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| 1. The average rate of disappearance of ozone in the reaction is found to be 8.76 × 10¯3atm over a certain interval of time. What is the rate of appearance of during this interval?   |  |  |  | | --- | --- | --- | |  | a. | 13.1 × 10¯3atm/s | |  | b. | 8.76 × 10¯3atm/s | |  | c. | 5.84 × 10¯3atm/s | |  | d. | 336 × 10¯3atm/s | |  | e. | 25.6 × 10¯3atm/s |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 2/17/2017 7:33 AM | |

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| 2. The balanced equation for the reaction of bromate ion with bromide ion in acidic solution is given by:  At a particular instant in time, the value of is 3.0 × 10–3mol/L s. What is the value of in the same units?   |  |  |  | | --- | --- | --- | |  | a. | 1.8 × 10–3 | |  | b. | 3.0 × 10–3 | |  | c. | 5.0 × 10–3 | |  | d. | 1.5 × 10–3 | |  | e. | 2.5 × 10–3 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 2/16/2017 12:12 AM | |

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| 3. Consider the reaction  What is the ratio of the initial rate of the appearance of water to the initial rate of disappearance of oxygen?   |  |  |  | | --- | --- | --- | |  | a. | 1 : 1 | |  | b. | 2 : 1 | |  | c. | 1 : 2 | |  | d. | 2 : 2 | |  | e. | 3 : 2 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 4. Consider the reaction:  At a certain instant the initial rate of disappearance of the oxygen gas is X. What is the value of the appearance of water at the same instant?   |  |  |  | | --- | --- | --- | |  | a. | 1.2 X | |  | b. | 1.1 X | |  | c. | 0.86 X | |  | d. | 0.58 X | |  | e. | cannot be determined from the data |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 5. For the reaction 2A + 4B→2C + 2D, at a particular instant in time, the rate of the reaction is 0.0352 *M*/s. What is the rate of change of B?   |  |  |  | | --- | --- | --- | |  | a. | 0.0088 *M*/s | |  | b. | –0.0088 *M/*s | |  | c. | –0.141 *M*/s | |  | d. | –0.0352 *M*/s | |  | e. | 0.141 *M*/s |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/7/2017 5:56 AM | |

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| 6. Consider the reaction X → Y + Z Which of the following is a possible rate law?   |  |  |  | | --- | --- | --- | |  | a. | Rate = *k*[X] | |  | b. | Rate = *k*[Y] | |  | c. | Rate = *k*[Y][Z] | |  | d. | Rate = *k*[X][Y] | |  | e. | Rate = *k*[Z] |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 7. Consider the following rate law:  How are the exponents *n* and *m* determined?   |  |  |  | | --- | --- | --- | |  | a. | by using the balanced chemical equation | |  | b. | by using the subscripts for the chemical formulas | |  | c. | by using the coefficients of the chemical formulas | |  | d. | by educated guess | |  | e. | by experiment |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/7/2017 5:59 AM | |

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| 8. The following data were obtained for the reaction of NO with O2. Concentrations are in molecules/cm3 and rates are in molecules/cm3⋅s.   |  |  |  | | --- | --- | --- | | **[NO]0** | **[O2]0** | **Initial Rate** | | 1 × 1018 | 1 × 1018 | 2.0 × 1016 | | 2 × 1018 | 1 × 1018 | 8.0 × 1016 | | 3 × 1018 | 1 × 1018 | 18.0 × 1016 | | 1 × 1018 | 2 × 1018 | 4.0 × 1016 | | 1 × 1018 | 3 × 1018 | 6.0 × 1016 |   What is the rate law?   |  |  |  | | --- | --- | --- | |  | a. | Rate = *k*[NO][O2] | |  | b. | Rate = *k*[NO][O2]2 | |  | c. | Rate = *k*[NO]2[O2] | |  | d. | Rate = *k*[NO]2 | |  | e. | Rate = *k*[NO]2[O2]2 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/7/2017 6:20 AM | |

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| 9. The reaction of with hydroxide ion proceeds with the formation of .  The following data were obtained at 55°C.   |  |  |  |  | | --- | --- | --- | --- | |  | **[(CH3)3CBr]0** | **[OH–]0** | **Initial Rate** | | **Exp.** | **(mol/L)** | **(mol/L)** | **(mol/L)** | | 1 | 0.10 | 0.10 | 1.0 × 10–3 | | 2 | 0.20 | 0.10 | 2.0 × 10–3 | | 3 | 0.10 | 0.20 | 1.0 × 10–3 | | 4 | 0.30 | 0.20 | ? |   What will the initial rate (in mol/L·s) be in Experiment 4?   |  |  |  | | --- | --- | --- | |  | a. | 3.0 × 10–3 | |  | b. | 6.0 × 10–3 | |  | c. | 9.0 × 10–3 | |  | d. | 18 × 10–3 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | experimental determination of rate | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 10. For a reaction in which A and B react to form C, the following initial rate data were obtained:   |  |  |  | | --- | --- | --- | | **[A]** | **[B]** | **Initial Rate of Formation of C** | | **(mol/L)** | **(mol/L)** | **(mol/L·s)** | | 0.10 | 0.10 | 1.00 | | 0.10 | 0.20 | 4.00 | | 0.20 | 0.20 | 8.00 |   What is the rate law?   |  |  |  | | --- | --- | --- | |  | a. | Rate = *k*[A][B] | |  | b. | Rate = *k*[A]2[B] | |  | c. | Rate = *k*[A][B]2 | |  | d. | Rate = *k*[A]2[B]2 | |  | e. | Rate = *k*[A]3 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 11. Tabulated below are initial rate data for the reaction   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Run** |  |  |  |  | **Initial Rate (*M*/s)** | | 1 | 0.01 | 0.01 | 0.01 | 0.01 | 1 × 10–5 | | 2 | 0.01 | 0.02 | 0.01 | 0.01 | 2 × 10–5 | | 3 | 0.02 | 0.02 | 0.01 | 0.01 | 8 × 10–5 | | 4 | 0.02 | 0.02 | 0.02 | 0.01 | 8 × 10–5 | | 5 | 0.02 | 0.02 | 0.02 | 0.02 | 8 × 10–5 |   The experimental rate law is:   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/7/2017 6:34 AM | |

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| 12. Tabulated below are initial rate data for the reaction:                 2Fe(CN)63– + 2I– → 2Fe(CN)64– + I2   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Run** | **[Fe(CN)63–]0** | **[I–]0** | **[Fe(CN)64–]0** | **[I2]0** | **Rate (*M*/s)** | | 1 | 0.01 | 0.01 | 0.01 | 0.01 | 1 × 10–5 | | 2 | 0.01 | 0.02 | 0.01 | 0.01 | 2 × 10–5 | | 3 | 0.02 | 0.02 | 0.01 | 0.01 | 8 × 10–5 | | 4 | 0.02 | 0.02 | 0.02 | 0.01 | 8 × 10–5 | | 5 | 0.02 | 0.02 | 0.02 | 0.02 | 8 × 10–5 |   What is the value of *k*?   |  |  |  | | --- | --- | --- | |  | a. | 107 *M*–5 s–1 | |  | b. | 103 *M*–3 s–1 | |  | c. | 10 *M*–2 s–1 | |  | d. | 50 *M*–2 s–1 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| A general reaction written as A + 2B → C + 2D is studied and yields the following data:   |  |  |  |  | | --- | --- | --- | --- | |  | [A]0 | [B]0 | Initial Δ[C]/Δ*t* | |  | 0.150 *M* | 0.150 *M* | 8.00 × 10–3 mol/L·s | |  | 0.150 *M* | 0.300 *M* | 1.60 × 10–2 mol/L·s | |  | 0.300 *M* | 0.150 *M* | 3.20 × 10–2 mol/L·s | |

