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| 1. Calculate the [H+] in a solution that is 0.18*M* in NaF and 0.25 *M* in HF. (*K*a = 7.2 × 10–4)   |  |  |  | | --- | --- | --- | |  | a. | 7.2 × 10–4 *M* | |  | b. | 1.4 *M* | |  | c. | 1.0 × 10–3 *M* | |  | d. | 0.20 *M* | |  | e. | 5.2 × 10–4 *M* |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | Chemistry | common-ion effect | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 2. For a solution equimolar in HCN and NaCN, which statement is *false*?   |  |  |  | | --- | --- | --- | |  | a. | This is an example of the common ion effect. | |  | b. | The [H+] is larger than it would be if only the HCN was in solution. | |  | c. | The [H+] is equal to the *K*a. | |  | d. | Addition of more NaCN will shift the acid dissociation equilibrium of HCN to the left. | |  | e. | Addition of NaOH will increase [CN–] and decrease [HCN]. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | Chemistry | common-ion effect | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 3. What will happen if a small amount of hydrochloric acid is added to a 0.1 *M* solution of HF?   |  |  |  | | --- | --- | --- | |  | a. | The percent ionization of HF will increase. | |  | b. | The percent ionization of HF will decrease. | |  | c. | The percent ionization of HF will remain unchanged. | |  | d. | *K*a for HF will increase. | |  | e. | *K*a for HF will decrease. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | Chemistry | common-ion effect | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 4. What will happen if a small amount of sodium hydroxide is added to a 0.1 *M* solution of ammonia?   |  |  |  | | --- | --- | --- | |  | a. | *K*b for ammonia will increase. | |  | b. | *K*b for ammonia will decrease. | |  | c. | The percent ionization of ammonia will increase. | |  | d. | The percent ionization of ammonia will decrease. | |  | e. | The percent ionization of ammonia will remain unchanged. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | Chemistry | common-ion effect | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 5. 15.0mL of 0.50 *M* HCl is added to a 100.-mL sample of 0.314*M* HNO2 (*K*a for HNO2 = 4.0 × 10–4). What is the equilibrium concentration of NO2– ions?   |  |  |  | | --- | --- | --- | |  | a. | 1.7 × 10–3 *M* | |  | b. | 1.1 × 10–4 *M* | |  | c. | 2.7 × 10–1 *M* | |  | d. | 4.1 × 10–2 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | Chemistry | common-ion effect | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 6. 15.0 mL of 0.50 *M* NaOH is added to a 100.-mL sample of 0.487 *M* NH3 (*K*b for NH3 = 1.8 × 10–5). What is the equilibrium concentration of NH4+ ions?   |  |  |  | | --- | --- | --- | |  | a. | 1.1 × 10–2 *M* | |  | b. | 7.6 × 10–6 *M* | |  | c. | 4.2 × 10–1 *M* | |  | d. | 1.2 × 10–4 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | Chemistry | common-ion effect | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 7. What is the percent dissociation of HNO2 when 0.058 g of sodium nitrite is added to 110.0 mL of a 0.060 *M* HNO2 solution? *K*a for HNO2 is 4.0 × 10–4.   |  |  |  | | --- | --- | --- | |  | a. | 13% | |  | b. | 0.31% | |  | c. | 5.2% | |  | d. | 0.076% | |  | e. | 8.2% |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | Chemistry | common-ion effect | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 8. Which of the following mixtures would result in a buffered solution?   |  |  |  | | --- | --- | --- | |  | a. | Mixing 100.0 mL of 0.100 *M* HCl with 100.0 mL of 0.100 *M* NaOH. | |  | b. | Mixing 100.0 mL of 0.100 *M* NH3 (*K*b = 1.8 × 10–5) with 100.0 mL of 0.100 *M* NaOH. | |  | c. | Mixing 100.0 mL of 0.100 *M* HCl with 100.0 mL of 0.100 *M* NH3 (*K*b = 1.8 × 10–5). | |  | d. | Mixing 50.0 mL of 0.100 *M* HCl with 100.0 mL of 0.100 *M* NH3 (*K*b = 1.8 × 10–5). | |  | e. | At least two of the above mixtures would result in a buffered solution. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 9. Which of the following will not produce a buffered solution?   |  |  |  | | --- | --- | --- | |  | a. | 100 mL of 0.1 *M* Na2CO3 and 50 mL of 0.1 *M* HCl | |  | b. | 100 mL of 0.1 *M* NaHCO3 and 25 mL of 0.2 *M* HCl | |  | c. | 100 mL of 0.1 *M* Na2CO3 and 75 mL of 0.2 *M* HCl | |  | d. | 50 mL of 0.2 *M* Na2CO3 and 5 mL of 1.0 *M* HCl | |  | e. | 100 mL of 0.1 *M* Na2CO3 and 50 mL of 0.1 *M* NaOH |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 10. What combination of substances will give a buffered solution that has a pH of 5.05?  (Assume each pair of substances is dissolved in 5.0 L of water.) (*K*b for NH3 = 1.8 × 10–5; *K*b for C5H5N = 1.7 × 10–9)   |  |  |  | | --- | --- | --- | |  | a. | 1.0 mole NH3 and 1.5 mole NH4Cl | |  | b. | 1.5 mole NH3 and 1.0 mole NH4Cl | |  | c. | 1.0 mole C5H5N and 1.5 mole C5H5NHCl | |  | d. | 1.5 mole C5H5N and 1.0 mole C5H5NHCl | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 2/26/2017 11:48 PM | |

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| 11. Suppose a buffer solution is made from formic and (HCHO2) and sodium formate (NaCHO2). What is the net ionic equation for the reaction that occurs when a small amount of hydrochloric acid is added to the buffer?   |  |  |  | | --- | --- | --- | |  | a. | H3O+(*aq*) + OH–(*aq*) → 2H2O(*l*) | |  | b. | H3O+(*aq*) + HCHO2(*aq*) → H2O(*l*) + H2CHO2+(*aq*) | |  | c. | HCl(*aq*)+ OH–(*aq*) → H2O(*l*) + Cl–(*aq*) | |  | d. | HCl(*aq*) + CHO2–(*aq*) → HCHO2(*aq*) + Cl–(*aq*) | |  | e. | H3O+(*aq*) + CHO2–(*aq*) → HCHO2(*aq*) + H2O(*l*) |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 12. Suppose a buffer solution is made from formic acid, HCHO2, and sodium formate, NaCHO2. What is the net ionic equation for the reaction that occurs when a small amount of sodium hydroxide is added to the buffer?   |  |  |  | | --- | --- | --- | |  | a. | NaOH(*aq*) + H3O+(*aq*) → Na+(*aq*) + 2H2O(*l*) | |  | b. | H3O+(*aq*) + OH–(*aq*) → 2H2O(*l*) | |  | c. | OH–(*aq*) + HCHO2(*aq*) → CHO2–(*aq*) + H2O(*l*) | |  | d. | NaOH(*aq*) + HCHO2(*aq*) → NaCHO2(*aq*) + H2O(*l*) | |  | e. | Na+(*aq*) + HCHO2(*aq*) → NaH(*aq*) + HCO2+(*aq*) |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 13. A weak acid, HF, is in solution with dissolved sodium fluoride, NaF. If HCl is added, which ion will react with the extra hydrogen ions from the HCl to keep the pH from changing?   |  |  |  | | --- | --- | --- | |  | a. | OH– | |  | b. | Na+ | |  | c. | F– | |  | d. | Na– | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 14. Which of the following is true for a buffered solution?   |  |  |  | | --- | --- | --- | |  | a. | The solution resists change in its [H+]. | |  | b. | The solution will not change its pH very much even if a concentrated acid is added. | |  | c. | The solution will not change its pH very much even if a strong base is added. | |  | d. | Any H+ ions will react with a conjugate base of a weak acid already in solution. | |  | e. | All of these. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 15. A 100. mL sample of 0.10 *M* HCl is mixed with 50. mL of 0.14*M* NH3. What is the resulting pH? (*K*b for NH3 = 1.8 × 10–5)   |  |  |  | | --- | --- | --- | |  | a. | 3.04 | |  | b. | 10.96 | |  | c. | 12.30 | |  | d. | 1.52 | |  | e. | 1.70 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | pH of a buffer | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 16. The following question refers to a 2.0-liter buffered solution created from 0.72*M* NH3 (*K*b = 1.8 × 10–5) and 0.26 *M* NH4F. What is the pH of this solution?   |  |  |  | | --- | --- | --- | |  | a. | 9.26 | |  | b. | 9.70 | |  | c. | 4.30 | |  | d. | 5.18 | |  | e. | 8.81 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | pH of a buffer | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 17. The following question refers to a 2.0-liter buffered solution created from 0.34 *M* NH3 (*K*b = 1.8 × 10–5) and 0.26 *M* NH4F. When 0.10 mol of H+ ions is added to the solution what is the pH?   |  |  |  | | --- | --- | --- | |  | a. | 4.77 | |  | b. | 4.71 | |  | c. | 10.48 | |  | d. | 9.23 | |  | e. | 7.93 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 18. You have a 250.-mL sample of 1.090*M* acetic acid (*K*a = 1.8 × 10–5). Assuming no volume change, how much NaOH must be added to make the best buffer?   |  |  |  | | --- | --- | --- | |  | a. | 5.45 g | |  | b. | 10.9 g | |  | c. | 15.5 g | |  | d. | 20.5 g | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 19. You have a 250.-mL sample of 1.28*M* acetic acid (*K*a = 1.8 × 10–5). Calculate the pH of the best buffer.   |  |  |  | | --- | --- | --- | |  | a. | 7.00 | |  | b. | 4.74 | |  | c. | 4.25 | |  | d. | 9.26 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | pH of a buffer | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 20. You have a 250.0-mL sample of 1.00 *M* acetic acid (*K*a = 1.8 × 10–5). Calculate the pH after adding 0.0050 mol of NaOH to 1.0 liter of the best buffer.   |  |  |  | | --- | --- | --- | |  | a. | 7.05 | |  | b. | 2.41 | |  | c. | 3.54 | |  | d. | 4.78 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 21. You have a 250.0-mL sample of 1.00 *M* acetic acid (*K*a = 1.8 × 10–5). Calculate the pH after adding 0.0040 mol HCl to 1.0 liter of the best buffer.   |  |  |  | | --- | --- | --- | |  | a. | 4.72 | |  | b. | 2.35 | |  | c. | 3.12 | |  | d. | 6.98 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 22. You have solutions of 0.200 *M* HNO2 and 0.200 *M* KNO2 (*K*a for HNO2 = 4.00 × 10–4). A buffer of pH 3.000 is needed. What volumes of HNO2 and KNO2 are required to make 1 liter of buffered solution?   |  |  |  | | --- | --- | --- | |  | a. | 500 mL of each | |  | b. | 286 mL HNO2; 714 mL KNO2 | |  | c. | 413 mL HNO2; 587 mL KNO2 | |  | d. | 714 mL HNO2; 286 mL KNO2 | |  | e. | 587 mL HNO2; 413 mL KNO2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | Henderson-Hasselbalch equation | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 23. A solution contains 0.250 *M* HA (*K*a = 1.0 × 10–6) and 0.45 *M* NaA. What is the pH after 0.30 mole of HCl is added to 1.00 L of this solution?   |  |  |  | | --- | --- | --- | |  | a. | 0.52 | |  | b. | 7.44 | |  | c. | 5.44 | |  | d. | 2.10 | |  | e. | 8.56 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 24. The following question refers to the following system: A 1.0-liter solution contains 0.25 *M* HF and 0.83*M* NaF (*K*a for HF is 7.2 × 10–4). What is the pH of this solution?   |  |  |  | | --- | --- | --- | |  | a. | 3.14 | |  | b. | 3.66 | |  | c. | 2.62 | |  | d. | 0.52 | |  | e. | 10.34 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | pH of a buffer | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 25. The following question refers to the following system: A 1.0-liter solution contains 0.25 *M* HF and 0.45*M* NaF (*K*a for HF is 7.2 × 10–4).  If one adds 0.30 liters of 0.020 *M* KOH to the solution, what will be the change in pH?   |  |  |  | | --- | --- | --- | |  | a. | 0.02 | |  | b. | 3.41 | |  | c. | 0.27 | |  | d. | –0.10 | |  | e. | –0.24 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 2/23/2017 3:43 AM | |

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| 26. How many moles of HCl need to be added to 150.0 mL of 0.50 *M* NaZ to have a solution with a pH of 6.50? (*K*a of HZ is 2.3 × 10–5)? Assume negligible volume of the HCl.   |  |  |  | | --- | --- | --- | |  | a. | 6.8 × 10–3 | |  | b. | 7.5 × 10–2 | |  | c. | 5.0 × 10–1 | |  | d. | 1.0 × 10–3 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | Henderson-Hasselbalch equation | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 27. Calculate the pH of a solution that is 0.50 *M* in HF (*K*a = 7.2 × 10–4) and 0.66*M* in NaF.   |  |  |  | | --- | --- | --- | |  | a. | 3.14 | |  | b. | 3.26 | |  | c. | 0.12 | |  | d. | 10.74 | |  | e. | 3.02 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | Henderson-Hasselbalch equation | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 28. Calculate the pH of a solution that is 2.00 *M* HF, 1.00 *M* NaOH, and 0.672*M* NaF. (*K*a = 7.2 × 10–4)   |  |  |  | | --- | --- | --- | |  | a. | 3.14 | |  | b. | 3.37 | |  | c. | 2.67 | |  | d. | 2.92 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 29. Consider a solution consisting of the following two buffer systems:                H2CO3 HCO3– + H+ p*K*a = 6.4                H2PO4– HPO42– + H+ p*K*a = 7.2 At pH 6.4, which one of the following is true of the relative amounts of acid and conjugate base present?   |  |  |  | | --- | --- | --- | |  | a. | [H2CO3] > [HCO3–] and [H2PO4–] > [HPO42–] | |  | b. | [H2CO3] = [HCO3–] and [H2PO4–] > [HPO42–] | |  | c. | [H2CO3] = [HCO3–] and [HPO42–] > [H2PO4–] | |  | d. | [HCO3–] > [H2CO3] and [HPO42–] > [H2PO4–] | |  | e. | [H2CO3] > [HCO3–] and [HPO42–] > [H2PO4–] |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | Henderson-Hasselbalch equation | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 30. Given 100.0 mL of a buffer that is 0.50 *M* in HOCl and 0.60*M* in NaOCl, what is the pH after 10.0 mL of 1.0 *M* NaOH has been added? (*K*a for HOCl = 3.5 × 10–8)   |  |  |  | | --- | --- | --- | |  | a. | 7.55 | |  | b. | 7.63 | |  | c. | 7.46 | |  | d. | 7.21 | |  | e. | 7.70 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 31. How many moles of solid NaF would have to be added to 1.0 L of 1.99*M* HF solution to achieve a buffer of pH 3.35? Assume there is no volume change. (*K*a for HF = 7.2 × 10–4)   |  |  |  | | --- | --- | --- | |  | a. | 3.2 | |  | b. | 0.41 | |  | c. | 0.81 | |  | d. | 1.0 | |  | e. | 1.6 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | Henderson-Hasselbalch equation | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 32. What is the pH of a solution that results when 0.010 mol HNO3 is added to 500. mL of a solution that is 0.10 *M* in aqueous ammonia and 0.50*M* in ammonium nitrate. Assume no volume change. (The *K*b for NH3 = 1.8 × 10–5.)   |  |  |  | | --- | --- | --- | |  | a. | 9.26 | |  | b. | 5.05 | |  | c. | 10.07 | |  | d. | 8.44 | |  | e. | 8.67 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 33. How many mmoles of HCl must be added to 100 mL of a 0.100 *M* solution of methylamine (p*K*b = 3.36) to give a buffer having a pH of 10.00?   |  |  |  | | --- | --- | --- | |  | a. | 8.1 | |  | b. | 18.7 | |  | c. | 20.0 | |  | d. | 41.5 | |  | e. | 12.7 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | Henderson-Hasselbalch equation | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 34. Calculate the pH of a solution made by mixing 100.0 mL of 0.644*M* NH3 with 100.0 mL of 0.100 *M* HCl. (*K*b for NH3 = 1.8 × 10–5)   |  |  |  | | --- | --- | --- | |  | a. | 9.99 | |  | b. | 4.01 | |  | c. | 8.52 | |  | d. | 9.26 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | pH of a buffer | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 35. A solution contains 0.500 *M* HA (*K*a = 1.0 × 10–8) and 0.390*M* NaA. What is the [H+] after 0.10 mole of HCl is added to 1.00 L of this solution?   |  |  |  | | --- | --- | --- | |  | a. | 1.0 × 10–8 *M* | |  | b. | 3.4 × 10–8 *M* | |  | c. | 4.8 × 1021 *M* | |  | d. | 2.1 × 10–8 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 36. Consider a solution of 2.0 *M* HCN and 1.0 *M* NaCN (*K*a for HCN = 6.2 × 10–10). Which of the following statements is true?   |  |  |  | | --- | --- | --- | |  | a. | The solution is not a buffer because [HCN] is not equal to [CN–]. | |  | b. | The pH will be below 7.00 because the concentration of the acid is greater than that of the base. | |  | c. | [OH–] > [H+] | |  | d. | The buffer will be more resistant to pH changes from addition of strong acid than of strong base. | |  | e. | All of the above are false. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 37. Which of the following solutions will be the best buffer at a pH of 9.26? (*K*a for HC2H3O2 is 1.8 × 10–5, *K*b for NH3 is 1.8 × 10–5).   |  |  |  | | --- | --- | --- | |  | a. | 0.10 *M* HC2H3O2 and 0.10 *M* Na C2H3O2 | |  | b. | 5.0 *M* HC2H3O2 and 5.0 *M* Na C2H3O2 | |  | c. | 0.10 *M* NH3 and 0.10 *M* NH4Cl | |  | d. | 5.0 *M* NH3 and 5.0 *M* NH4Cl | |  | e. | 5.0 *M* HC2H3O2 and 5.0 *M* NH3 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| You have two buffered solutions. Buffered solution 1 consists of 5.0 *M* HOAc and 5.0 *M* NaOAc; buffered solution 2 is made of 0.050 *M* HOAc and 0.050 *M* NaOAc. |

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| 38. How do the pHs of the buffered solutions compare?   |  |  |  | | --- | --- | --- | |  | a. | The pH of buffered solution 1 is greater than that of buffered solution 2. | |  | b. | The pH of buffered solution 2 is greater than that of buffered solution 1. | |  | c. | The pH of buffered solution 1 is equal to that of buffered solution 2. | |  | d. | Cannot be determined without the *K*a values. | |  | e. | None of these (A-D). |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 15-1 | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | pH of a buffer | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 39. Buffered solution 1 has a greater buffering capacity than buffered solution 2.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.3 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 15-1 | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 40. In titrating 0.20 *M* sulfuric acid, H2SO4, with 0.4 *M* NaOH at 25°C, the solution at the equivalence point is   |  |  |  | | --- | --- | --- | |  | a. | 0.20 *M* Na2SO4 | |  | b. | very acidic | |  | c. | slightly acidic | |  | d. | 0.10 *M* H2SO4 and 0.4 *M* NaOH | |  | e. | 0.10 *M* Na2SO4 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 2/23/2017 1:41 AM | |

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| 41. One milliliter (1.00 mL) of acid taken from a lead storage battery is pipetted into a flask. Water and phenolphthalein indicator are added, and the solution is titrated with 0.50 *M* NaOH until a pink color appears; 12.0 mL are required. The number of grams of H2SO4 (formula weight = 98) present in one liter of the battery acid is:   |  |  |  | | --- | --- | --- | |  | a. | 588 | |  | b. | 294 | |  | c. | 33 | |  | d. | 1176 | |  | e. | 49 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 42. You are given 5.00 mL of an H2SO4 solution of unknown concentration. You divide the 5.00-mL sample into five 1.00-mL samples and titrate each separately with 0.1000 *M* NaOH. In each titration the H2SO4 is completely neutralized. The average volume of NaOH solution used to reach the endpoint is 18.7 mL. What was the concentration of H2SO4 in the 5.00-mL sample?   |  |  |  | | --- | --- | --- | |  | a. | 1.87 *M* | |  | b. | 4.68 *M* | |  | c. | 0.935 *M* | |  | d. | 0.187 *M* | |  | e. | 9.35 *M* |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 43. What is the molarity of a sodium hydroxide solution if 25.1 mL of this solution reacts exactly with 22.30 mL of 0.253 *M* sulfuric acid?   |  |  |  | | --- | --- | --- | |  | a. | 0.225 *M* | |  | b. | 0.899 *M* | |  | c. | 6.35 *M* | |  | d. | 0.450 *M* | |  | e. | 0.238 *M* |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 44. If 25.0 mL of 0.451 *M* NaOH solution is titrated with 0.253 *M* H2SO4, the flask at the endpoint will contain (besides the indicator phenolphthalein) as the principal components:   |  |  |  | | --- | --- | --- | |  | a. | sodium hydroxide, sulfuric acid, and water | |  | b. | dissolved sodium sulfate and water | |  | c. | sodium hydroxide, sodium sulfate, and water | |  | d. | dissolved sodium sulfate, sulfuric acid, and water | |  | e. | precipitated sodium sulfate and water |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 45. A 21.5-mL sample of tartaric acid is titrated to a phenolphthalein endpoint with 20. mL of 1.0 *M* NaOH. Assuming tartaric acid is diprotic, what is the molarity of the acid?   |  |  |  | | --- | --- | --- | |  | a. | 1.0 *M* | |  | b. | 0.47 *M* | |  | c. | 2.0 *M* | |  | d. | 0.93 *M* | |  | e. | impossible to determine |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 46. If 25 mL of 0.750 *M* HCl are added to 100. mL of 0.275*M* NaOH, what is the final pH?   |  |  |  | | --- | --- | --- | |  | a. | 12.85 | |  | b. | 1.15 | |  | c. | 13.34 | |  | d. | 0.66 | |  | e. | 7.00 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 47. A 50.00-mL sample of 0.100 *M* KOH is titrated with 0.173*M* HNO3. Calculate the pH of the solution after 52.00 mL of HNO3 is added.   |  |  |  | | --- | --- | --- | |  | a. | 12.59 | |  | b. | 1.05 | |  | c. | 1.41 | |  | d. | 12.95 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 48. A solution of hydrochloric acid of unknown concentration was titrated with 0.40 *M* NaOH. If a 100.-mL sample of the HCl solution required exactly 10. mL of the NaOH solution to reach the equivalence point, what was the pH of the HCl solution?   |  |  |  | | --- | --- | --- | |  | a. | 12.6 | |  | b. | 1.4 | |  | c. | –0.6 | |  | d. | 2.8 | |  | e. | 5.6 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 49. A titration of 200.0 mL of 1.83*M* H2A was done with 1.00 *M* NaOH. For the diprotic acid H2A, *K*a1 = 2.5 × 10–5, *K*a2 = 3.1 × 10–9. Calculate the pH before any 1.00 M NaOH has been added.   |  |  |  | | --- | --- | --- | |  | a. | 11.83 | |  | b. | 4.34 | |  | c. | 9.66 | |  | d. | 8.68 | |  | e. | 2.17 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 50. A titration of 200.0 mL of 1.00 *M* H2A was done with 1.28*M* NaOH. For the diprotic acid H2A, *K*a1 = 2.5 × 10–5, *K*a2 = 3.1 × 10–9. Calculate the pH after 100.0 mL of 1.28*M* NaOH have been added.   |  |  |  | | --- | --- | --- | |  | a. | 9.15 | |  | b. | 8.76 | |  | c. | 5.24 | |  | d. | 9.70 | |  | e. | 4.85 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 51. A titration of 200.0 mL of 1.00 *M* H2A was done with 1.01*M* NaOH. For the diprotic acid H2A, *K*a1 = 2.5 × 10–5, *K*a2 = 3.1 × 10–9. Calculate the pH after 600.0 mL of 1.01*M* NaOH have been added.   |  |  |  | | --- | --- | --- | |  | a. | 13.411 | |  | b. | 0.589 | |  | c. | 13.705 | |  | d. | 0.295 | |  | e. | 9.411 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 52. Consider the titration of 300.0 mL of 0.425*M* NH3 (*K*b = 1.8 × 10–5) with 0.500 *M* HNO3. After 150.0 mL of 0.500 *M* HNO3 have been added, the pH of the solution is:   |  |  |  | | --- | --- | --- | |  | a. | 4.90 | |  | b. | 11.10 | |  | c. | 6.10 | |  | d. | 9.10 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak base by a strong acid | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 53. Consider the titration of 300.0 mL of 0.450*M* NH3 (*K*b = 1.8 × 10–5) with 0.450*M* HNO3. How many milliliters of 0.450*M* HNO3 are required to reach the stoichiometric point of the reaction?   |  |  |  | | --- | --- | --- | |  | a. | 3.50 × 102 mL | |  | b. | 4.00 × 102 mL | |  | c. | 4.50 × 102 mL | |  | d. | 3.00 × 102 mL | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak base by a strong acid | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 54. Consider the titration of 300.0 mL of 0.450*M* NH3 (*K*b = 1.8 × 10–5) with 0.450*M* HNO3. At the stoichiometric point of this titration, the pH is:   |  |  |  | | --- | --- | --- | |  | a. | 4.80 | |  | b. | 2.70 | |  | c. | 4.95 | |  | d. | 4.74 | |  | e. | 7.00 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak base by a strong acid | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 55. Consider the titration of 500.0 mL of 0.200 *M* NaOH with 0.800 *M* HCl. How many milliliters of 0.800 *M* HCl must be added to reach a pH of 13.000?   |  |  |  | | --- | --- | --- | |  | a. | 55.6 mL | |  | b. | 24.6 mL | |  | c. | 18.5 mL | |  | d. | 12.9 mL | |  | e. | 4.32 mL |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 56. What quantity of NaOH(*s*) must be added to 2.00 L of 0.629*M* HCl to achieve a pH of 13.00? (Assume no volume change.)   |  |  |  | | --- | --- | --- | |  | a. | 1.06 mol | |  | b. | 1.46 mol | |  | c. | 0.20 mol | |  | d. | 1.00 × 10–13 mol | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 57. A 50.0-mL sample of 0.10 *M* HNO2 (*K*a = 4.0 × 10–4) is titrated with 0.12 M NaOH. The pH after 25.0 mL of NaOH have been added is   |  |  |  | | --- | --- | --- | |  | a. | 10.43 | |  | b. | 7.00 | |  | c. | 6.57 | |  | d. | 3.57 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 58. The pH at the equivalence point of the titration of a strong acid with a strong base is:   |  |  |  | | --- | --- | --- | |  | a. | 3.9 | |  | b. | 4.5 | |  | c. | 7.0 | |  | d. | 8.2 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 59. The pH at the equivalence point of a titration of a weak acid with a strong base will be   |  |  |  | | --- | --- | --- | |  | a. | less than 7.00 | |  | b. | equal to 7.00 | |  | c. | greater than 7.00 | |  | d. | equal to the pKa of the acid | |  | e. | more data needed to answer this question |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 60. A 75.0-mL sample of 0.0650*M* HCN (*K*a = 6.2 × 10–10) is titrated with 0.65*M* NaOH. What volume of 0.65*M* NaOH is required to reach the stoichiometric point?   |  |  |  | | --- | --- | --- | |  | a. | 750. mL | |  | b. | 7.50 mL | |  | c. | 3.75 mL | |  | d. | 75.0 mL | |  | e. | cannot determine without knowing the pH at the stoichiometric point |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 61. A 75.0-mL sample of 0.0500 *M* HCN (*K*a = 6.2 × 10–10) is titrated with 0.279*M* NaOH. What is the [H+] in the solution after 3.0 mL of 0.279*M* NaOH have been added?   |  |  |  | | --- | --- | --- | |  | a. | 4.6 × 10–6 *M* | |  | b. | 1.0 × 10–7 *M* | |  | c. | 3.5 *M* | |  | d. | 2.2 × 10–9 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 62. A student titrates an unknown weak acid, HA, to a pale pink phenolphthalein endpoint with 25.0 mL of 0.100 *M* NaOH. The student then adds 13.0 mL of 0.100 *M* HCl. The pH of the resulting solution is 4.7. Which of the following is true?   |  |  |  | | --- | --- | --- | |  | a. | At pH 4.7, half the conjugate base, A–, has been converted to HA. | |  | b. | The p*K*a of the acid is 4.7. | |  | c. | The p*K*a of the acid is less than 4.7. | |  | d. | The p*K*a of the acid is greater than 4.7. | |  | e. | More than one of the above is correct. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak acid by a strong base | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 63. How many moles of HCl(*g*) must be added to 1.0 L of 2.0*M* NaOH to achieve a pH of 0.00? (Neglect any volume change.)   |  |  |  | | --- | --- | --- | |  | a. | 1.0 moles | |  | b. | 4.0 moles | |  | c. | 3.0 moles | |  | d. | 5.0 moles | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 64. A 50.0-mL sample of a 1.50 *M* NaOH solution is titrated with a 1.56*M* HCl solution. What will be the final volume of solution when the NaOH has been completely neutralized by the HCl?   |  |  |  | | --- | --- | --- | |  | a. | 98.1 mL | |  | b. | 48.1 mL | |  | c. | 83.1 mL | |  | d. | 167 mL | |  | e. | 2.7 mL |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/15/2017 2:41 AM | |

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| 65. You have 75.0 mL of 0.14*M* HA. After adding 30.0 mL of 0.10 *M* NaOH, the pH is 5.50. What is the *K*a value of HA?   |  |  |  | | --- | --- | --- | |  | a. | 3.2 × 10–6 | |  | b. | 1.3 × 10–6 | |  | c. | 0.40 | |  | d. | 9.0 × 10–7 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 66. Consider the titration of 100.0 mL of 0.10 *M* H2A (*K*a1 = 1.50 × 10–4; *K*a2 = 8.28 × 10–7) with 0.20 *M* NaOH. Calculate the [H+] after 75.0 mL of 0.20 *M* NaOH has been added.   |  |  |  | | --- | --- | --- | |  | a. | 1.7 × 10–6 *M* | |  | b. | 1.2 × 10–8 *M* | |  | c. | 4.1 × 10–7 *M* | |  | d. | 8.3 × 10–7 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 67. Consider the titration of 100.0 mL of 0.10 *M* H2A (*K*a1 = 1.5 × 10–4; *K*a2 = 8.0 × 10–7) with 0.20 *M* NaOH. Calculate the volume of 0.20 *M* NaOH required to reach an [H+] of 6.0 × 10–4 *M*.   |  |  |  | | --- | --- | --- | |  | a. | 0 mL | |  | b. | 10. mL | |  | c. | 25. mL | |  | d. | 50. mL | |  | e. | 65. mL |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 68. A 50.00-mL sample of a 1.00 *M* solution of the diprotic acid H2A (*K*a1 = 1.0 × 10–6 and *K*a2 = 1.0 × 10–10) is titrated with 2.00 *M* NaOH. How many mL of 2.00 *M* NaOH must be added to reach a pH of 10?   |  |  |  | | --- | --- | --- | |  | a. | 0 mL | |  | b. | 12.5 mL | |  | c. | 25.0 mL | |  | d. | 37.5 mL | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 69. Consider the titration of 100.0 mL of 0.100 *M* H2A (*K*a1 = 1.50 × 10–4; *K*a2 = 1.00 × 10–8). How many milliliters of 0.100 *M* NaOH must be added to reach a pH of 5.000?   |  |  |  | | --- | --- | --- | |  | a. | 41.9 mL | |  | b. | 93.8 mL | |  | c. | 100. mL | |  | d. | 200. mL | |  | e. | 60.0 mL |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 70. A 100.0-mL sample of 0.597*M* H2A (diprotic acid) is titrated with 0.200 *M* NaOH. After 125.0 mL of 0.200 *M* NaOH has been added, the pH of the solution is 4.50. Calculate Ka1 for H2A.   |  |  |  | | --- | --- | --- | |  | a. | 4.4 × 10–10 | |  | b. | 4.5 | |  | c. | 2.3 × 10–5 | |  | d. | not enough information to calculate | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| Consider the following information about the diprotic acid, ascorbic acid. (H2As for short, molar mass 176.1) H2As HAs– + H+ p*K*a = 4.10 (*K*a = 7.9 × 10–5) HAs– As2– + H+p*K*a = 11.79 (*K*a = 1.6 × 10–12) The titration curve for disodium ascorbate, Na2As, with standard HCl is shown below: |

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| 71. What major species is (are) present at point III?   |  |  |  | | --- | --- | --- | |  | a. | As2– and HAs– | |  | b. | HAs– only | |  | c. | HAs– and H2As | |  | d. | H2As only | |  | e. | H2As and H+ |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 15-2 | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 72. What is the pH at point I (V1/2 HCl added)?   |  |  |  | | --- | --- | --- | |  | a. | 4.10 | |  | b. | 7.95 | |  | c. | 11.79 | |  | d. | 12.39 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 15-2 | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 73. What is the pH at point III?   |  |  |  | | --- | --- | --- | |  | a. | 4.10 | |  | b. | 7.95 | |  | c. | 11.79 | |  | d. | 12.39 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 15-2 | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 74. Which of the following is a major species present at point IV?   |  |  |  | | --- | --- | --- | |  | a. | H2As | |  | b. | HAs– | |  | c. | As2– | |  | d. | H+ | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 15-2 | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 75. A solution contains 10. mmol of H3PO4 and 5.0 mmol of NaH2PO4. How many milliliters of 0.10 *M* NaOH must be added to reach the second equivalence point of the titration of the H3PO4 with NaOH?   |  |  |  | | --- | --- | --- | |  | a. | 250 | |  | b. | 150 | |  | c. | 1.0 × 102 | |  | d. | 50 | |  | e. | 2.0 × 102 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 76. A solution contains 25 mmol of H3PO4 and 10. mmol of NaH2PO4. What volume of 2.0 *M* NaOH must be added to reach the second equivalence point of the titration of the H3PO4 with NaOH?   |  |  |  | | --- | --- | --- | |  | a. | 5.0 mL | |  | b. | 12 mL | |  | c. | 25 mL | |  | d. | 30. mL | |  | e. | 60. mL |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 77. A 100.-mL sample of a 0.10 *M* solution of H3PO4 is titrated with 0.20 *M* NaOH. What volume of base must be added to reach the third equivalence point?   |  |  |  | | --- | --- | --- | |  | a. | 50. mL | |  | b. | 1.0 × 102 | |  | c. | 150 mL | |  | d. | 2.0 × 102 | |  | e. | 250 mL |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 78. For carbonic acid (H2CO3), *K*a1 = 4.30 × 10–7 and *K*a2 = 5.62 × 10–11. Calculate the pH of a 0.89*M* solution of Na2CO3.   |  |  |  | | --- | --- | --- | |  | a. | 1.90 | |  | b. | 10.16 | |  | c. | 3.84 | |  | d. | 12.10 | |  | e. | 9.10 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 79. A solution containing 10. mmol of and 5.0 mmol of is titrated with 1.9*M* HCl. What volume of HCl must be added to reach the first equivalence point?   |  |  |  | | --- | --- | --- | |  | a. | 2.6 mL | |  | b. | 5.3 mL | |  | c. | 10.3 mL | |  | d. | 15.3 mL | |  | e. | 20.3 mL |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 80. A solution containing 10. mmol of and 5.0 mmol of is titrated with 1.5*M* HCl. What total volume of HCl must be added to reach the second equivalence point?   |  |  |  | | --- | --- | --- | |  | a. | 10.0 mL | |  | b. | 6.7 mL | |  | c. | 3.3 mL | |  | d. | 16.7 mL | |  | e. | 21.7 mL |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 81. You dissolve 1.09 grams of an unknown diprotic acid in 200.0 mL of H2O. This solution is just neutralized by 5.00 mL of a 1.00 *M* NaOH solution. What is the molar mass of the unknown acid?   |  |  |  | | --- | --- | --- | |  | a. | 218 | |  | b. | 109 | |  | c. | 27.3 | |  | d. | 436 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 82. A 2.90-g sample of an acid, H2X, requires 45.0 mL of a 0.500 *M* NaOH solution for complete reaction (removing both protons). The molar mass of the acid is:   |  |  |  | | --- | --- | --- | |  | a. | 129 | |  | b. | 303 | |  | c. | 280 | |  | d. | 258 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 83. A 0.210-g sample of an acid (molar mass = 192 g/mol) is titrated with [$X] mL of [$Y] *M* NaOH to a phenolphthalein endpoint. The formula of the acid is:   |  |  |  | | --- | --- | --- | |  | a. | HA | |  | b. | H2A | |  | c. | H3A | |  | d. | H4A | |  | e. | not enough information given |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 84. Consider the titration of 100.0  mL of 0.250 *M* aniline (*K*b = 3.82 × 10–10) with 0.500 *M* HCl. Calculate the pH of the solution at the stoichiometric point.   |  |  |  | | --- | --- | --- | |  | a. | 5.10 | |  | b. | 9.42 | |  | c. | 2.68 | |  | d. | 11.32 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak base by a strong acid | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 85. Consider the titration of 100.0 mL of 0.250 *M* aniline (*K*b = 3.8 × 10–10) with 0.500 *M* HCl. For calculating the volume of HCl required to reach a pH of 8.0, which of the following expressions is correct? (*x* = volume in mL of HCl required to reach a pH of 8.0)   |  |  |  | | --- | --- | --- | |  | a. | = [aniline] | |  | b. | [H+] = *x* | |  | c. | = [aniline] | |  | d. | = [aniline] | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak base by a strong acid | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 86. A 100.0-mL sample of 0.2 *M* (CH3)3N (*K*b = 5.33 × 10–5) is titrated with 0.2 *M* HCl. What is the pH at the equivalence point?   |  |  |  | | --- | --- | --- | |  | a. | 2.6 | |  | b. | 8.6 | |  | c. | 10.7 | |  | d. | 5.4 | |  | e. | 7.0 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak base by a strong acid | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 87. Calculate the pH at the equivalence point for the titration of 1.0 *M* ethylamine, C2H5NH2, by 1.0 *M* perchloric acid, HClO4. (p*K*b for C2H5NH2 = 3.25)   |  |  |  | | --- | --- | --- | |  | a. | 6.05 | |  | b. | 2.24 | |  | c. | 5.53 | |  | d. | 2.09 | |  | e. | 5.38 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak base by a strong acid | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 88. What volume of 0.0100 *M* NaOH must be added to 1.00 L of 0.0500 *M* HOCl to achieve a pH of 8.00? The *K*a for HOCl is 3.5 × 10–8.   |  |  |  | | --- | --- | --- | |  | a. | 1.0 L | |  | b. | 5.0 L | |  | c. | 1.2 L | |  | d. | 3.9 L | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 89. Which of the following is the net ionic equation for the reaction that occurs during the titration of nitric acid with potassium hydroxide?   |  |  |  | | --- | --- | --- | |  | a. | HNO3 + K+ OH– → KNO3 + H2O | |  | b. | HNO3 + H2O → NO3– + H3O+ | |  | c. | HNO3 + KOH → K+ + NO3– + H2O | |  | d. | HNO3 + OH– → NO3– + H2O | |  | e. | H+ + OH– → H2O |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 90. In titrating 100 mL of 0.10 *M* HCl (*aq*) with 0.10 *M* NaOH, the pH does not change a great deal initially. Why is this?   |  |  |  | | --- | --- | --- | |  | a. | The amount of OH– has no affect on the pH of aqueous solutions. | |  | b. | The H+ from the HCl (*aq*) acts like a buffer. | |  | c. | The major species when the acid and base are mixed form a buffered solution. | |  | d. | The statement “In titrating 100 mL of 0.10 *M* HCl (*aq*) with 0.10 *M* NaOH, the pH does not change a great deal initially.” is not true. | |  | e. | None of these. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a strong acid by a strong base | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 91. You have 100.0 mL of 0.100 *M* aqueous solutions of each of the following acids: HCN, HF, HCl, and HC2H3O2. You titrate each with 0.100 *M* NaOH (*aq*). Rank the pHs of each of the solutions when each are titrated to the equivalence point, from highest to lowest pH.   |  |  | | --- | --- | |  | *K*a for HCN = 6.2 × 10–10 | |  | *K*a for HF = 7.2 × 10–4 | |  | *K*a for HC2H3O2 = 1.8 × 10–5 |   ​   |  |  |  | | --- | --- | --- | |  | a. | HCN, HC2H3O2, HF, HCl | |  | b. | HCl, HF, HCN, HC2H3O2 | |  | c. | HF, HCN, HC2H3O2, HCl | |  | d. | HC2H3O2, HCl, HCN, HF | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak acid by a strong base | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/14/2017 6:16 AM | |

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| 92. How many of the following will raise the pH of a weak acid HA in aqueous solution?   |  |  |  | | --- | --- | --- | |  | I. | addition of water | |  | II. | making a buffered solution by adding NaA(*s*) | |  | III. | addition of NaCl(*s*) | |  | IV. | addition of HNO3 | |  | V. | titrating with KOH |  |  |  |  | | --- | --- | --- | |  | a. | 1 | |  | b. | 2 | |  | c. | 3 | |  | d. | 4 | |  | e. | 5 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | Chemistry | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 2/23/2017 6:14 AM | |

