixture?
     1. C6H12O6*(l)*
     2. C6H12O6*(s)*
     3. LiCl*(aq)*
     4. LiCl*(s)*
  2. A dilute, aqueous potassium nitrate solution is best classified as a
     1. Homogenous compound
     2. Homogeneous mixture
     3. Heterogeneous compound
     4. Heterogeneous mixture
  3. Which must be a mixture of substances
     1. Solid b. Liquid c. Solution d. Gas

**Separation Techniques**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Technique** | **Separates** | **(What does it separate?)** | **Based on** | **Property** |
| Evaporation | separates |  | based on |  |
| Filtration | separates |  | based on |  |
| Distillation | separates |  | based on |  |
| Chromatography | separates |  | based on |  |

* **Questions:**
  1. A mixture of crystals of salt and sugar is added to water and stirred until all solids have dissolved. Which statement best describes the resulting mixture?
     1. The mixture is homogeneous and can be separated by filtration.
     2. The mixture is homogeneous and cannot be separated by filtration.
     3. The mixture is heterogeneous and can be separated by filtration.
     4. The mixture is heterogeneous and cannot be separated by filtration.
  2. When a mixture of water, sand, and salt is filtered, what passes through the filter paper?
     1. Water only
     2. Water and sand only
     3. Water and salt only
     4. Water, sand, and salt
  3. When sample *X*is passed through a filter paper a white residue, *Y,*remains on the paper and a clear liquid, *Z,*passes through. When liquid *Z*is vaporized, another white residue remains. Sample *X*is best classified as
     1. An element
     2. A compound
     3. A heterogeneous mixture
     4. A homogeneous mixture

**Factors That Affect Solubility**

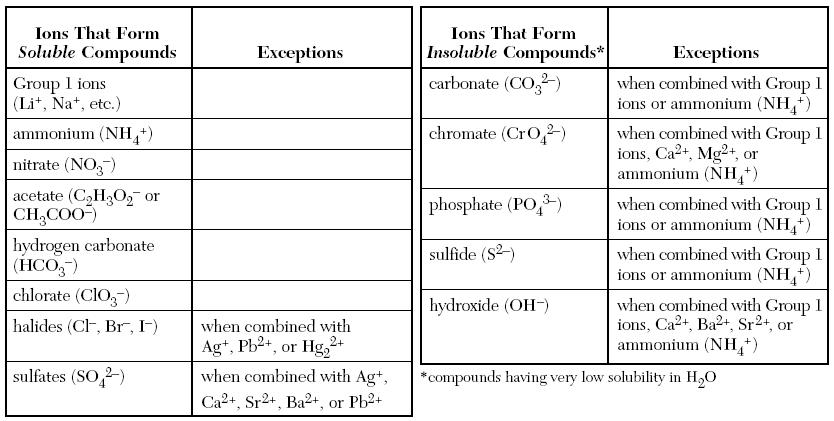
|  |  |  |
| --- | --- | --- |
| **Factors That Affect Solubility** | **Effect on Gases** | **Effect on Solids/Liquids** |
| Increase Temperature |  |  |
| Decrease Temperature |  |  |
| Increase Pressure |  |  |
| Decrease Pressure |  |  |
| Increase Surface Area |  |  |
| Decrease Surface Area |  |  |
| Increase Agitation/Stirring |  |  |
| Decrease Agitation/Stirring |  |  |
| Increase Particle Size |  |  |
| Decrease Particle Size |  |  |

|  |  |  |
| --- | --- | --- |
| **Nature of Solvent (does the dissolving)** |  | **Nature of Solute (what gets dissolved)** |
| Ionic | dissolves |  |
| Polar | dissolves |  |
| Non-polar | dissolves |  |

