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| 1. The molar solubility of PbI2 is 1.46 × 10–3*M*. Calculate the value of *K*sp for PbI2.   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 2. The concentration of OH– in a saturated solution of Mg(OH)2 is 3.62 × 10–4 *M*. The *K*sp of Mg(OH)2 is   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 3. The solubility of CaSO4 in pure water at 0oC is 1.09 gram(s) per liter. The value of the solubility product is   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 4. It is observed that 7.53 mmol of BaF2 will dissolve in 1.0 L of water. Use these data to calculate the value of *K*sp for barium fluoride.   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 5. The solubility in mol/L of Ag2CrO4 is 1.8 × 10–4 *M*. Calculate the *K*sp for this compound.   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 6. The solubility of Cd(OH)2 in water is 1.69 × 10–5 mol/L. The *K*sp value for Cd(OH)2 is   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 2/24/2017 1:00 AM | |

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| 7. The solubility of silver phosphate, Ag3PO4, at 25°C is 1.59 × 10–5 mol/L. What is the *K*sp for the silver phosphate at 25°C?   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 8. The solubility of an unknown salt, M3Z2, at 25°C is  mol/L. What is the *K*sp for M3Z2 at 25°C?   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 9. The solubility of an unknown salt, MZ2, at 25°C is  mol/L. What is the *K*sp for MZ2 at 25°C?   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 10. The solubility of an unknown salt, MZ3, at 25°C is  mol/L. What is the *K*sp for MZ3 at 25°C?   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 11. Barium carbonate has a measured solubility of 4.04 × 10–5 at 25°C. Determine the *K*sp.   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 12. A 300.0-mL saturated solution of copper(II) peroidate, Cu(IO4)2, contains 0.38 grams of dissolved salt. Determine the *K*sp.   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 2/24/2017 2:08 AM | |

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| 13. The in a saturated solution of is 5.86 × 10–3 *M*. Calculate the *K*sp for .   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 14. The correct mathematical expression for finding the molar solubility (*s*) of Sn(OH)2 is:   |  |  |  | | --- | --- | --- | |  | a. | 2*s*2 = *K*sp | |  | b. | 2*s*3 = *K*sp | |  | c. | 108*s*5 = *K*sp | |  | d. | 4*s*3 = *K*sp | |  | e. | 8*s*3 = *K*sp |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 15. Find the solubility (in mol/L) of lead(II) chloride, PbCl2, at 25°C. *K*sp = 1.62 × 10–5.   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 2/24/2017 2:11 AM | |

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| 16. Calculate the concentration of chromate ion, CrO42–, in a saturated solution of CaCrO4 (*K*sp = 7.08 × 10–4).   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | *M* |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 17. Calculate the concentration of the silver ion in a saturated solution of silver chloride, AgCl (*K*sp = 1.55 × 10–10).   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 18. Silver chromate, Ag2CrO4, has a *K*sp of 8.97 × 10–12. Calculate the solubility in mol/L of silver chromate.   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | *M* |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 19. An unknown salt, M2Z, has a *K*sp of . Calculate the solubility in mol/L of M2Z.   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | none of the above |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 20. An unknown salt, M3Z, has a *K*sp of . Calculate the solubility in mol/L of M3Z.   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | none of the above |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 21. Calculate the concentration of Al3+ in a saturated aqueous solution of Al(OH)3 (*K*sp = 1.6 × 10–32).   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 22. In a solution prepared by adding excess PbI2 (*K*sp = 1.37 × 10–8) to water, the [I–] at equilibrium is:   |  |  |  | | --- | --- | --- | |  | a. | mol/L | |  | b. | mol/L | |  | c. | mol/L | |  | d. | mol/L | |  | e. | mol/L |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 23. The solubility of silver phosphate, Ag3PO4, at 25°C is 1.64 × 10–5 mol/L. Determine the concentration of the Ag+ ion in a saturated solution.   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | *M* |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 24. Which of the following compounds has the lowest solubility in mol/L in water at 25°C?   |  |  |  | | --- | --- | --- | |  | a. | Ag3PO4 *K*sp = 1.8 × 10–18 | |  | b. | Sn(OH)2 *K*sp = 3 × 10–27 | |  | c. | CdS     *K*sp = 1.0 × 10–28 | |  | d. | CaSO4 *K*sp = 6.1 × 10–5 | |  | e. | Al(OH)3 *K*sp = 2 × 10–33 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | relative solubilities | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 25. Solubility Products (*K*sp)   |  |  | | --- | --- | | BaSO4 | 1.5 × 10–9 | | CoS | 5.0 × 10–22 | | PbSO4 | 1.3 × 10–8 | | AgBr | 5.0 × 10–13 | | BaCO3 | 1.6 × 10–9 |   ​  Which of the following compounds is the most soluble (in moles/liter)?   |  |  |  | | --- | --- | --- | |  | a. | BaSO4 | |  | b. | CoS | |  | c. | PbSO4 | |  | d. | AgBr | |  | e. | BaCO3 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | relative solubilities | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 2/24/2017 2:41 AM | |