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| 13. What is the order of the reaction with respect to B?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-1 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction order | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 14. What is the order of the reaction with respect to A?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-1 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction order | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 15. What is the overall order of the reaction?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-1 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction order | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 16. What is the numerical value of the rate constant?   |  |  |  | | --- | --- | --- | |  | a. | 0.053 | |  | b. | 1.19 | |  | c. | 2.37 | |  | d. | 5.63 | |  | e. | none of these (A-D) |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-1 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 17. Determine the initial rate of B consumption (Δ[B]/Δ*t*) for the first trial?   |  |  |  | | --- | --- | --- | |  | a. | 8.00 × 10–3 mol/L·s | |  | b. | 1.60 × 10–2 mol/L·s | |  | c. | 3.20 × 10–2 mol/L·s | |  | d. | 4.00 × 10–3 mol/L·s | |  | e. | none of these (A-D) |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-1 | | *KEYWORDS:* | change of concentration with time | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 18. Determine the initial rate of C production (Δ[C]/Δ*t*) if [A] = 0.200 *M* and [B] = 0.500 *M*.   |  |  |  | | --- | --- | --- | |  | a. | 4.74 × 10–2 mol/L·s | |  | b. | 2.37 × 10–1 mol/L·s | |  | c. | 1.19 × 10–1 mol/L·s | |  | d. | 8.23 × 10–2 mol/L·s | |  | e. | none of these (A-D) |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-1 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| Consider the following data concerning the equation:       H2O2 + 3I– + 2H+ → I3– + 2H2O   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | [H2O2] |  | [I–] | [H+] | rate | | I | 0.100 *M* |  | 5.00 × 10–4 *M* | 1.00 × 10–2 *M* | 0.137 *M*/sec | | II. | 0.100 *M* |  | 1.00 × 10–3 *M* | 1.00 × 10–2 *M* | 0.268 *M*/sec | | III. | 0.200 *M* |  | 1.00 × 10–3 *M* | 1.00 × 10–2 *M* | 0.542 *M*/sec | | IV. | 0.400 *M* |  | 1.00 × 10–3 *M* | 2.00 × 10–2 *M* | 1.084 *M*/sec | |

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| 19. The rate law for this reaction is   |  |  |  | | --- | --- | --- | |  | a. | rate = *k*[H2O2][I–][H+] | |  | b. | rate = *k*[H2O2]2[I–]2[H+]2 | |  | c. | rate = *k*[I–][H+] | |  | d. | rate = *k*[H2O2][H+] | |  | e. | rate = *k*[H2O2][I–] |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-2 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 20. The average value for the rate constant *k* (without units) is   |  |  |  | | --- | --- | --- | |  | a. | 2710 | |  | b. | 2.74 × 104 | |  | c. | 137 | |  | d. | 108 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-2 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 21. Two mechanisms are proposed:   |  |  | | --- | --- | | I. |  | | II. |  |   Which mechanism and which step as the rate determining step would best fit the data?  ​   |  |  |  | | --- | --- | --- | |  | a. | Mechanism I, with the first step the rate determining step. | |  | b. | Mechanism I, with the second step the rate determining step. | |  | c. | Mechanism II, with the first step rate determining. | |  | d. | Mechanism II, with the second step rate determining. | |  | e. | None of the above could be correct. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-2 | | *KEYWORDS:* | Chemistry | general chemistry | rate determining step | rates of reaction | reaction mechanism | the rate law and the mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/7/2017 3:11 AM | |

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| The following initial rate data were found for the reaction            2MnO4– + 5H2C2O4 + 6H+→ 2Mn2+ + 10CO2 + 8H2O   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | [MnO4–]0 |  | [H2C2O4]0 | [H+]0 | Initial Rate (*M*/s) | |  | 1 × 10–3 |  | 1 × 10–3 | 1.0 | 2 × 10–4 | |  | 2 × 10–3 |  | 1 × 10–3 | 1.0 | 8 × 10–4 | |  | 2 × 10–3 |  | 2 × 10–3 | 1.0 | 1.6 × 10–3 | |  | 2 × 10–3 |  | 2 × 10–3 | 2.0 | 1.6 × 10–3 | |

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| 22. Which of the following is the correct rate law?   |  |  |  | | --- | --- | --- | |  | a. | Rate = *k*[MnO4–]2[H2C2O4]5[H+]6 | |  | b. | Rate = *k*[MnO4–]2[H2C2O4][H+] | |  | c. | Rate = *k*[MnO4–][H2C2O4][H+] | |  | d. | Rate = *k*[MnO4–]2[H2C2O4] | |  | e. | Rate = *k*[MnO4–]2[H2C2O4]2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-3 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 23. What is the value of the rate constant?   |  |  |  | | --- | --- | --- | |  | a. | 2 × 105 *M*⋅s–1 | |  | b. | 2 × 105 *M*–2⋅s–1 | |  | c. | 200 *M*–1⋅s–1 | |  | d. | 200 *M*–2⋅s–1 | |  | e. | 2 × 10–4 *M*⋅s–1 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-3 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| The following questions refer to the reaction between nitric oxide and hydrogen            2NO + H2 → N2O + H2O   |  |  |  |  | | --- | --- | --- | --- | | Experiment | Initial [NO], *M* | Initial [H2], *M* | Initial Rate of Disappearance of NO (mol/L sec) | | 1 | 6.4 × 10–3 | 2.2 × 10–3 | 2.7 × 10–5 | | 2 | 12.8 × 10–3 | 2.2 × 10–3 | 1.1 × 10–4 | | 3 | 6.4 × 10–3 | 4.5 × 10–3 | 5.4 × 10–5 | |