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| 93. A 25.00-mL sample of propanoic acid, CH3CH2COOH, of unknown concentration was titrated with 0.143*M* KOH. The equivalence point was reached when 35.28 mL of base had been added.What is the concentration of the propanoate ion at the equivalence point?   |  |  |  | | --- | --- | --- | |  | a. | 0.143 *M* | |  | b. | 0.0837 *M* | |  | c. | 0.202 *M* | |  | d. | 0.128 *M* | |  | e. | 0.147 *M* |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 94. A 50.00-mL solution of 0.0350 *M* benzoic acid (*K*a = 6.4 × 10–5) is titrated with a 0.0209*M* solution of sodium hydroxide as the titrant. What is the pH of the acid solution after 15.00 mL of titrant have been added? (*K*w = 1.00 × 10–14)   |  |  |  | | --- | --- | --- | |  | a. | 1.46 | |  | b. | 2.83 | |  | c. | 3.56 | |  | d. | 10.13 | |  | e. | 4.19 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak acid by a strong base | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 95. A 50.00-mL solution of 0.0252*M* ammonia (*K*b = 1.8 × 10–5) is titrated with a 0.0287*M* solution of hydrochloric acid as the titrant. What is the pH of the base solution after 10.23 mL of titrant have been added? (*K*w = 1.00 × 10–14)   |  |  |  | | --- | --- | --- | |  | a. | 10.82 | |  | b. | 12.40 | |  | c. | 4.74 | |  | d. | 9.77 | |  | e. | 4.23 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak base by a strong acid | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 96. A 50.00-mL solution of 0.0505*M* acetic acid (*K*a = 1.8 × 10–5) is titrated with a 0.0326*M* solution of sodium hydroxide as the titrant. What is the pH of at the equivalence point? (*K*w = 1.00 × 10–14)   |  |  |  | | --- | --- | --- | |  | a. | 8.52 | |  | b. | 5.48 | |  | c. | 4.74 | |  | d. | 10.78 | |  | e. | 9.26 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak base by a strong acid | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 97. A 50.00-mL solution of 0.0350*M* methylamine (*K*b = 4.4 × 10–4) is titrated with a 0.0246*M* solution of hydrochloric acid as the titrant. What is the pH at the equivalence point? (*K*w = 1.0 × 10–14)   |  |  |  | | --- | --- | --- | |  | a. | 10.64 | |  | b. | 7.76 | |  | c. | 2.60 | |  | d. | 3.36 | |  | e. | 6.24 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of a weak base by a strong acid | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| Consider the titration of 100.0 mL of the weak diprotic acid H2A (0.10 *M*) with 0.20 *M* NaOH. What are the major species at each of the following points in the titration? (Water is always assumed to be a major species.) |

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| 98. Before any NaOH is added   |  |  |  | | --- | --- | --- | |  | a. | HA– | |  | b. | H2A, HA– | |  | c. | HA–, A2– | |  | d. | H2A | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 15-3 | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 99. After 25.0 mL of 0.20 *M* NaOH is added   |  |  |  | | --- | --- | --- | |  | a. | HA– | |  | b. | H2A, HA– | |  | c. | HA–, A2– | |  | d. | H2A | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 15-3 | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 100. After 50.0 mL of 0.20 *M* NaOH is added   |  |  |  | | --- | --- | --- | |  | a. | HA– | |  | b. | H2A, HA– | |  | c. | HA–, A2– | |  | d. | H2A | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 15-3 | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 101. After 75.0 mL of 0.20 *M* NaOH is added   |  |  |  | | --- | --- | --- | |  | a. | HA– | |  | b. | H2A, HA– | |  | c. | HA–, A2– | |  | d. | H2A | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 15-3 | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 102. After 200.0 mL of 0.20 *M* NaOH is added   |  |  |  | | --- | --- | --- | |  | a. | HA– | |  | b. | H2A, HA– | |  | c. | HA–, A2– | |  | d. | H2A | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 15-3 | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | titration of polyprotic acids | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 103. Consider the following indicators and their pH ranges:   |  |  | | --- | --- | | Methyl orange | 3.2-4.4 | | Methyl red | 4.8-6.0 | | Bromothymol blue | 6.0-7.6 | | Phenolphthalein | 8.2-10.0 | | Alizarin yellow | 10.1-12.0 |   Assume an indicator works best when the equivalence point of a titration comes in the middle of the indicator range. For which of the following titrations would methyl red be the best indicator?   |  |  |  | | --- | --- | --- | |  | a. | 0.100 *M* HNO3 + 0.100 *M* KOH | |  | b. | 0.100 *M* aniline (*K*b = 3.8 × 10–10) + 0.100 *M* HCl | |  | c. | 0.100 *M* NH3 (*K*b = 1.8 × 10–5) + 0.100 *M* HCl | |  | d. | 0.100 *M* HF (*K*a = 7.2 × 10–4) + 0.100 *M* NaOH | |  | e. | 0.100 *M* acetic acid (*K*a = 1.8 × 10–5) + 0.100 *M* NaOH |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 104. Assume an indicator works best when the equivalence point of a titration comes in the middle of the indicator range. Which indicator would be best for the following titration?  0.100 *M* HOCl (*K*a = 3.5 × 10-8) + 0.100 *M* NaOH   |  |  |  | | --- | --- | --- | |  | a. | crystal violet (0.2 - 1.8) | |  | b. | phenolphthalien (8.2 - 10.0) | |  | c. | methyl orange (3.2 - 4.4) | |  | d. | thymolphthalein (9.5 - 10.5) | |  | e. | cresol red (7.0 - 8.8) |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 105. In the titration of a weak acid HA with 0.100 *M* NaOH, the stoichiometric point is known to occur at a pH value of approximately 10. Which of the following indicator acids would be best to use to mark the endpoint of this titration?   |  |  |  | | --- | --- | --- | |  | a. | indicator A, *K*a = 10–14 | |  | b. | indicator B, *K*a = 10–11 | |  | c. | indicator C, *K*a = 10–8 | |  | d. | indicator D, *K*a = 10–6 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 106. In the titration of a weak acid, HA, with a sodium hydroxide solution of approximately the same concentration, the stoichiometric point occurs at pH = 9.5. Which of the following weak acid indicators would be best suited to mark the endpoint of this titration?   |  |  |  | | --- | --- | --- | |  | a. | indicator A, *K*a = 10–11 | |  | b. | indicator B, *K*a = 10–13 | |  | c. | indicator C, *K*a = 10–9 | |  | d. | indicator D, *K*a = 10–7 | |  | e. | indicator E, *K*a = 10–5 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 107. In the titration of a weak acid HA with 0.100 *M* NaOH, the stoichiometric point is known to occur at a pH value of approximately 11. Which of the following indicators would be best to use to mark the endpoint of this titration?   |  |  |  | | --- | --- | --- | |  | a. | an indicator with *K*a = 10–10 | |  | b. | an indicator with *K*a = 10–8 | |  | c. | an indicator with *K*a = 10–14 | |  | d. | an indicator with *K*a = 10–11 | |  | e. | an indicator with *K*a = 10–12 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 108. A certain indicator HIn has a p*K*a of 9.00 and a color change becomes visible when 7.00% of it is In–. At what pH is this color change visible?   |  |  |  | | --- | --- | --- | |  | a. | 10.2 | |  | b. | 3.85 | |  | c. | 6.15 | |  | d. | 7.88 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 15.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 109. Methyl orange is an indicator with a *K*a of 1 × 10–4. Its acid form, HIn, is red, while its base form, In–, is yellow. At pH 6.0, the indicator will be   |  |  |  | | --- | --- | --- | |  | a. | red | |  | b. | orange | |  | c. | yellow | |  | d. | blue | |  | e. | not enough information |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acid-base titration curve | acids and bases | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 110. Which of the following pairs of 0.100 mol L-1 solutions, when mixed, will produce a buffer solution?   |  |  |  | | --- | --- | --- | |  | a. | 50 mL of aqueous CH3COONa and 25 mL aqueous NaOH | |  | b. | 50 mL of aqueous CH3COOH and 25 mL aqueous HCl | |  | c. | 50 mL of aqueous CH3COOH and 25 mL aqueous CH3COONa | |  | d. | 50 mL of aqueous CH3COOH and 100 mL aqueous NaOH | |  | e. | 50 mL of aqueous NaOH and 25 mL aqueous HCl |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 111. Equal volumes of the following pairs of solutions are mixed. Which pair will produce a buffer solution?   |  |  |  | | --- | --- | --- | |  | a. | 0.10 mol L-1 HCl and 0.05 mol L-1 NaOH | |  | b. | 0.10 mol L-1 HCl and 0.15 mol L-1 NH3 | |  | c. | 0.10 mol L-1 HCl and 0.05 mol L-1 NH3 | |  | d. | 0.10 mol L-1 HCl and 0.20 mol L-1 CH3COOH | |  | e. | 0.10 mol L-1 HCl and 0.20 mol L-1 NaCl |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 112. Which of the following solutions would be described as a buffer solution?   |  |  |  | | --- | --- | --- | |  | a. | 0.25 M CH3COOH and 0.20 M HCl | |  | b. | 0.25 M CH3COOH and 0.20 M NaOH | |  | c. | 0.15 M NaBr and 0.20 M HBr | |  | d. | 0.25 M NH3 and 0.15 M NaOH | |  | e. | 0.25 M HCl and 0.10 M NaOH |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 113. Which of the following mixtures would be classified as a buffer solution?   |  |  |  | | --- | --- | --- | |  | a. | 50 mL of 0.100 M HCl and 50 mL of 0.100 M KCl | |  | b. | 50 mL of 0.100 M CH3COOH and 55 mL of 0.100 M NaOH | |  | c. | 50 mL of 0.100 M CH3COOH and 25 mL of 0.100 M NaOH | |  | d. | 50 mL of 0.100 M CH3COOH and 0.500 mL of 0.000100 M NaOH | |  | e. | 50 mL of 0.100 M CH3COOH and 55 mL of 0.100 M HCl |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 114. Which of the following mixtures would NOT be described as a buffer solution?   |  |  |  | | --- | --- | --- | |  | a. | 0.15 M NH4Cl and 0.25 M NH3 | |  | b. | 0.20 M NaOH and 0.40 M CH3COOH | |  | c. | 0.25 M HNO2 and 0.15 M KNO2 | |  | d. | 0.25 M HNO3 and 0.15 M KNO3 | |  | e. | 0.30 M NH3 and 0.15 M HCl |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 115. 100 mL of a buffer that consists of 0.20 M NH3 and 0.20 M NH4Cl is titrated with 25 mL of 0.20 M HCl.  Calculate the pH of the resulting solution given that the Kb for NH3 is 1.8 x 10-5.   |  |  |  | | --- | --- | --- | |  | a. | 4.74 | |  | b. | 4.97 | |  | c. | 9.03 | |  | d. | 9.26 | |  | e. | 9.48 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | acids and bases | adding an acid or base to a buffer | buffer | Chemistry | general chemistry | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 116. What is the pH for a buffer that consists of 0.45 M CH3COOH and 0.30 M CH3COONa? Ka of CH3COOH = 1.8 x 10-5   |  |  |  | | --- | --- | --- | |  | a. | 2.55 | |  | b. | 4.56 | |  | c. | 9.08 | |  | d. | 4.92 | |  | e. | 9.44 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | pH of a buffer | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 117. What is the pH for a buffer that consists of 0.25 M CH3COOH and 0.55 M CH3COONa? Ka of CH3COOH = 1.8 x 10-5   |  |  |  | | --- | --- | --- | |  | a. | 2.67 | |  | b. | 5.08 | |  | c. | 9.60 | |  | d. | 4.40 | |  | e. | 8.92 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | pH of a buffer | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 118. What is the pH for a buffer that consists of 0.45 M CH3CH2COOH and 0.80 M CH3CH2COOK? Ka of CH3CH2COOH = 1.3 x 10-5   |  |  |  | | --- | --- | --- | |  | a. | 2.62 | |  | b. | 5.14 | |  | c. | 9.36 | |  | d. | 4.64 | |  | e. | 8.86 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | pH of a buffer | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 119. What is the pH for a buffer that consists of 0.25 M CH3CH2COOH and 0.50 M CH3CH2COONa? Ka of CH3CH2COOH = 1.3 x 10-5   |  |  |  | | --- | --- | --- | |  | a. | 2.74 | |  | b. | 5.19 | |  | c. | 9.41 | |  | d. | 4.59 | |  | e. | 8.81 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | pH of a buffer | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/4/2016 4:29 PM | |

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| 120. What is the pH for a buffer that consists of 0.45 M benzoic acid, C6H5COOH and 0.10 M potassium benzoate C6H5COOK? Ka of C6H5COOH = 6.4 x 10-5   |  |  |  | | --- | --- | --- | |  | a. | 2.27 | |  | b. | 3.54 | |  | c. | 9.16 | |  | d. | 4.84 | |  | e. | 10.46 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | pH of a buffer | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/15/2017 5:06 AM | |

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| 121. What is the pH for a buffer that consists of 0.25 M benzoic acid, C6H5COOH and 0.65 M potassium benzoate C6H5COOK? Ka of C6H5COOH = 6.4 x 10-5   |  |  |  | | --- | --- | --- | |  | a. | 2.40 | |  | b. | 4.60 | |  | c. | 10.22 | |  | d. | 3.78 | |  | e. | 9.40 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 15.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | acids and bases | buffer | Chemistry | general chemistry | pH of a buffer | solutions of a weak acid or base with another solute | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:29 PM | | *DATE MODIFIED:* | 3/15/2017 5:07 AM | |