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| 26. Which of the following compounds has the lowest solubility in mol/L in water?   |  |  |  | | --- | --- | --- | |  | a. | Al(OH)3 *K*sp = 2 × 10–32 | |  | b. | CdS     *K*sp = 1.0 × 10–28 | |  | c. | PbSO4 *K*sp = 1.3 × 10–8 | |  | d. | Sn(OH)2 *K*sp = 3 × 10–27 | |  | e. | MgC2O4 *K*sp = 8.6 × 10–5 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | relative solubilities | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 27. Which of the following salts shows the lowest solubility in water? (*K*sp values: Ag2S = 1.6 × 10–49; Bi2S3 = 1.0 × 10–72; HgS = 1.6 × 10–54; Mg(OH)2 = 8.9 × 10–12; MnS = 2.3 × 10–13)   |  |  |  | | --- | --- | --- | |  | a. | Bi2S3 | |  | b. | Ag2S | |  | c. | MnS | |  | d. | HgS | |  | e. | Mg(OH)2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | relative solubilities | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 28. How many moles of Fe(OH)2 [*K*sp = 1.8 × 10–15] will dissolve in 1.0 liter of water buffered at pH = 10.26?   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/15/2017 6:03 AM | |

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| 29. The molar solubility of BaCO3 (*K*sp = 1.6 × 10–9) in 0.10 *M* BaCl2 solution is:   |  |  |  | | --- | --- | --- | |  | a. | 1.6 × 10–10 | |  | b. | 4.0 × 10–5 | |  | c. | 7.4 × 10–4 | |  | d. | 0.10 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 30. The Ksp of AgI is 1.5 × 10–16. Calculate the solubility in mol/L of AgI in a 0.28*M* NaI solution.   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. | 0.28 | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 31. The molar solubility of AgCl (*K*sp = 1.6 × 10–10) in 0.0036*M* sodium chloride at 25°C is:   |  |  |  | | --- | --- | --- | |  | a. | 0.0036 | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 32. The *K*sp of PbSO4 is 1.3 × 10–8. Calculate the solubility (in mol/L) of PbSO4 in a 0.0054*M* solution of Na2SO4.   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | *M* |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 33. The *K*sp for PbF2 is 4.0 × 10–8. If a 0.032*M* NaF solution is saturated with PbF2, what is the [Pb2+] in the solution?   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | *M* |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 34. The *K*sp of an unknown salt, MZ2, is 2.9 × 10–11. Calculate the solubility (in mol/L) of MZ2 in a 0.0270*M* solution of CaZ2.   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | *M* |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 2/24/2017 4:20 AM | |

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| 35. The solubility of La(IO3)3 in a 0.90*M* KIO3 solution is  mol/L. Calculate the *K*sp for La(IO3)3.   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 36. The solubility of an unknown salt, M2Z, in a 0.0461*M* CaZ solution is 8.1 × 10–11 mol/L. Calculate the *K*sp for M2Z.   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 2/24/2017 4:27 AM | |

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| 37. Chromate ion is added to a saturated solution of Ag2CrO4 to reach 0.78*M* CrO42–. Calculate the final concentration of silver ion at equilibrium (*K*sp for Ag2CrO4 is 9.0 × 10–12).   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | *M* |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 38. Calculate the solubility of Ag2CrO4 (*K*sp = 9.0 × 10–12) in a 0.071*M* AgNO3 solution.   |  |  |  | | --- | --- | --- | |  | a. | mol/L | |  | b. | mol/L | |  | c. | mol/L | |  | d. | mol/L | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 39. The solubility of Mg(OH)2 (*K*sp = 8.9 × 10–12) in 1.0 L of a solution buffered (with large capacity) at pH 10.08 is:   |  |  |  | | --- | --- | --- | |  | a. | moles | |  | b. | moles | |  | c. | moles | |  | d. | moles | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 40. Calculate the solubility of Ca3(PO4)2 (*K*sp = 1.3 × 10–32) in a 0.035*M* Ca(NO3)2 solution.   |  |  |  | | --- | --- | --- | |  | a. | mol/L | |  | b. | mol/L | |  | c. | mol/L | |  | d. | mol/L | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 41. Calculate the solubility of Cu(OH)2 in a solution buffered at pH = 7.52. (*K*sp = 1.6 × 10–19)   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 42. How many moles of CaF2 will dissolve in 3.0 liters of 0.066*M* NaF solution? (*K*sp for CaF2 = 4.0 × 10–11)   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 2/24/2017 4:51 AM | |