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| 24. What is the rate law for this reaction?   |  |  |  | | --- | --- | --- | |  | a. | Rate = *k*[NO] | |  | b. | Rate = *k*[NO]2 | |  | c. | Rate = *k*[NO]2[H2] | |  | d. | Rate = *k*[NO][H2] | |  | e. | Rate = *k*[N2O][H2O] |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-4 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 25. What is the magnitude of the rate constant for this reaction?   |  |  |  | | --- | --- | --- | |  | a. | 0.66 | |  | b. | 4.2 × 10–3 | |  | c. | 870 | |  | d. | 1.9 | |  | e. | 300 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-4 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 26. What are the units for the rate constant for this reaction?   |  |  |  | | --- | --- | --- | |  | a. | L/mol·s | |  | b. | L2/mol2·s | |  | c. | mol/L·s | |  | d. | s–2 | |  | e. | L–2 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-4 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 27. What is the order of this reaction?   |  |  |  | | --- | --- | --- | |  | a. | 3 | |  | b. | 2 | |  | c. | 1 | |  | d. | 0 | |  | e. | cannot be determined from the data |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-4 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction order | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| The reaction H2SeO3(*aq*) 6I–(*aq*) + 4H+(*aq*) → 2I3–(*aq*) + 3H2O(*l*) + Se(*s*) was studied at 0°C by the method of initial rates:   |  |  |  |  | | --- | --- | --- | --- | | [H2SeO3]0 | [H+]0 | [I–]0 | Rate (mol/L s) | | 1.0 × 10–4 | 2.0 × 10–2 | 2.0 × 10–2 | 1.66 × 10–7 | | 2.0 × 10–4 | 2.0 × 10–2 | 2.0 × 10–2 | 3.33 × 10–7 | | 3.0 × 10–4 | 2.0 × 10–2 | 2.0 × 10–2 | 4.99 × 10–7 | | 1.0 × 10–4 | 4.0 × 10–2 | 2.0 × 10–2 | 6.66 × 10–7 | | 1.0 × 10–4 | 1.0 × 10–2 | 2.0 × 10–2 | 0.41 × 10–7 | | 1.0 × 10–4 | 2.0 × 10–2 | 4.0 × 10–2 | 13.4 × 10–7 | | 1.0 × 10–4 | 4.0 × 10–2 | 4.0 × 10–2 | 5.33 × 10–6 | |

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| 28. The rate law is   |  |  |  | | --- | --- | --- | |  | a. | Rate = *k*[H2SeO3][H+][I–] | |  | b. | Rate = *k*[H2SeO3][H+]2[I–] | |  | c. | Rate = *k*[H2SeO3][H+][I–]2 | |  | d. | Rate = *k*[H2SeO3]2[H+][I–] | |  | e. | Rate = *k*[H2SeO3][H+]2[I–]3 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-5 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 29. The numerical value of the rate constant is   |  |  |  | | --- | --- | --- | |  | a. | 5.2 × 105 | |  | b. | 2.1 × 102 | |  | c. | 4.2 | |  | d. | 1.9 × 10–6 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-5 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| The following questions refer to the reaction shown below:   |  |  |  |  | | --- | --- | --- | --- | |  |  |  | Initial Rate of | |  | Initial [A] | Initial [B] | Disappearance of A | | Experiment | (mol/L) | (mol/L) | (mol/L·s) | | 1 | 0.16 | 0.15 | 0.08 | | 2 | 0.16 | 0.30 | 0.30 | | 3 | 0.08 | 0.30 | 0.08 | |

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| 30. What is the rate law for this reaction?   |  |  |  | | --- | --- | --- | |  | a. | Rate = *k*[A][B] | |  | b. | Rate = *k*[A]2[B] | |  | c. | Rate = *k*[A][B]2 | |  | d. | Rate = *k*[A]2[B]2 | |  | e. | Rate = *k*[B] |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-6 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 31. What is the magnitude of the rate constant for the reaction?   |  |  |  | | --- | --- | --- | |  | a. | 140 | |  | b. | 79 | |  | c. | 119 | |  | d. | 164 | |  | e. | 21 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-6 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 32. What are the units for the rate constant for this reaction?   |  |  |  | | --- | --- | --- | |  | a. | L/mol·s | |  | b. | L2/mol2·s | |  | c. | mol/L·s | |  | d. | L3/mol3·s | |  | e. | mol3/L |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-6 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 33. What is the order of this reaction?   |  |  |  | | --- | --- | --- | |  | a. | 4 | |  | b. | 3 | |  | c. | 2 | |  | d. | 1 | |  | e. | 0 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-6 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction order | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 34. Initial rate data have been determined at a certain temperature for the gaseous reaction  2NO + 2H2 → N2 + 2H2O   |  |  |  | | --- | --- | --- | | [NO]0 | [H2]0 | Initial Rate (*M*/s) | | 0.10 | 0.20 | 0.0150 | | 0.10 | 0.30 | 0.0225 | | 0.20 | 0.20 | 0.0600 |   What is the value of the rate constant?   |  |  |  | | --- | --- | --- | |  | a. | 7.5 | |  | b. | 3.0 × 10–3 | |  | c. | 380 | |  | d. | 0.75 | |  | e. | 3.0 × 10–4 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 35. The following data were obtained at 25°C:   |  |  |  |  | | --- | --- | --- | --- | | [A]0 | [B]0 | [C]0 | Rate | | 0.1 | 0.2 | 0.3 | 0.063 | | 0.3 | 0.4 | 0.2 | 0.084 | | 0.6 | 0.4 | 0.2 | 0.168 | | 0.3 | 0.4 | 0.1 | 0.021 | | 0.6 | 0.2 | 0.2 | 0.168 |   What is the correct rate law?   |  |  |  | | --- | --- | --- | |  | a. | Rate = *k*[A][B][C] | |  | b. | Rate = *k*[A][B][C]2 | |  | c. | Rate = *k*[A][C] | |  | d. | Rate = *k*[A]3[B]2[C] | |  | e. | Rate = *k*[A][C]2 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| The oxidation of Cr3+ to CrO42– can be accomplished using Ce4+ in a buffered solution. The following data were obtained:   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Relative Initial Rate | [Ce4+]0 | [Ce3+]0 | [Cr3+]0 | |  | 1 | 2.0 × 10–3 | 1.0 × 10–2 | 3.0 × 10–2 | |  | 2 | 4.0 × 10–3 | 2.0 × 10–2 | 3.0 × 10–2 | |  | 4 | 4.0 × 10–3 | 1.0 × 10–2 | 3.0 × 10–2 | |  | 16 | 8.0 × 10–3 | 2.0 × 10–2 | 6.0 × 10–2 | |

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| 36. Determine the order in the rate law of the species Ce4+.   |  |  |  | | --- | --- | --- | |  | a. | 1 | |  | b. | 2 | |  | c. | 3 | |  | d. | –1 | |  | e. | –2 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-7 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction order | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 37. Determine the order in the rate law of the species Ce3+.   |  |  |  | | --- | --- | --- | |  | a. | 1 | |  | b. | 2 | |  | c. | 3 | |  | d. | –1 | |  | e. | –2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-7 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction order | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 38. Determine the order in the rate law of the species Cr3+.   |  |  |  | | --- | --- | --- | |  | a. | 1 | |  | b. | 2 | |  | c. | 3 | |  | d. | –1 | |  | e. | –2 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-7 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction order | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 39. The rate expression for a particular reaction is rate = *k*[A][B]2. If the initial concentration of B is increased from 0.1 *M* to 0.3 *M*, the initial rate will increase by which of the following factors?   |  |  |  | | --- | --- | --- | |  | a. | 2 | |  | b. | 6 | |  | c. | 12 | |  | d. | 3 | |  | e. | 9 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction order | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 40. The following data were obtained for the reaction 2A + B → C where rate = Δ[C]/Δ*t*   |  |  |  | | --- | --- | --- | | [A](*M*) | [B](*M*) | Initial Rate  (*M*/s) | | 0.100 | 0.0500 | 2.13 × 10–4 | | 0.200 | 0.0500 | 1.70 × 10–2 | | 0.400 | 0.100 | 1.36 × 10–1 |   What is the value of the rate constant?   |  |  |  | | --- | --- | --- | |  | a. | 2.13 | |  | b. | 0.213 | |  | c. | 0.426 | |  | d. | 1.70 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/7/2017 7:49 AM | |

