

MC: (_____ - _____ / 4)(3 pts each) = _____ FR: _____ Overall: _____

SECTION I: Multiple Choice (3 pts each): Choose the option that is the best answer or completes each question or statement. Write your answers in the blanks provided and erase mistakes completely. In this section, as a correction for haphazard guessing, one-fourth of the number of questions you answer incorrectly will be subtracted from the number of questions you answer correctly.

- An unsaturated solution is one that:
 - Contains more dissolved solute than the solubility allows
 - Contains the maximum concentration of solute particles
 - Has a concentration lower than the solubility
 - Has the dissolved solute in equilibrium with the un-dissolved solute
 - Not enough information given or none of the aboveAns: _____
- Which one of the following is most soluble in water?
 - CH₃OH
 - CH₃CH₂OH
 - CH₃CH₂CH₂OH
 - CH₃CH₂CH₂CH₂OH
 - Not enough information given or none of the aboveAns: _____
- Of the units below, _____ are appropriate for a first-order reaction rate constant.
 - M s⁻¹
 - s⁻¹
 - L/mol
 - M⁻¹ s⁻¹
 - Not enough information given or none of the aboveAns: _____

Consider the following reaction for Questions 4 – 5: $2 \text{NO (g)} \leftrightarrow \text{N}_2 \text{(g)} + \text{O}_2 \text{(g)}$

- The equilibrium constant for the reaction above is $K_{\text{eq}} = 230$ at 100°C. At equilibrium,
 - Products predominate
 - Reactants predominate
 - Approximately equal quantities of products and reactants are present
 - Only products are present
 - Only reactants are presentAns: _____
- In an experiment, 0.35 mol of N₂ and 0.40 mol of O₂ are placed in a 1.00 L vessel at 25°C. At equilibrium, it is determined that 0.19 mol of O₂ remain. K_p at this temperature is:
 - 0.063
 - 0.15
 - 3.7
 - 550
 - Not enough information given or none of the aboveAns: _____

6. Which one of the following statements about K_w is false?
- K_w is the chemical equilibrium expression of: $\text{OH}^- (\text{aq}) + \text{H}^+ (\text{aq}) \leftrightarrow \text{H}_2\text{O} (\text{l})$
 - K_w is known as the ion-product constant for water.
 - K_w changes with temperature.
 - The value of K_w show that water is a weak base.
 - None of the above
- Ans: _____
7. ZOH is a weak base. An aqueous solution of ZOH is prepared by dissolving 0.040 mol of ZOH in sufficient water to yield 2.00 L of solution. The pOH of the solution was 9.07 at 25°C. The K_b of ZOH is:
- 3.5×10^{-9}
 - 6.9×10^{-9}
 - 1.8×10^{-17}
 - 3.6×10^{-17}
 - Not enough information given
- Ans: _____
8. Of the following, which is most likely to be the strongest base?
- H_3PO_4
 - H_2PO_4^-
 - HPO_4^{2-}
 - PO_4^{3-}
 - AsO_4^{3-}
- Ans: _____
9. Which of the following cannot act as a Lewis acid?
- HCl
 - BF_3
 - H_3O^+
 - CO_2
 - All of these can be Lewis acids
- Ans: _____
10. Determine the K_{sp} for manganese (II) hydroxide, where the solubility is 2.2×10^{-5} M.
- 1.1×10^{-14}
 - 4.3×10^{-14}
 - 2.1×10^{-14}
 - 4.8×10^{-10}
 - Not enough information given or none of the above
- Ans: _____
11. Which of the following could be added to a solution of sodium acetate to produce an effective buffer?
- Acetic acid
 - Hydrochloric acid
 - Potassium acetate
 - Sodium chloride
- I only
 - III only
 - IV only
 - I or II
 - I, II, III, or IV
- Ans: _____

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- In a saturated solution of a salt in water:
 - The rate of crystallization > the rate of dissolution
 - The rate of dissolution > the rate of crystallization
 - The rate of crystallization = the rate of dissolution
 - The addition of additional salt causes massive crystallization
 - Not enough information given or none of the aboveAns: _____
- Which one of the following is most soluble in hexane (C₆H₁₄)?
 - CH₃OH
 - CH₃CH₂OH
 - CH₃CH₂CH₂OH
 - CH₃CH₂CH₂CH₂OH
 - Not enough information given or none of the aboveAns: _____
- Of the units below, _____ are appropriate for a second-order reaction rate constant.
 - M s⁻¹
 - s⁻¹
 - L/mol
 - M⁻¹ s⁻¹
 - Not enough information given or none of the aboveAns: _____
- Of the following, which is most likely to be the strongest base?
 - ClO⁻
 - ClO₂⁻
 - ClO₃⁻
 - ClO₄⁻
 - IO⁻Ans: _____
- Which of the following cannot act as a Lewis base?
 - Cl⁻
 - NH₃
 - CN⁻
 - CH₄
 - All of these can be Lewis basesAns: _____