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| 43. The solubility in mol/L of M(OH)2 in 0.057*M* KOH is 1.0 × 10–5 mol/L. What is the *K*sp for M(OH)2?   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility and the common-ion effect | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 44. The two salts AgX and AgY exhibit very similar solubilities in water. It is known that the salt AgX is much more soluble in acid than is AgY. What can be said about the relative strengths of the acids HX and HY?   |  |  |  | | --- | --- | --- | |  | a. | Nothing. | |  | b. | HY is stronger than HX. | |  | c. | HX is stronger than HY. | |  | d. | The acids are weak acids and have equal values for *K*a. | |  | e. | Both acids are strong. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | effect of pH on solubility | general chemistry | qualitative effect of pH | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 45. You have two salts, AgX and AgY, with very similar *K*sp values. You know that *K*a for HX is much greater than *K*a for HY. Which salt is more soluble in acidic solution?   |  |  |  | | --- | --- | --- | |  | a. | AgX | |  | b. | AgY | |  | c. | They are equally soluble in acidic solution. | |  | d. | Cannot be determined by the information given. | |  | e. | None of these (A-D). |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | effect of pH on solubility | general chemistry | qualitative effect of pH | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 46. The solubility of AgCl in water is \_\_\_\_\_ the solubility of AgCl in strong acid at the same temperature.   |  |  |  | | --- | --- | --- | |  | a. | greater than | |  | b. | less than | |  | c. | about the same as | |  | d. | cannot be determined | |  | e. | much different from |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | effect of pH on solubility | general chemistry | qualitative effect of pH | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 47. Which of the following solid salts is more soluble in 1.0 M H+ than in pure water?   |  |  |  | | --- | --- | --- | |  | a. | NaCl | |  | b. | CaCO3 | |  | c. | KCl | |  | d. | AgCl | |  | e. | KNO3 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | effect of pH on solubility | general chemistry | qualitative effect of pH | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 48. Which of the following solid salts is more soluble in 1.0 M H+ than in pure water?   |  |  |  | | --- | --- | --- | |  | a. | NaCl | |  | b. | KCl | |  | c. | FePO4 | |  | d. | AgCl | |  | e. | KNO3 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | effect of pH on solubility | general chemistry | qualitative effect of pH | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 49. Given the following *K*sp values, which statement about solubility in mol/L in water is correct?   |  |  |  |  | | --- | --- | --- | --- | |  | ***K*sp** |  | ***K*sp** | | PbCrO4 | 2.0 × 10–16 | Pb(OH)2 | 1.2 × 10–15 | | Zn(OH)2 | 4.5 × 10–17 | MnS | 2.3 × 10–13 |   ​   |  |  |  | | --- | --- | --- | |  | a. | PbCrO4, Zn(OH)2, and Pb(OH)2 have equal solubilities in water. | |  | b. | PbCrO4 has the lowest solubility in water. | |  | c. | The solubility of MnS in water will not be pH dependent. | |  | d. | MnS has the highest molar solubility in water. | |  | e. | A saturated PbCrO4 solution will have a higher [Pb2+] than a saturated Pb(OH)2 solution. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | relative solubilities | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 2/24/2017 5:02 AM | |

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| 50. The best explanation for the dissolution of ZnS in dilute HCl is that:   |  |  |  | | --- | --- | --- | |  | a. | The zinc ion is amphoteric. | |  | b. | The sulfide-ion concentration is decreased by the formation of H2S. | |  | c. | the sulfide-ion concentration is decreased by oxidation to sulfur. | |  | d. | the zinc-ion concentration is decreased by the formation of a chloro complex. | |  | e. | The solubility product of ZnCl2 is less than that of ZnS. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | effect of pH on solubility | general chemistry | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 51. What is the best way to ensure complete precipitation of SnS from a saturated H2S solution?   |  |  |  | | --- | --- | --- | |  | a. | Add more H2S. | |  | b. | Add a strong acid. | |  | c. | Add a weak acid. | |  | d. | Add a strong base. | |  | e. | Add a weak base. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | effect of pH on solubility | general chemistry | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 52. The *K*sp of Al(OH)3 is 2 × 10–32. At what pH will a 0.5*M* Al3+ solution begin to show precipitation of Al(OH)3?   |  |  |  | | --- | --- | --- | |  | a. | 3.5 | |  | b. | 10.5 | |  | c. | 1.0 | |  | d. | 6.0 | |  | e. | 3.1 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 53. You have a solution consisting of 0.10 *M* Cl– and 0.10 *M* CrO42–. You add 0.10 *M* silver nitrate dropwise to this solution. Given that the *K*sp for Ag2CrO4 is 9.0 × 10–12, and that for AgCl is 1.6 × 10–10, which of the following will precipitate first?   |  |  |  | | --- | --- | --- | |  | a. | silver chloride | |  | b. | silver chromate | |  | c. | silver nitrate | |  | d. | cannot be determined by the information given | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| The following questions refer to the following system: 3.5 × 102 mL of 3.2 *M* Pb(NO3)2 and 2.0 × 102 mL of 0.020 *M* NaCl are added together. *K*sp for the lead chloride is 1.6 × 10–5. |