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| 41. The reaction 2A + 5B → products is first order in A and third order in B. What is the rate law for this reaction?   |  |  |  | | --- | --- | --- | |  | a. | rate = *k*[A]2[B]5 | |  | b. | rate = *k*[A]3[B]1 | |  | c. | rate = *k*[A]1[B]3 | |  | d. | rate = *k*[A]5[B]2 | |  | e. | rate = *k*[A]2/7[B]5/7 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction order | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 42. The reaction 3A + 4B → products is first order in A and second order in B. What is the overall order of the reaction?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 7 | |  | c. | 1 | |  | d. | 3 | |  | e. | 2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction order | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 43. The reactants A and B are mixed, and the reaction is timed until a color change occurs. The data are as follows:   |  |  |  | | --- | --- | --- | | **[A]** | **[B]** | **Time (s)** | | 0.100 | 0.140 | 25 | | 0.050 | 0.140 | 50 | | 0.100 | 0.070 | 100 |   The order of the reaction in terms of B is   |  |  |  | | --- | --- | --- | |  | a. | 2. | |  | b. | . | |  | c. | 0. | |  | d. | . | |  | e. | 1. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 44. The reaction has the following rate law:  After a period of s, the concentration of NO falls from an initial value of 2.8 × 10–3 mol/L to 2.0 × 10–3 mol/L. What is the rate constant, *k*?   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | second-order reaction | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 45. The following data were collected for the decay of HO2 radicals:   |  |  |  |  | | --- | --- | --- | --- | | **Time** | **[HO2]** | **Time** | **[HO2]** | | 0 s | 1.0 × 1011 molec/cm3 | 14 s | 1.25 × 1010 molec/cm3 | | 2 s | 5.0 × 1010 molec/cm3 | 30 s | 6.225 × 109 molec/cm3 | | 6 s | 2.5 × 1010 molec/cm3 |  |  |   Which of the following best describes the reaction?   |  |  |  | | --- | --- | --- | |  | a. | The decay of HO2 occurs by a first-order process. | |  | b. | The half-life of the reaction is 2 ms. | |  | c. | A plot of ln [HO2] versus time is linear with a slope of –*k*. | |  | d. | The rate of the reaction increases with time. | |  | e. | A plot of 1/[HO2] versus time gives a straight line. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/9/2017 1:13 AM | |

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| 46. A first-order reaction is 45% complete at the end of 43 minutes. What is the length of the half-life of this reaction?   |  |  |  | | --- | --- | --- | |  | a. | 50. min | |  | b. | 37 min | |  | c. | 2.7 h | |  | d. | 62 min | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| The following questions refer to the gas-phase decomposition of ethylene chloride.           C2H5Cl → products  Experiment shows that the decomposition is first order.  The following data show kinetics information for this reaction:   |  |  | | --- | --- | | Time (s) | ln [C2H5Cl] (*M*) | | 1.0 | –1.625 | | 2.0 | –1.735 | |

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| 47. What is the rate constant for this decomposition?   |  |  |  | | --- | --- | --- | |  | a. | 0.29/s | |  | b. | 0.35/s | |  | c. | 0.11/s | |  | d. | 0.02/s | |  | e. | 0.22/s |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-8 | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 48. What was the initial concentration of the ethylene chloride?   |  |  |  | | --- | --- | --- | |  | a. | 0.29 *M* | |  | b. | 0.35 *M* | |  | c. | 0.11 *M* | |  | d. | 0.02 *M* | |  | e. | 0.22 *M* |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-8 | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 49. What would the concentration be after 5.0 seconds?   |  |  |  | | --- | --- | --- | |  | a. | 0.13 *M* | |  | b. | 0.08 *M* | |  | c. | 0.02 *M* | |  | d. | 0.19 *M* | |  | e. | 0.12 *M* |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-8 | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 50. What is the half-life time for this reaction?   |  |  |  | | --- | --- | --- | |  | a. | 0.7 s | |  | b. | 1.3 s | |  | c. | 8.9 s | |  | d. | 6.3 s | |  | e. | 2.2 s |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-8 | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 51. For a reaction: , [A]0 = 4.3 *M*, and the first two half-lives are 56 and 28 minutes, respectively. Calculate *k* (without units).   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 52. For a reaction: , [A]0 = 6.0 *M*, and the first two half-lives are 56 and 28 minutes, respectively. Calculate [A] at *t* = 99.5 minutes.   |  |  |  | | --- | --- | --- | |  | a. | 5.3 *M* | |  | b. | 11 *M* | |  | c. | 1.02 *M* | |  | d. | 0.66 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | zero-order reaction | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 53. For which order reaction is the half-life of the reaction proportional to 1/*k* (*k* is the rate constant)?   |  |  |  | | --- | --- | --- | |  | a. | zero order | |  | b. | first order | |  | c. | second order | |  | d. | all of the above | |  | e. | none of the above |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| The kinetics of the reaction were studied and the following results obtained, where the rate law is:  For a run where [A]0 = 1.0 × 10–3 *M* and [B]0 = 5.0 *M*, a plot of ln [A] versus *t* was found to give a straight line with slope = –5.0 × 10–2 s–1. For a run where [A]0 = 1.0 × 10–3 *M* and [B]0 = 10.0 *M*, a plot of ln [A] versus *t* was found to give a straight line with slope = –7.1 × 10–2 s–1. |

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| 54. What is the value of *n*?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 0.5 | |  | c. | 1 | |  | d. | 1.5 | |  | e. | 2 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-9 | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 55. What is the value of *m*?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 0.5 | |  | c. | 1 | |  | d. | 1.5 | |  | e. | 2 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-9 | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 56. Calculate the value of *k* (ignore units).   |  |  |  | | --- | --- | --- | |  | a. | 22 | |  | b. | 10 | |  | c. | 50 | |  | d. | 1.1 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-9 | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| For the reaction , the following data were collected:   |  |  |  | | --- | --- | --- | |  | *t* (minutes) | [N2O5] (mol/L) | |  | 0 | 1.24 × 10–2 | |  | 10. | 0.92 × 10–2 | |  | 20. | 0.68 × 10–2 | |  | 30. | 0.50 × 10–2 | |  | 40. | 0.37 × 10–2 | |  | 50. | 0.28 × 10–2 | |  | 70. | 0.15 × 10–2 | |

