

Solutions Practice Test

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Which of the following substances is NOT a solution?

- A) air
- B) brass
- C) copper — element!
- D) All of the above are solutions.

2) Which of the following substances is NOT a solution?

- A) bronze
- B) sea water
- C) soda
- D) All of the above are solutions.

3) Suppose a Hydrochloric Acid solution contains 30 % HCl with the remaining portion of the solution composed of water.

What is the solute in this type of ~~martini?~~ soln?

- A) water
- B) air
- C) HCl
- D) NaCl
- E) none of the above

4) Oil does not dissolve in water because

- A) oil is polar.
- B) oil is nonpolar.
- C) water is nonpolar.
- D) water is saturated.
- E) oil is hydrated.

* Expected to know water is polar

5) The solubility of solids in water:

- A) is independent of the temperature.
- B) increases with increasing temperature. (usually)
- C) decreases with increasing temperature.
- D) Solids are not soluble in water.

6) What is the molarity of a solution prepared by dissolving 10.7 g NaI in 0.250 L?

- A) 42.8 B) 0.0714
- C) 2.86×10^{-4}
- D) 0.286
- E) none of the above

$$10.7 \text{ g NaI} \left(\frac{1 \text{ mol NaI}}{147.89 \text{ g NaI}} \right) \left(\frac{1}{0.250 \text{ L soln}} \right)$$

$$= 0.286 \text{ M NaI}$$

7) How many grams of KCl are needed to make 50.0 mL of 2.45 M KCl?

- A) 9.13
- B) 1.52
- C) 91.3
- D) 0.123
- E) none of the above

$$50.0 \text{ mL Soln.} \left(\frac{1.00 \text{ L Soln.}}{1000 \text{ mL Soln.}} \right) \left(\frac{2.45 \text{ mol KCl}}{1.00 \text{ L Soln.}} \right) \left(\frac{74.55 \text{ g KCl}}{1 \text{ mol KCl}} \right) = 9.13 \text{ g KCl}$$

8) After you have completed the task of diluting a solution, which statement below must be TRUE?

- A) The new solution has more volume but has a lower concentration than before.
- B) The new solution has more volume but has a higher concentration than before.
- C) The new solution has less volume but has a lower concentration than before.
- D) The new solution has less volume but has a higher concentration than before.

9) What is the final concentration of a solution prepared by diluting 35.0 mL of 12.0 M HCl to a final volume of 1.20 L?

- A) 0.504 M
- B) 3.50 M
- C) 0.420 M
- D) 0.350 M

$$M_1 V_1 = M_2 V_2$$

$$\frac{M_1 V_1}{V_2} = M_2 = \frac{(12.0 \text{ M HCl})(35.0 \text{ mL})}{(1200 \text{ mL})} = 0.350 \text{ M HCl}$$

$$\rightarrow 1.20 \text{ L} \left(\frac{1000 \text{ mL}}{1 \text{ L}} \right) = 1200 \text{ mL} \quad \leftarrow 3 \text{ SF}$$

10) Which of the following statements about colligative properties is FALSE?

- A) The boiling point of a solution is increased by the addition of salt.
- B) The freezing point of a solution is lowered by the addition of salt.
- C) The change in temperature is proportional to the molality.
- D) The identity of the solute is not a factor.
- E) All of the above statements are true.

11) What is the molality of a solution made by dissolving 14.7 g of $\text{C}_6\text{H}_{12}\text{O}_6$ into 150.0 ml of water? Assume the density of water is 1.00 g/mL.

- A) 0.544
- B) 0.0816
- C) 10.2
- D) 0.980
- E) none of the above

$$14.7 \text{ g C}_6\text{H}_{12}\text{O}_6 \left(\frac{1 \text{ mol C}_6\text{H}_{12}\text{O}_6}{180.18 \text{ g C}_6\text{H}_{12}\text{O}_6} \right) \left(\frac{1}{150.0 \text{ g H}_2\text{O}} \right) \left(\frac{1000 \text{ g H}_2\text{O}}{1.00 \text{ kg H}_2\text{O}} \right) = 0.544 \text{ m C}_6\text{H}_{12}\text{O}_6$$

$$150.0 \text{ mL H}_2\text{O} \rightarrow 150.0 \text{ g H}_2\text{O}$$

$$d_{\text{H}_2\text{O}} = \frac{1.00 \text{ g}}{\text{mL}}$$

12) What is the change in the boiling point of a solution made by dissolving 14.7 g of $C_6H_{12}O_6$ into 150.0 ml of water? The density of water is 1.00 g/mL and $K_b = 0.512\text{ }^\circ\text{C/m}$.

- A) $0.502\text{ }^\circ\text{C}$
- B) $5.22\text{ }^\circ\text{C}$
- C) $0.0418\text{ }^\circ\text{C}$
- D) $0.279\text{ }^\circ\text{C}$
- E) none of the above

$$\Delta t_b = K_b m$$

$$= \left(0.512\frac{^\circ\text{C}}{m}\right) (0.544\text{ m } C_6H_{12}O_6) = \underline{\underline{0.279\text{ }^\circ\text{C}}}$$

$$m \rightarrow 14.7\text{ g } C_6H_{12}O_6 \left(\frac{1\text{ mol } C_6H_{12}O_6}{180.18\text{ g } C_6H_{12}O_6}\right) \left(\frac{1}{150.0\text{ g } H_2O}\right) \left(\frac{1000\text{ g } H_2O}{1.0\text{ kg } H_2O}\right)$$

$$= 0.544\text{ m } C_6H_{12}O_6$$

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

- 13) A solution is a homogeneous mixture of two or more substances. *True*
- 14) The major component in a solution is called the ~~solute~~ solvent. *False*
- 15) A saturated solution holds the maximum amount of solute under the solution conditions. *True*
- 16) The solubility of solids in water generally increases with increasing temperature. *True*
- 17) Molarity is defined as the moles of solute per liter of solution. *True*
- 18) A sample of salt water will freeze at a ~~higher~~ lower temperature than a sample of pure water. *False*