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| 54. Determine the ion product.   |  |  |  | | --- | --- | --- | |  | a. | 1.1 × 10–4 | |  | b. | 1.5 × 10–2 | |  | c. | 7.8 × 10–3 | |  | d. | 8.1 × 10–4 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 16-1 | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 55. Will precipitation occur?   |  |  |  | | --- | --- | --- | |  | a. | Yes. | |  | b. | No. | |  | c. | Maybe, it depends on the temperature. | |  | d. | Maybe, it depends on the limiting reagent concentration. | |  | e. | None of these. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 16-1 | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 56. What is the limiting reagent in the formation of the lead chloride?   |  |  |  | | --- | --- | --- | |  | a. | Pb2+ | |  | b. | Cl– | |  | c. | (NO3)– | |  | d. | PbCl2 | |  | e. | Pb(NO3)2 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 16-1 | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 57. Determine the equilibrium concentration of the chloride ion.   |  |  |  | | --- | --- | --- | |  | a. | 3.9 × 10–4 | |  | b. | 8.0 × 10–6 | |  | c. | 2.8 × 10–3 | |  | d. | 6.1 × 10–2 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 16-1 | | *KEYWORDS:* | Chemistry | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 58. The *K*sp for BaF2 is 2.4 × 10–5. When 10 mL of 0.01 *M* NaF is mixed with 10 mL of 0.01 *M* BaNO3, will a precipitate form?   |  |  |  | | --- | --- | --- | |  | a. | No, because *Q* is 1 × 10–12 and since it is less than *K*sp no precipitate will form. | |  | b. | Yes, because *Q* is 1 × 10–12 and since it is less than *K*sp a precipitate will form. | |  | c. | No, because *Q* is 1.25 × 10–7 and since it is less than *K*sp no precipitate will form. | |  | d. | Yes, because *Q* is 1.25 × 10–7 and since it is less than *K*sp a precipitate will form. | |  | e. | None of the above. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 59. How many moles of Ca(NO3)2 must be added to 1.0 L of a 0.203*M* KF solution to begin precipitation of CaF2? For CaF2, *K*sp = 4.0 × 10–11.   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 60. A 50.0-mL sample of 0.100 *M* Ca(NO3)2 is mixed with 50.00 mL of 0.200 *M* NaF. When the system has come to equilibrium, which of the following sets of conditions will hold? The *K*sp for CaF2 is 4.0 × 10–11.   |  |  |  | | --- | --- | --- | | Moles Solid CaF2 Formed | [Ca2+] | [F–] |  |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 61. The *K*sp for Mn(OH)2 is 2.0 × 10–13. At what pH will Mn(OH)2 begin to precipitate from a solution in which the initial concentration of Mn2+ is 0.10 *M*?   |  |  |  | | --- | --- | --- | |  | a. | 6.47 | |  | b. | 13.3 | |  | c. | 5.85 | |  | d. | 7.03 | |  | e. | 8.15 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 62. Sodium chloride is added slowly to a solution that is 0.010 *M* in Cu+, Ag+, and Au+. The *K*sp values for the chloride salts are 1.9 × 10–7, 1.6 × 10–10, and 2.0 × 10–13, respectively. Which compound will precipitate first?   |  |  |  | | --- | --- | --- | |  | a. | CuCl | |  | b. | AgCl | |  | c. | AuCl | |  | d. | All will precipitate at the same time. | |  | e. | Cannot be determined. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 63. A 0.012-mol sample of Na2SO4 is added to 400 mL of each of two solutions. One solution contains 1.5 × 10–3 *M* BaCl2; the other contains 1.5 × 10–3 *M* CaCl2. Given that *K*sp for BaSO4 = 1.5 × 10–9 and *K*sp for CaSO4 = 6.1 × 10–5:   |  |  |  | | --- | --- | --- | |  | a. | BaSO4 would precipitate but CaSO4 would not. | |  | b. | CaSO4 would precipitate but BaSO4 would not. | |  | c. | Both BaSO4 and CaSO4 would precipitate. | |  | d. | Neither BaSO4 nor CaSO4 would precipitate. | |  | e. | Not enough information is given to determine if precipitation would occur. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 64. If 30 mL of 5.0 × 10–4 *M* Ca(NO3)2 are added to 70 mL of 2.0 × 10–4 *M* NaF, will a precipitate occur? (*K*sp of CaF2 = 4.0 × 10–11)   |  |  |  | | --- | --- | --- | |  | a. | No, because the ion product is greater than *K*sp. | |  | b. | Yes, because the ion product is less than *K*sp. | |  | c. | No, because the ion product is less than *K*sp. | |  | d. | Not enough information is given. | |  | e. | Yes, because the ion product is greater than *K*sp. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 65. The concentration of Mg2+ in seawater is 0.052 *M*. At what pH will 99% of the Mg2+ be precipitated as the hydroxide? [*K*sp for Mg(OH)2 = 8.9 × 10–12]   |  |  |  | | --- | --- | --- | |  | a. | 8.35 | |  | b. | 9.22 | |  | c. | 6.50 | |  | d. | 10.12 | |  | e. | 4.86 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | fractional precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 66. A precipitate forms when a solution that is 0.10 *M* in Cu2+, Pb2+, and Ni2+ is saturated with H2S and adjusted to pH = 1. What sulfides are present in the precipitate?  [H2S] = 0.10 *M*; for H2S, *K*a1 × *K*a2 = 1.1 × 10–24  *K*sp: CuS = 8.5 × 10–45, PbS = 7.0 × 10–29, NiS = 3.0 × 10–21   |  |  |  | | --- | --- | --- | |  | a. | CuS, PbS, and NiS | |  | b. | PbS and NiS | |  | c. | NiS | |  | d. | CuS and PbS | |  | e. | CuS |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | fractional precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 67. A solution is 0.010 *M* in each of Pb(NO3)2, Mn(NO3)2, and Zn(NO3)2. Solid NaOH is added until the pH of the solution is 8.50. Which of the following statements is true?   |  |  | | --- | --- | | **Salt** | ***Ksp*** | | Pb(OH)2 | 1.4 × 10–20 | | Mn(OH)2 | 2.0 × 10–13 | | Zn(OH)2 | 2.1 × 10–16 |  |  |  |  | | --- | --- | --- | |  | a. | No precipitate will form. | |  | b. | Only Pb(OH)2 will precipitate. | |  | c. | Only Mn(OH)2 will precipitate. | |  | d. | Only Zn(OH)2 and Pb(OH)2 will precipitate. | |  | e. | All three hydroxides will precipitate. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | fractional precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/15/2017 7:18 AM | |