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| 57. The order of this reaction in N2O5 is   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-10 | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 58. The concentration of O2 at *t* = 10. minutes is   |  |  |  | | --- | --- | --- | |  | a. | 2.0 × 10–4 mol/L | |  | b. | 0.32 × 10–2 mol/L | |  | c. | 0.16 × 10–2 mol/L | |  | d. | 0.64 × 10–2 mol/L | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-10 | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 59. The initial rate of production of NO2 for this reaction is approximately   |  |  |  | | --- | --- | --- | |  | a. | 7.4 × 10–4 mol/L·min | |  | b. | 3.2 × 10–4 mol/L·min | |  | c. | 1.24 × 10–2 mol/L·min | |  | d. | 1.6 × 10–4 mol/L·min | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-10 | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 60. The half-life of this reaction is approximately   |  |  |  | | --- | --- | --- | |  | a. | 15 minutes | |  | b. | 18 minutes | |  | c. | 23 minutes | |  | d. | 36 minutes | |  | e. | 45 minutes |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-10 | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 61. The concentration N2O5 at 100 minutes will be approximately   |  |  |  | | --- | --- | --- | |  | a. | 0.03 × 10–2 mol/L | |  | b. | 0.06 × 10–2 mol/L | |  | c. | 0.10 × 10–2 mol/L | |  | d. | 0.01 × 10–2 mol/L | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-10 | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| The following questions refer to the hypothetical reaction A + B → products. The kinetics data given can be analyzed to answer the questions.   |  |  |  |  | | --- | --- | --- | --- | |  | [A]0 | [B]0 | Rate of decrease | |  | (mol/L) | (mol/L) | of [A] (*M*/s) | |  | 5.0 | 5.0 | X | |  | 10.0 | 5.0 | 2X | |  | 5.0 | 10.0 | 2X | |  | Time (s) | [B] (mol/L) | | |  | 10.0 | 100 | | |  | 20.0 | 100 | | |  | 30.0 | 100 | |   ​ |

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| 62. The rate law for the reaction is Rate = *k*[A]*x*[B]*y*. What are the values of *x* and *y*?   |  |  |  | | --- | --- | --- | |  | a. | *x* = 0     *y* = 1 | |  | b. | *x* = 1     *y* = 0 | |  | c. | *x* = 1     *y* = 1 | |  | d. | *x* = 2     *y* = 1 | |  | e. | *x* = 1     *y* = 2 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-11 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 63. What form will the pseudo-rate law have?   |  |  |  | | --- | --- | --- | |  | a. | Rate = *k*'[A]*x* | |  | b. | Rate = *k*'[B]*y* | |  | c. | Rate = *k*'[A]*x*[B]*y* | |  | d. | Rate = *kk*'[A]*x* | |  | e. | Rate = *kk*'[B]*y* |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-11 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining the rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 64. Determine the magnitude of the pseudo-rate constant (*k*') if the magnitude of X in the rate data is 0.00905.   |  |  |  | | --- | --- | --- | |  | a. | 4.3 × 10–3 | |  | b. | 1.2 × 10–2 | |  | c. | 0.86 | |  | d. | 0.31 | |  | e. | 1.81 × 10–3 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-11 | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| The reaction A → B + C is known to be zero order in A with a rate constant of 5.0 × 10–2 mol/L·s at 25°C. An experiment was run at 25°C where [A]0 = 1.0 × 10–3 *M*. |

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| 65. The integrated rate law is   |  |  |  | | --- | --- | --- | |  | a. | [A] = *kt* | |  | b. | [A] – [A]0 = *kt* | |  | c. |  | |  | d. |  | |  | e. | [A]0 – [A] = *kt* |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-12 | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | zero-order reaction | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 66. What is the concentration of B after 5 × 10–3 sec?   |  |  |  | | --- | --- | --- | |  | a. | 5.0 × 10–5 *M* | |  | b. | 5.0 × 10–4 *M* | |  | c. | 7.5 × 10–4 *M* | |  | d. | 2.5 × 10–4 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-12 | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | zero-order reaction | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 67. The reaction is known to be zero order in A with a rate constant of 5.0 × 10–2 mol/L s at 25°C. An experiment was run at 25°C where [A]0 = 1.5 × 10–3 *M*. After 5.0 minutes, the rate is   |  |  |  | | --- | --- | --- | |  | a. | 5.0 × 10–2 mol/L·s | |  | b. | 2.5 × 10–2 mol/L·s | |  | c. | 1.3 × 10–2 mol/L·s | |  | d. | 1.5 × 10–3 mol/L·s | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | zero-order reaction | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 68. The reaction is known to be zero order in A with a rate constant of 5.0 × 10–2 mol/L s at 25°C. An experiment was run at 25°C where [A]0 = *M*. The half-life for the reaction is   |  |  |  | | --- | --- | --- | |  | a. | s | |  | b. | s | |  | c. | s | |  | d. | s | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 69. The reaction  exhibits the rate law  where *k* = 1.0 × 10–5 *M*–1 s–1 at 25°C. This reaction is run where the initial concentration of NOBr ([NOBr]0) is 0.30 *M*. What is one half-life for this experiment?   |  |  |  | | --- | --- | --- | |  | a. | 3.0 s | |  | b. | 1.5 × 10–5s | |  | c. | 6.9 × 10–4 s | |  | d. | 3.3 × 105s | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction mechanism | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 2/15/2017 8:04 AM | |

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| 70. The reaction  exhibits the rate law  where *k* = 1.0 × 10–5 *M*–1 ⋅ s–1 at 25°C. This reaction is run where the initial concentration of NOBr ([NOBr]0) is 1.00 × 10–1 *M*. The [NO] after 1.00 hour has passed is   |  |  |  | | --- | --- | --- | |  | a. | 3.6 × 10–4 *M* | |  | b. | 9.9 × 10–3 *M* | |  | c. | 9.7 × 10–3 *M* | |  | d. | 1.0 × 10–3 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | second-order reaction | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| For the reaction A → Products, successive half-lives are observed to be 10.0 min and 40.0 min. |

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| 71. The reaction follows the integrated rate law   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-13 | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 72. At the beginning of the reaction, [A] was 0.59 *M*. The numerical value of the rate constant is   |  |  |  | | --- | --- | --- | |  | a. | 0.069 | |  | b. | 0.17 | |  | c. | 10. | |  | d. | 0.030 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *PREFACE NAME:* | Ref 12-13 | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/9/2017 1:55 AM | |

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| 73. The reaction  is first order in N2O5. For this reaction at 45oC, the rate constant *k* = 1.0 × 10–5 s–1, where the rate law is defined as  For a particular experiment ([N2O5]0 = 1.0 × 10–3 *M*), calculate [N2O5] after 2.7 × 105 seconds.   |  |  |  | | --- | --- | --- | |  | a. | 2.7 *M* | |  | b. | 1.0 × 10–3 *M* | |  | c. | 6.7 × 10–5 *M* | |  | d. | 0 *M* | |  | e. | 9.6 *M* |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 2/16/2017 12:47 AM | |

