5.2 Explaining Solutions /48

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. The following substances are common chemicals: butane, (lighters) ethanol, (alcoholic drinks) dichloromethane, CH2Cl2(l) (solvent in correction fluid) **(4 marks)**
   1. Classify the type(s) of intermolecular forces present among molecules of each of these substances.
   2. Predict the solubility (low, moderate, or high) of each substance in water.
2. Why are ionic compounds highly soluble in water, compared with their solubility in any other solvent? **(2 marks)**
3. List the three features of a water molecule that make water the best solvent. **(3 marks)**
4. For each of the following substances, write the chemical formula including pure state of matter at SATP, predict the solubility (low/high) in water, and if appropriate, write a balanced dissociation equation. **(4 marks)**
   1. silver sulfide
   2. ammonium borate
   3. copper(II) nitrate trihydrate
   4. glucose
5. In your own words, describe what is believed to happen when an ionic compound dissolves in water. **(1 mark)**
6. Write dissociation or ionization equations for each of the following pure substances when they dissolve in water: **(4 marks)**
   1. CaCl2(s) (road salt)
   2. HF(g) (etching glass)
   3. (NH4)2HPO4(s) (fertilizer)
   4. Al2(SO4)3(s) (making pickles)
7. Compare dissociation and ionization by listing similarities and differences. **(2 marks)**
8. According to Arrhenius’ theory, what is the explanation for (a) an acid turning blue litmus red? (b) a base turning red litmus blue? (c) neutralization of an acid and a base? **(3 marks)**
9. List three examples of solutions in consumer products. **(3 marks)**
10. A key characteristic of science is the goal of explaining natural products and processes. Do we need a theoretical explanation of solutions in order to use them? Answer from consumer and Aboriginal perspectives. **(2 marks)**
11. Many substances dissolve in water because water is such a polar solvent. **(3 marks)**
    1. Are energy changes always involved when substances dissolve in water? Justify your answer.
    2. Describe a brief experimental design to test your answer to (a).
    3. What are some limitations that might be encountered if you were to perform this experiment?
12. List the chemical formulas for the major entities present in water for each of the following:

**(13 marks)**

* 1. zinc
  2. potassium dichromate
  3. sodium bromide
  4. acetic acid
  5. oxygen
  6. sulfur
  7. nitric acid
  8. copper(II) sulfate
  9. calcium phosphate
  10. silver chloride
  11. methanol
  12. paraffin wax, C25H52(s)
  13. aluminum sulfate

1. Why is water such a good solvent for dissolving many ionic and molecular compounds? How is this property an advantage and a disadvantage? **(2 marks)**
2. The dissolving of calcium chloride in water is very exothermic compared with dissolving sodium chloride in water. Would calcium chloride be an appropriate substitute for a sidewalk deicer? Identify some positive and negative aspects, including several perspectives. **(2 marks)**