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| 68. An industrial plant processes its waste water through a sedimentation tank that removes hazardous metals by precipitating them as insoluble carbonate salts. If sodium carbonate is gradually added to the tank, what would be the order of precipitation of the metals, Pb2+, Cu2+, Hg22+, and Zn2+ if each is ≈ 1.0 × 10–4 *M*? ( *K*sp PbCO3 = 7.4 × 10–14, *K*sp CuCO3 = 1.4 × 10–10, *K*sp Hg2CO3 = 8.9 × 10–17, and *K*sp ZnCO3 = 1.4 × 10–11)   |  |  |  | | --- | --- | --- | |  | a. | Pb2+, Hg22+, Zn2+, Cu2+ | |  | b. | Hg22+, Pb2+, Zn2+, Cu2+ | |  | c. | Cu2+, Zn2+, Pb2+, Hg22+ | |  | d. | Cu2+, Zn2+, Hg22+, Pb2+ | |  | e. | All metal ions will precipitate at the same time. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | fractional precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 69. A solution contains 0.018 moles each of I–, Br–, and Cl–. When the solution is mixed with 200 mL of 0.24 *M* AgNO3, how much AgCl(*s*) precipitates out?   |  |  |  | | --- | --- | --- | | *K*sp | AgI | = 1.5 × 10–16 | | *K*sp | AgBr | = 5.0 × 10–13 | | *K*sp | AgCl | = 1.6 × 10–10 |   ​   |  |  |  | | --- | --- | --- | |  | a. | 0.0 g | |  | b. | 1.7 g | |  | c. | 2.6 g | |  | d. | 3.3 g | |  | e. | 5.0 g |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | fractional precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 2/24/2017 7:49 AM | |

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| 70. A 100.-mL sample of solution contains 10.0 mmol of Ca2+ ion. How many mmol of solid Na2SO4 must be added in order to cause precipitation of 99.9% of the calcium as CaSO4? The *K*sp of CaSO4 is 6.1 × 10–5. Assume the volume remains constant.   |  |  |  | | --- | --- | --- | |  | a. | 17.4 | |  | b. | 10.0 | |  | c. | 61.0 | |  | d. | 71.0 | |  | e. | 6.1 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | fractional precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 71. What is the maximum concentration of carbonate ions that will precipitate BaCO3 but not MgCO3 from a solution that is *M* each in Mg2+ and Ba2+? For MgCO3, *K*sp = 1.0 × 10–15 and for BaCO3, *K*sp = 2.6 × 10–9.   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | None of these; MgCO3 will always precipitate before BaCO3. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 72. What is the maximum concentration of iodide ions that will precipitate AgI but not PbI2 from a solution that is *M* each in Ag+ and Pb2+? For AgI, *K*sp = 1.5 × 10–16 and for PbI2, *K*sp = 1.4 × 10–8.   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | None of these; PbI2 will always precipitate before AgI. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 73. In the qualitative analysis scheme for metal ions, how are the Analytical Group I cations separated from the other cations?   |  |  |  | | --- | --- | --- | |  | a. | by addition of HCl, forming insoluble metal chlorides | |  | b. | by addition of H2SO4, forming insoluble metal sulfates | |  | c. | by addition of H2S in acidic solution, forming insoluble metal sulfides | |  | d. | by addition of H2S in basic solution, forming insoluble metal sulfides or hydroxides | |  | e. | by addition of (NH4)2CO3 or (NH4)3PO4, forming insoluble metal carbonates or phosphates |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | applications of solubility equilibria | Chemistry | general chemistry | qualitative analysis of metal ions | solubility | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 74. In the qualitative analysis scheme for metal ions, how are the Analytical Group II cations separated from the cations of Analytical Groups III–V?   |  |  |  | | --- | --- | --- | |  | a. | by addition of HCl, forming insoluble metal chlorides | |  | b. | by addition of H2SO4, forming insoluble metal sulfates | |  | c. | by addition of H2S in acidic solution, forming insoluble metal sulfides | |  | d. | by addition of H2S in basic solution, forming insoluble metal sulfides or hydroxides | |  | e. | by addition of (NH4)2CO3 or (NH4)3PO4, forming insoluble metal carbonates or phosphates |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | applications of solubility equilibria | Chemistry | general chemistry | qualitative analysis of metal ions | solubility | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 75. In the qualitative analysis scheme for metal ions, how are the Analytical Group III cations separated from the cations of Analytical Groups IV and V?   |  |  |  | | --- | --- | --- | |  | a. | by addition of HCl, forming insoluble metal chlorides | |  | b. | by addition of H2SO4, forming insoluble metal sulfates | |  | c. | by addition of H2S in acidic solution, forming insoluble metal sulfides | |  | d. | by addition of H2S in basic solution, forming insoluble metal sulfides or hydroxides | |  | e. | by addition of (NH4)2CO3 or (NH4)3PO4, forming insoluble metal carbonates or phosphates |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | applications of solubility equilibria | Chemistry | general chemistry | qualitative analysis of metal ions | solubility | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 76. When a mixture containing cations of Analytical Groups I–III is treated with H2S in acidic solution, which cations are expected to precipitate?   |  |  |  | | --- | --- | --- | |  | a. | Analytical Group I only | |  | b. | Analytical Group II only | |  | c. | Analytical Group III only | |  | d. | Analytical Groups I and II | |  | e. | Analytical Groups II and III |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | applications of solubility equilibria | Chemistry | general chemistry | qualitative analysis of metal ions | solubility | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 77. In the classic scheme for qualitative analysis, the cations of Analytical Group IV are precipitated as phosphates or carbonates. Analytical Group IV consists of   |  |  |  | | --- | --- | --- | |  | a. | alkali metals | |  | b. | alkaline earth elements | |  | c. | the halogens | |  | d. | transition metals having +2 ions | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | applications of solubility equilibria | Chemistry | general chemistry | qualitative analysis of metal ions | solubility | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 78. Consider a solution containing the following cations: Na+, Hg2+, Mn2+, Al3+ and Ag+. Treatment of the solution with dilute HCl followed by saturation with H2S results in formation of precipitate(s). Which ions still remain in solution (i.e., did not precipitate)?   |  |  |  | | --- | --- | --- | |  | a. | Ag+ only | |  | b. | Na+, Hg2+, Al3+ | |  | c. | Ag+ and Hg2+ | |  | d. | Na+, Al3+, and Mn2+ | |  | e. | Na+ only |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | applications of solubility equilibria | Chemistry | general chemistry | qualitative analysis of metal ions | solubility | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 79. Which of the following solid salts should be more soluble in 1.0 *M* NH3 than in water?   |  |  |  | | --- | --- | --- | |  | a. | Na2CO3 | |  | b. | KCl | |  | c. | AgBr | |  | d. | KNO3 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ion formation | general chemistry | solubility | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 80. The overall *K*f for the complex ion Ag(NH3)2+ is 1.7 × 107. The *K*sp for AgI is 1.5 × 10–16. What is the molar solubility of AgI in a solution that is 2.0 *M* in NH3?   |  |  |  | | --- | --- | --- | |  | a. | 1.5 × 10–9 | |  | b. | 1.3 × 10–3 | |  | c. | 1.0 × 10–4 | |  | d. | 5.8 × 10–12 | |  | e. | 8.4 × 10–5 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ions and solubility | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 81. The *K*f for the complex ion Ag(NH3)2+ is 1.7 × 107. The *K*sp for AgCl is 1.6 × 10–10. Calculate the molar solubility of AgCl in 1.0 *M* NH3.   |  |  |  | | --- | --- | --- | |  | a. | 5.2 × 10–2 | |  | b. | 4.7 × 10–2 | |  | c. | 2.9 × 10–3 | |  | d. | 1.3 × 10–5 | |  | e. | 1.7 × 10–10 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ions and solubility | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 82. Given the following values of equilibrium constants:   |  |  | | --- | --- | | Cu(OH)2(*s*)Cu2+(*aq*) + 2OH–(*aq*) | *K*sp = 1.63 × 10–19 | | Cu(NH3)42+(*aq*)Cu2+(*aq*) + 4NH3(*aq*) | *K*= 1.0 × 10–13 |   What is the value of the equilibrium constant for the following reaction?  Cu(OH)2(*s*) + 4NH3(*aq*)Cu(NH3)42+(*aq*) + 2OH–(*aq*)   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ion formation | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 2/24/2017 8:08 AM | |