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| Consider the reaction 3A + B + C → D + E where the rate law is defined as  .  An experiment is carried out where [B]0 = [C]0 = 1.00 *M* and [A]0 = 1.00 × 10–4 *M*. |

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| 74. After 3.00 minutes, [A] = 3.26 × 10–5 *M*. The value of *k* is   |  |  |  | | --- | --- | --- | |  | a. | 6.23 × 10–3 L3/mol3·s | |  | b. | 3.26 × 10–5 L3/mol3·s | |  | c. | 1.15 × 102 L3/mol3·s | |  | d. | 1.00 × 108 L3/mol3·s | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-14 | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 75. The half-life for this experiment is   |  |  |  | | --- | --- | --- | |  | a. | 1.11 × 102 s | |  | b. | 87.0 s | |  | c. | 6.03 × 10–3 s | |  | d. | 117 s | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-14 | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 76. The concentration of C after 10.0 minutes is   |  |  |  | | --- | --- | --- | |  | a. | 1.00 *M* | |  | b. | 1.10 × 10–5 *M* | |  | c. | 0.330 *M* | |  | d. | 0.100 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-14 | | *KEYWORDS:* | Chemistry | experimental determination of rate | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 77. The concentration of A after 10.0 minutes is   |  |  |  | | --- | --- | --- | |  | a. | 1.06 × 10–9 *M* | |  | b. | 2.38 × 10–6 *M* | |  | c. | 9.80 × 10–6 *M* | |  | d. | 1.27 × 10–5 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-14 | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 78. The reaction  is second order in A. When [A]0 = 0.100 *M*, the reaction is 20.0% complete in 38.1 minutes. Calculate the value of the rate constant (in L/min·mol).   |  |  |  | | --- | --- | --- | |  | a. | 6.56 × 10–2 | |  | b. | 5.25 × 10–4 | |  | c. | 1.48 | |  | d. | 1.05 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | second-order reaction | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 79. The reaction  is second order in A. When [A]0 = 0.100 *M*, the reaction is 20.0% complete in 48.2 minutes. Calculate the half-life for the reaction.   |  |  |  | | --- | --- | --- | |  | a. | 1.93 × 102 min | |  | b. | 12.1 min | |  | c. | 2.41 × 104 min | |  | d. | 8.57 min | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 80. A first-order reaction is 40.0% complete at the end of 39.1 minutes. What is the value of the rate constant (in min–1)?   |  |  |  | | --- | --- | --- | |  | a. | 2.34 × 10–2 | |  | b. | 1.31 × 10–2 | |  | c. | 76.5 | |  | d. | 42.7 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 81. The OH· radical disproportionates according to the elementary chemical reaction This reaction is second order in OH·. The rate constant for the reaction is 2.0 × 10–12 cm3/molecules at room temperature. If the initial OH concentration is 1.7 × 1013 molecules/cm3, what is the first half-life for the reaction?   |  |  |  | | --- | --- | --- | |  | a. | 3.5 × 1011 s | |  | b. | 3.4 × 101 s | |  | c. | 2.9 × 10–2 s | |  | d. | 5.9 × 10–14 s | |  | e. | 1.5 × 10–2 s |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 82. At a particular temperature, N2O5 decomposes according to a first-order rate law with a half-life of 3.0 s. If the initial concentration of N2O5 is 1.0 × 1016 molecules/cm3, what will be the concentration in molecules/cm3 after 11.5 s?   |  |  |  | | --- | --- | --- | |  | a. | 7.0 × 1014 | |  | b. | 3.4 × 101 | |  | c. | 1.0 × 1016 | |  | d. | 2.0 × 1014 | |  | e. | 2.3 × 10–1 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 83. At a given temperature, a first-order reaction has a rate constant of 2.8 × 10–3 s–1. The time required for the reaction to be 27% completed is   |  |  |  | | --- | --- | --- | |  | a. | 7.7 min | |  | b. | 0.81 min | |  | c. | 25 min | |  | d. | 1.8 min | |  | e. | 19 min |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 84. A chemical reaction that is first order in *X* is observed to have a rate constant of 2.1 × 10–2s–1. If the initial concentration of *X* is 1.0 *M*, what is the concentration of *X* after 195 s?   |  |  |  | | --- | --- | --- | |  | a. | 60 *M* | |  | b. | 0.59 *M* | |  | c. | 0.19 *M* | |  | d. | 0.98 *M* | |  | e. | 0.016 *M* |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 85. A particular first-order reaction has a rate constant of 0.0136 s–1. What is the half-life for this reaction?   |  |  |  | | --- | --- | --- | |  | a. | 1.77 s | |  | b. | 50.7 s | |  | c. | 73.1 s | |  | d. | 0.0197 s | |  | e. | 0.0136 s |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 86. The reaction A → products is first order. If the initial concentration of A is 0.646*M* and, after 72.8 seconds have elapsed, the concentration of A has fallen to 0.0146*M*, what is the rate constant of the reaction?   |  |  |  | | --- | --- | --- | |  | a. | 0.05216 s–1 | |  | b. | 0.00952 s–1 | |  | c. | 0.00867 s–1 | |  | d. | 0.919 s–1 | |  | e. | 0.0137 s–1 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 87. The reaction A → products is second order. If the initial concentration of A is 0.402*M* and, after 86.4 seconds have elapsed, the concentration of A has fallen to 0.0426*M*, what is the rate constant of the reaction?   |  |  |  | | --- | --- | --- | |  | a. | 0.0259 *M*–1 s–1 | |  | b. | 0.242 *M*–1 s–1 | |  | c. | 0.00802 *M*–1 s–1 | |  | d. | 0.00415 *M*–1 s–1 | |  | e. | 0.0115 *M*–1 s–1 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | second-order reaction | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 88. The radioactive nuclide undergoes first-order decay with a half-life of 6.76 min. If a quantity of  is produced, what fraction remains after 83.9 seconds?   |  |  |  | | --- | --- | --- | |  | a. | 0.0805 | |  | b. | 0.000183 | |  | c. | 0.206 | |  | d. | 0.866 | |  | e. | 0.133 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 2/16/2017 1:46 AM | |

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| 89. 63Ni decays by a first-order process via the emission of a beta particle. The 63Ni isotope has a half-life of 100. years. How long will it take for 85% of the nickel to undergo decay?   |  |  |  | | --- | --- | --- | |  | a. | 23 years | |  | b. | 1.3 years | |  | c. | 110 years | |  | d. | 10 years | |  | e. | 270 years |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| Two isomers (A and B) of a given compound dimerize as follows:   Both processes are known to be second order in reactant, and *k*1 is known to be 0.25 L/mol·s at 25°C, where  In a particular experiment, A and B were placed in separate containers at 25°, where [A]0 = 1.0 × 10–2 *M* and [B]0 = 2.5 × 10–2 *M*. It was found that [A] = 3[B] after the reactions progressed for 3.0 minutes. |