* Note: nature or solute and solvent, temperature, and pressure, affect how MUCH of something can be dissolved and surface area and stirring affects how FAST something dissolves
* **Questions**:
  1. 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
  2. The solubility of KCl(s) in water depends on the
     1. Pressure of the solution
     2. Rate of stirring
     3. Size of the KCl sample
     4. Temperature of the water
  3. At room temperature, the solubility of which solute on water would be most affected by a change in pressure?
     1. Methanol
     2. Sugar
     3. Carbon dioxide
     4. Sodium nitrate

**Table F: Solubility Guidelines for Aqueous Solutions**

* Compounds containing alkali metal cations or the ammonium ion (NH4+) are soluble
* Compounds containing nitrate (NO3-), chlorate (ClO3-), and acetate (C2H3O2 - ) anions are soluble.
* Chlorides, bromides, and iodides are soluble except those containing Ag+, Pb2+,or Hg2 2+
* Sulfates are soluble except those containing Hg22+, Pb2+,Sr2+,Ca2 +, or Ba2+
* Hydroxides (OH) are insoluble except compounds of the alkali metals, Ca2+, Sr2+,and Ba2+
* Compounds containing PO4 3-, S2-, CO3 2-, SO3 2- ions are insoluble except those that also contain alkali metals or NH4 +
* Compounds that are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (can dissolve) are also \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ meaning they can conduct electricity
* Compounds that are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (cannot dissolve) are also \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ meaning they cannot conduct electricity
* **Questions:**



* 1. When PbI2(s) is added to Na2CO3(aq), a white precipitate is formed. According to Reference Table F, the white precipitate most likely is
     1. KNO3
     2. PbCO3
     3. NaI
     4. Na2CO3
  2. Which precipitate does the reaction Ba(NO3)2*(aq)* + Na2SO4*(aq)* 🡪 2 NaNO3*(aq)* + BaSO4*(s),* form?
     1. Nitrogen
     2. Barium sulfate
     3. Barium nitrate
     4. Soluble salt
  3. Based on Reference Table F, which of these saturated solutions has the lowest concentration of dissolved ions?
     1. NaCl*(aq)*
     2. MgCl2*(aq)*
     3. NiCl2*(aq)*
     4. AgCl*(aq)*

**Table G: Solubility Curves at Standard Pressure**

* Table G is a graph that shows the solubility of numerous solutes and their ability to dissolve in **100 g of H2O**
  + - * + 1 g H2O = 1 mL H2O
* Each curve represents the greatest amount of solute that can dissolve at the given temperature which is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Measurements below the curve are known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because more solute can be dissolved.
* Measurements on the curve are known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because no more solute can be dissolved at the given conditions and still be a stable solution.
* Measurements above the curve are known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because an unstable solution as formed, and the excess solute will crystallize or precipitate out of solution
* Since the graph is based on 100 g of water, if the question asks about 200 g of water, you must \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ your answer.
* Since the graph is based on 100 g of water, if the question asks about 50 g of water, you must \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ your answer.
* The amount of substance that precipitates out of solution can be measured by taking data from both temperatures and calculating the difference.
* **Questions**:
  1. Based on the graph, how much KNO3 can dissolve in 100g of H2O at 20°C? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. Based on the graph, how much KNO3 can dissolve in 50g of H2O at 60°C? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  3. Based on the graph, how much KCl can dissolve in 200g of H2O at 90°C? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  4. In 100g of H2O, how many grams of NH4Cl will precipitate out of solution if the temperature decreases from 80°C to 50°C? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  5. 72g of NH4Cl at 90°C represents what type of solution? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  6. 10g of NH3 at 70°C represents what type of solution? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  7. 90g of HCl at 50°C represents what type of solution? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  8. 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 b. 42 g c. 58 gd. 84 g
  9. How many grams of KCl must be dissolved in 200 grams of water to make a saturated solution at 60 ºC?
     1. 30 g b. 45 g c. 56 g d. 90 g
  10. Which is a saturated solution?
      1. 40 g NH4Cl in 100 g water at 50 ºC
      2. 2 g SO2 in 100 g water at 10 ºC
      3. 52 g KCl in 100 g water at 80 ºC
      4. 120 g KI in 100 g water at 20 ºC