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| Consider a solution made by mixing 500.0 mL of 4.0 *M* NH3 and 500.0 mL of 0.40 *M* AgNO3. Ag+ reacts with NH3 to form AgNH3+ and Ag(NH3)2+:   |  |  |  |  | | --- | --- | --- | --- | |  | Ag+ + NH3AgNH3+ |  | *K*1 = 2.1 × 103 | |  | AgNH3+ + NH3Ag(NH3)2+ |  | *K*2 = 8.2 × 103 | |

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| 83. The concentration of Ag(NH3)2+ at equilibrium is:   |  |  |  | | --- | --- | --- | |  | a. | 2.0 *M* | |  | b. | 0.40 *M* | |  | c. | 0.20 *M* | |  | d. | 1.0 × 10–3 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 16-2 | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ion formation | equilibrium calculations with Kf | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 84. The concentration of Ag+ at equilibrium is:   |  |  |  | | --- | --- | --- | |  | a. | 2.0 *M* | |  | b. | 1.2 × 10–8 *M* | |  | c. | 4.5 × 10–9 *M* | |  | d. | 1.6 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 16-2 | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ion formation | equilibrium calculations with Kf | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| The following questions refer to the following system: 500.0 mL of 0.020 *M* Mn(NO3)2 are mixed with 1.0 L of 1.0 *M* Na2C2O4. The oxalate ion, C2O4, acts as a ligand to form a complex ion with the Mn2+ ion with a coordination number of two.   |  |  |  |  | | --- | --- | --- | --- | |  | Mn2+ + C2O42–MnC2O4 |  | *K*1 = 7.9 × 103 | |  | [Mn(C2O4)2]2–MnC2O4 + C2O42– |  | *K*2 = 1.26 × 10–2 | |