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| 90. Calculate the concentration of A2 after 3.0 minutes.   |  |  |  | | --- | --- | --- | |  | a. | 2.8 × 10–22 *M* | |  | b. | 6.9 × 10–3 *M* | |  | c. | 3.1 × 10–3 *M* | |  | d. | 1.6 × 10–3 *M* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-15 | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | second-order reaction | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 91. Calculate the value of where     |  |  |  | | --- | --- | --- | |  | a. | 2.2 L/mol·s | |  | b. | 0.75 L/mol·s | |  | c. | 1.9 L/mol·s | |  | d. | 0.21 L/mol·s | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-15 | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | second-order reaction | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 92. Two isomers (A and B) of a given compound dimerize as follows:  Both processes are known to be second order in reactant, and *k*1 is known to be 0.28 L/mol s at 25°C, where:  In a particular experiment, A and B were placed in separate containers at 25oC, where [A]0 = 1.0 × 10–2 *M* and [B]0 = 2.5 × 10–2 *M*. It was found that [A] = 3[B] after the reactions progressed for 3.0 minutes. Calculate the half-life for the reaction involving A.   |  |  |  | | --- | --- | --- | |  | a. | s | |  | b. | s | |  | c. | s | |  | d. | s | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 2/16/2017 3:15 AM | |

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| 93. The decomposition of N2O5(*g*) to NO2(*g*) and O2(*g*) obeys first-order kinetics. Assuming the form of the rate law is:  where *k* = 3.4 × 10–5 s–1 at 25°C, what is the initial rate of reaction at 25°C where [N2O5]0 = 4.1 × 10–2 *M*?   |  |  |  | | --- | --- | --- | |  | a. | mol/L·s | |  | b. | mol/L·s | |  | c. | mol/L·s | |  | d. | mol/L·s | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 94. The decomposition of N2O5(*g*) to NO2(*g*) and O2(*g*) obeys first-order kinetics. Assuming the form of the rate law is:  where *k* = 4.6 × 10–5 s–1 at 25°C, what is the half-life for the reaction described?   |  |  |  | | --- | --- | --- | |  | a. | s | |  | b. | s | |  | c. | s | |  | d. | s | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 95. Consider a reaction of the type aA → Products in which the rate law is found to be rate = k[A]3 (yes, a termolecular reaction is improbable but possible). If the first half-life of the reaction is found to be 40 seconds, what is the time for the second half-life?   |  |  |  | | --- | --- | --- | |  | a. | 10 seconds | |  | b. | 20 seconds | |  | c. | 80 seconds | |  | d. | 160 seconds | |  | e. | 320 seconds |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 96. The reaction obeys the rate law:  at 500. K.  If the initial concentration of NO2 is 1.00 *M*, how long will it take for the [NO2] to decrease to 32.8% of its initial value?   |  |  |  | | --- | --- | --- | |  | a. | 48.0 s | |  | b. | 80 s | |  | c. | 146 s | |  | d. | s | |  | e. | cannot be determined from this data |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | second-order reaction | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 2/16/2017 7:59 AM | |

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| 97. If the reaction 2HI → H2 + I2 is second order, which of the following will yield a linear plot?   |  |  |  | | --- | --- | --- | |  | a. | log [HI] vs time | |  | b. | 1/[HI] vs time | |  | c. | [HI] vs time | |  | d. | ln [HI] vs time | |  | e. | None of these. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 98. The reaction 3NO → N2O + NO2 is found to obey the rate law, Rate = *k*[NO]2. If the first half-life of the reaction is found to be 2.0 s, what is the length of the fourth half-life?   |  |  |  | | --- | --- | --- | |  | a. | 2.0 s | |  | b. | 4.0 s | |  | c. | 8.0 s | |  | d. | 12.0 s | |  | e. | 16.0 s |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 99. In 6 *M* HCl, the complex ion Ru(NH3)63+ decomposes to a variety of products. The reaction is first order in Ru(NH3)63+ and has a half-life of 14 hours at 25°C. Under these conditions, how long will it take for the [Ru(NH3)63+] to decrease to 23.7% of its initial value?   |  |  |  | | --- | --- | --- | |  | a. | 5.5 hours | |  | b. | 9.7 hours | |  | c. | 3.3 hours | |  | d. | 14 hours | |  | e. | 29 hours |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 100. The elementary chemical reaction O + ClO → Cl + O2 is made pseudo-first order in oxygen atoms by using a large excess of ClO radicals. The rate constant for the reaction is 3.8 cm3/molecule⋅s. If the initial concentration of ClO is 1.0 × 1011 molecules/cm3, how long will it take for the oxygen atoms to decrease to 10.% of their initial concentration?   |  |  |  | | --- | --- | --- | |  | a. | 1.7 s | |  | b. | 0.028 s | |  | c. | 0.18 s | |  | d. | 0.61 s | |  | e. | 1.8 s |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 101. Determine the molecularity of the following elementary reaction: O3 → O2 + O.   |  |  |  | | --- | --- | --- | |  | a. | unimolecular | |  | b. | bimolecular | |  | c. | termolecular | |  | d. | quadmolecular | |  | e. | molecularity cannot be determined |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | elementary reaction | general chemistry | molecularity | rates of reaction | reaction mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 102. The decomposition of ozone may occur through the two-step mechanism shown:  The oxygen atom is considered to be a(n)   |  |  |  | | --- | --- | --- | |  | a. | reactant | |  | b. | product | |  | c. | catalyst | |  | d. | reaction intermediate | |  | e. | activated complex |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | elementary reaction | general chemistry | rates of reaction | reaction mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 103. The rate law for a reaction is found to be Rate = *k*[A]2[B]. Which of the following mechanisms gives this rate law?   |  |  | | --- | --- | | I. | A + BE (fast) | |  | E + B → C + D (slow) | | II. | A + BE (fast) | |  | E + A → C + D (slow) | | III. | A + A → E (slow). | |  | E + B → C + D (fast) |  |  |  |  | | --- | --- | --- | |  | a. | I | |  | b. | II | |  | c. | III | |  | d. | two of these | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction mechanism | the rate law and the mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 104. The experimental rate law for the decomposition of nitrous oxide (N2O) to N2 and O2 is Rate = *k*[N2O]2. Two mechanisms are proposed:   |  |  | | --- | --- | | I. | N2O → N2 + O | |  | N2O + O → N2 + O2 | | II. | 2N2O N4O2 | |  | N4O2 → 2N2 + O2 |   Which of the following could be a correct mechanism?   |  |  |  | | --- | --- | --- | |  | a. | Mechanism I, with the first step as the rate-determining step. | |  | b. | Mechanism I, with the second step as the rate-determining step as long as the first step is a fast equilibrium step. | |  | c. | Mechanism II, with the second step as the rate-determining step if the first step is a fast equilibrium step. | |  | d. | None of the choices (A-C) could be correct. | |  | e. | At least two of the above choices (A-C) could be correct. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction mechanism | the rate law and the mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 105. Consider the reaction 2O3(*g*) → 3O2(*g*). The following mechanism is proposed:                      O3 O2 + O                     O3 + O → 2O2  If we assume the second step of the mechanism is the rate determining step and the first step is a fast equilibrium step, which of the following rate laws is predicted by this mechanism?   |  |  |  | | --- | --- | --- | |  | a. | rate = k[O3] | |  | b. | rate = k[O3]2[O2] | |  | c. | rate = k[O3]2[O2]–1 | |  | d. | rate = k[O3]2 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction mechanism | the rate law and the mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 106. Of what use is it to find a rate law for a reaction?   |  |  |  | | --- | --- | --- | |  | a. | We can use the rate law to directly determine coefficients in the balanced equation. | |  | b. | From the rate law we can evaluate potential reaction mechanisms. | |  | c. | The rate law gives us a good indication of the thermodynamic stability of the products. | |  | d. | The rate law can lead us to determine the equilibrium constant for the reaction. | |  | e. | None of these. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction mechanism | the rate law and the mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| The following questions refer to the reaction 2A2 + B2 → 2C. The following mechanism has been proposed:   |  |  |  |  | | --- | --- | --- | --- | |  | step 1 (very slow) |  | A2 + B2 → R + C | |  | step 2 (slow) |  | A2 + R → C | |