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| 85. What is the equilibrium constant for the following formation?  Mn2+ + 2C2O42–[Mn(C2O4)2]2–   |  |  |  | | --- | --- | --- | |  | a. | 1.0 | |  | b. | 3.7 × 102 | |  | c. | 2.1 × 10–1 | |  | d. | 6.3 × 105 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 16-3 | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ion formation | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 86. Find the equilibrium concentration of the [Mn(C2O4)2]2– ion.   |  |  |  | | --- | --- | --- | |  | a. | 9.2 × 10–5 *M* | |  | b. | 0.01 *M* | |  | c. | 2.5 × 10–8 *M* | |  | d. | 1.3 × 10–4 *M* | |  | e. | 6.7 × 10–3 *M* |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 16-3 | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ion formation | equilibrium calculations with Kf | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 87. Find the equilibrium concentration of Mn(C2O4) in the system.   |  |  |  | | --- | --- | --- | |  | a. | 9.2 × 10–5 *M* | |  | b. | 0.01 *M* | |  | c. | 2.5 × 10–8 *M* | |  | d. | 1.3 × 10–4 *M* | |  | e. | 6.7 × 10–3 *M* |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 16-3 | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ion formation | equilibrium calculations with Kf | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 88. Find the equilibrium concentration of the Mn2+ ion.   |  |  |  | | --- | --- | --- | |  | a. | 9.2 × 10–5 *M* | |  | b. | 0.01 *M* | |  | c. | 2.5 × 10–8 *M* | |  | d. | 1.3 × 10–4 *M* | |  | e. | 6.7 × 10–3 *M* |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 16-3 | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ion formation | equilibrium calculations with Kf | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 89. Silver acetate, AgC2H3O2, is a sparingly soluble salt with *K*sp = 1.9 × 10–3. Consider a saturated solution in equilibrium with the solid salt. Compare the effects on the solubility of adding to the solution either the acid HNO3 or the base NH3.   |  |  |  | | --- | --- | --- | |  | a. | Either substance would decrease the solubility. | |  | b. | NH3 would increase the solubility, but HNO3 would decrease it. | |  | c. | NH3 would increase the solubility, but HNO3 would have virtually no effect. | |  | d. | Either substance would increase the solubility. | |  | e. | NH3 would decrease the solubility, but HNO3 would increase it. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ions and solubility | general chemistry | solubility | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 90. Calculate the molar concentration of uncomplexed Zn2+ in a solution that contains 0.20 mole of Zn(NH3)42+ per liter and 0.0116 M NH3 at equilibrium. The overall *K*f for Zn(NH3)42+ is 3.8 × 109.   |  |  |  | | --- | --- | --- | |  | a. | 2.9 × 10–3 *M* | |  | b. | 8.8 × 10–3 *M* | |  | c. | 6.7 × 10–4 *M* | |  | d. | 2.0 × 10–13 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ion formation | equilibrium calculations with Kf | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 91. The cation M2+ reacts with NH3 to form a series of complex ions as follows:   |  |  |  | | --- | --- | --- | |  | M2+ + NH3M(NH3)2+ | *K*1 = 102 | |  | M(NH3)2+ + NH3M(NH3)22+ | *K*2 = 103 | |  | M(NH3)22+ + NH3M(NH3)32+ | *K*3 = 102 |   A 1.0 × 10–3 mol sample of M(NO3)2 is added to 1.0 L of 15.0 *M* NH3 (*K*b = 1.8 × 10–5). Choose the dominant species in this solution.   |  |  |  | | --- | --- | --- | |  | a. | M2+ | |  | b. | M(NH3)2+ | |  | c. | M(NH3)22+ | |  | d. | M(NH3)32+ | |  | e. | M(NO3)2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ion formation | general chemistry | solubility | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 92. What is the molar solubility of lead(II) chromate in 0.075 *M* Na2S2O3? For PbCrO4, *K*sp = 2.0 × 10–16; for Pb(S2O3)34–, *K*f = 2.2 × 106.   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | *M* |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ions and solubility | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 2/27/2017 12:35 AM | | *DATE MODIFIED:* | 3/15/2017 9:33 AM | |

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| 93. Consider the following three complex ions of Ag+ and their formation constants, *K*f.  Ag(NH3)2+*K*f = 1.7 × 107 Ag(CN)2–*K*f = 5.6 × 1018 AgBr2–*K*f = 1.0 × 1011  Which of the following responses are *true*?  1. Ag(NH3)2+ is more stable than Ag(CN)2–. 2. Adding a strong acid (HNO3) to a solution that is 0.010 *M* in Ag(NH3)2+ would tend to dissociate the complex ion. 3. Adding a strong acid (HNO3) to a solution that is 0.010 *M* in AgBr2– would tend to dissociate the complex ion. 4. To dissolve AgI add either NaCN *or* HCN, fewer moles of NaCN would be required.   |  |  |  | | --- | --- | --- | |  | a. | 1 and 2 | |  | b. | 1 and 3 | |  | c. | 1 and 4 | |  | d. | 2 and 4 | |  | e. | 2 and 3 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | complex ion equilibria | general chemistry | solubility | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/15/2017 9:37 AM | |

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| 94. What is the concentration of Ni2+(*aq*) ion in a 0.025*M* Ni(NO3)2 solution that is also 1.0 *M* NH3? [*K*f for Ni(NH3)62+ = 5.5 × 108]   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ion formation | equilibrium calculations with Kf | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 95. What is the concentration of the Cd2+(*aq*) ion in a 0.022*M* Cd(NO3)2 solution that is also 1.0 *M* NH3? At this temperature, *K*f for Cd(NH3)42+ = 1.0 × 107.   |  |  |  | | --- | --- | --- | |  | a. | *M* | |  | b. | *M* | |  | c. | *M* | |  | d. | *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | complex ion equilibria | complex ion formation | equilibrium calculations with Kf | general chemistry | solubility | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 96. The correct mathematical expression for finding the molar solubility (*s)* of silver chloride is:   |  |  |  | | --- | --- | --- | |  | a. | *s*2 = *K*sp | |  | b. | 2*s*3 = *K*sp | |  | c. | 108*s*5 = *K*sp | |  | d. | 4*s*3 = *K*sp | |  | e. | 27*s*4 = *K*sp |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 97. The correct mathematical expression for finding the molar solubility (*s)* of barium chloride is:   |  |  |  | | --- | --- | --- | |  | a. | *s*2 = *K*sp | |  | b. | 2*s*3 = *K*sp | |  | c. | 108*s*5 = *K*sp | |  | d. | 4*s*3 = *K*sp | |  | e. | 27*s*4 = *K*sp |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 98. The correct mathematical expression for finding the molar solubility (*s)* of iron(III) hydroxide is:   |  |  |  | | --- | --- | --- | |  | a. | *s*2 = *K*sp | |  | b. | 2*s*3 = *K*sp | |  | c. | 108*s*5 = *K*sp | |  | d. | 4*s*3 = *K*sp | |  | e. | 27*s*4 = *K*sp |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 99. The correct mathematical expression for finding the molar solubility (*s)* of silver(I)phosphide is:   |  |  |  | | --- | --- | --- | |  | a. | *s*2 = *K*sp | |  | b. | 2*s*3 = *K*sp | |  | c. | 108*s*5 = *K*sp | |  | d. | 4*s*3 = *K*sp | |  | e. | 27*s*4 = *K*sp |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 100. The correct mathematical expression for finding the molar solubility (*s)* of silver(I)sulfide is:   |  |  |  | | --- | --- | --- | |  | a. | *s*2 = *K*sp | |  | b. | 2*s*3 = *K*sp | |  | c. | 108*s*5 = *K*sp | |  | d. | 4*s*3 = *K*sp | |  | e. | 27*s*4 = *K*sp |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 101. The correct mathematical expression for finding the molar solubility (*s)* of aluminum sulfide is:   |  |  |  | | --- | --- | --- | |  | a. | *s*2 = *K*sp | |  | b. | 2*s*3 = *K*sp | |  | c. | 108*s*5 = *K*sp | |  | d. | 4*s*3 = *K*sp | |  | e. | 27*s*4 = *K*sp |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 102. The correct mathematical expression for finding the molar solubility (*s)* of calcium phosphate is:   |  |  |  | | --- | --- | --- | |  | a. | *s*2 = *K*sp | |  | b. | 2*s*3 = *K*sp | |  | c. | 108*s*5 = *K*sp | |  | d. | 4*s*3 = *K*sp | |  | e. | 27*s*4 = *K*sp |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | solubility | solubility equilibria | solubility product constant | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 103. Given that the Ksp for calcium fluoride [CaF2] is 3.2 x 10-15, which of the following describes a solution that is 2.00 x 10-5 M NaF and 2.00 x 10-5 M Ca(NO3)2?   |  |  |  | | --- | --- | --- | |  | a. | Q = 4 x 10-10 and there will be a precipitate formed | |  | b. | Q = 8 x 10-10 and there will be a precipitate formed | |  | c. | Q = 8 x 10-15 and there will be no precipitate formed | |  | d. | Q = 1.3 x 10-13 and there will be a precipitate formed | |  | e. | Q = 8 x 10-15 and there will be a precipitate formed |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 104. A solution is 2.00 x 10-3 M Ba(NO3)2 and 0.0500 M KF.  Given that the Ksp of barium fluoride is 1.5 x 10-6,   |  |  |  | | --- | --- | --- | |  | a. | Qsp = 1 x 10-4 so a precipitate will be observed. | |  | b. | Qsp = 2 x 10-4 so a precipitate will be observed. | |  | c. | Qsp = 1 x 10-6 so no precipitate will be observed | |  | d. | Qsp = 2 x 10-5 so a precipitate will be observed. | |  | e. | Qsp = 5 x 10-6 so a precipitate will be observed. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |

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| 105. Which, if any of the following mixtures will result in a precipitate.  You might need to know that the  Ksp for AgCN is 2.2 x 10-16 and that for PbI2 is 7.9 x 10-9.  I.  a mixture that is 1.2 x 10-6 M AgNO3 and 2.4 x 10-10 M NaCN  II.  a mixture that is 2.3 x 10-4 M Pb(ClO4)2 and 4.6 x 10-3 M KI   |  |  |  | | --- | --- | --- | |  | a. | both will produce precipitates | |  | b. | Neither will produce precipitates | |  | c. | I will precipitate but II will not precipitate | |  | d. | II will precipitate but I will not precipitate | |  | e. | More information is required to come to a conclusion. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 2/27/2017 12:32 AM | |

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| 106. Which of the following leads to the formation of a precipitate?   |  |  |  | | --- | --- | --- | |  | a. | *Q* = *K*sp | |  | b. | *Q* < *K*sp | |  | c. | *Q* > *K*sp | |  | d. | Q = 1 | |  | e. | K = 1 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 16.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | criterion for precipitation | general chemistry | precipitation calculations | solubility | solubility equilibria | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:30 PM | | *DATE MODIFIED:* | 3/4/2016 4:30 PM | |