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| 107. What is the molecularity of step 2?   |  |  |  | | --- | --- | --- | |  | a. | unimolecular | |  | b. | bimolecular | |  | c. | termolecular | |  | d. | quadmolecular | |  | e. | molecularity cannot be determined |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-16 | | *KEYWORDS:* | Chemistry | elementary reaction | general chemistry | molecularity | rates of reaction | reaction mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 108. Which step is rate determining?   |  |  |  | | --- | --- | --- | |  | a. | both steps | |  | b. | step 1 | |  | c. | step 2 | |  | d. | a step that is intermediate to step 1 and step 2 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-16 | | *KEYWORDS:* | Chemistry | general chemistry | rate determining step | rates of reaction | reaction mechanism | the rate law and the mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 109. According to collision theory, the activated complex that forms in step 1 could have which of the following structures? (The dotted lines represent partial bonds.)   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-16 | | *KEYWORDS:* | activated complex | Chemistry | collision theory | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 110. According to the proposed mechanism, what should the overall rate law be?   |  |  |  | | --- | --- | --- | |  | a. | rate = *k*[A2]2 | |  | b. | rate = *k*[A2] | |  | c. | rate = *k*[A2][B2] | |  | d. | rate = *k*[A2][R] | |  | e. | rate = *k*[R]2 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-16 | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction mechanism | the rate law and the mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| Under certain conditions the reaction H2O2 + 3I– + 2H+ → I3– + 2H2O occurs by the following series of steps:   |  |  |  |  | | --- | --- | --- | --- | |  | | k1 | | |  | Step 1. |  | H2O2 + H+ H3O2+ | |  | | k–1 | |      |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Step 2. |  | H3O2+ + I– → H2O + HOI | (slow, rate constant *k*2) | |  | Step 3. |  | HOI + I– → OH– + I2 | (fast, rate constant *k*3) | |  | Step 4. |  | OH– + H+ → H2O | (fast, rate constant *k*4) | |  | Step 5. |  | I2 + I– → I3– | (fast, rate constant *k*5) | |

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| 111. Which of the steps would be called the rate-determining step?   |  |  |  | | --- | --- | --- | |  | a. | 1 | |  | b. | 2 | |  | c. | 3 | |  | d. | 4 | |  | e. | 5 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-17 | | *KEYWORDS:* | Chemistry | general chemistry | rate determining step | rates of reaction | reaction mechanism | the rate law and the mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 112. The rate constant *k* for the reaction would be given by   |  |  |  | | --- | --- | --- | |  | a. | *k* = *k*2 | |  | b. | *k* = *k*2*k*3 | |  | c. | *k* = *k*2*K* | |  | d. | *k* = *k*5 | |  | e. | *k* = *Kk*2*k*3*k*4*k*5 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-17 | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction mechanism | the rate law and the mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 113. The rate law for the reaction would be:   |  |  |  | | --- | --- | --- | |  | a. | Δ[I3]/Δ*t* = *k*[H2O2] | |  | b. | Δ[I3]/Δ*t* = *k*[H2O2][H+][I–] | |  | c. | Δ[I3]/Δ*t* = *k*[H2O2][H+] | |  | d. | Δ[I3]/Δ*t* = *k*[H2O2][I–] | |  | e. | Δ[I3]/Δ*t* = *k*[H2O2][H+]2[I–]–3 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-17 | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction mechanism | the rate law and the mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 114. The reaction:   |  |  | | --- | --- | |  | 2A + B → C | | has the following proposed mechanism: | | |  | Step 1:    A + BD (fast equilibrium) | |  | Step 2:    D + B → E | |  | Step 3:    E + A → C + B |   If step 2 is the rate-determining step, then the rate of formation of C should equal:   |  |  |  | | --- | --- | --- | |  | a. | *k*[A] | |  | b. | *k*[A]2[B] | |  | c. | *k*[A]2[B]2 | |  | d. | *k*[A][B] | |  | e. | *k*[A][B]2 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | rate determining step | rates of reaction | reaction mechanism | the rate law and the mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 115. The reaction 2NO + O2 → 2NO2 obeys the rate law  – = *k*obsd[NO]2[O2]. Which of the following mechanisms is consistent with the experimental rate law?   |  |  |  | | --- | --- | --- | |  | a. | NO + NO → N2O2        (slow) N2O2 + O2 → 2NO2      (fast) | |  | b. | NO + O2NO3     (fast equilibrium) NO3 + NO → 2NO2   (slow) | |  | c. | 2NON2O2           (fast equilibrium) N2O2 → NO2 + O         (slow) NO + O → NO2            (fast) | |  | d. | O2 + O2 → O2 + O2       (slow) O2 + NO → NO2 + O    (fast) O + NO → NO2             (fast) | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction mechanism | the rate law and the mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 116. The rate constant *k* is dependent on   |  |  | | --- | --- | | I. | the concentration of the reactant | | II. | the nature of the reactants | | III. | the temperature | | IV. | the order of the reaction |  |  |  |  | | --- | --- | --- | |  | a. | none of these | |  | b. | one of these | |  | c. | two of these | |  | d. | three of these | |  | e. | all of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | collision theory | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| The questions below refer to the following diagram: |

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| 117. Why is this reaction considered to be exothermic?   |  |  |  | | --- | --- | --- | |  | a. | Because energy difference B is greater than energy difference C. | |  | b. | Because energy difference B is greater than energy difference A. | |  | c. | Because energy difference A is greater than energy difference C. | |  | d. | Because energy difference B is greater than energy difference C plus energy difference A. | |  | e. | Because energy difference A and energy difference C are about equal. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-18 | | *KEYWORDS:* | Chemistry | collision theory | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 118. At what point on the graph is the activated complex present?   |  |  |  | | --- | --- | --- | |  | a. | point W | |  | b. | point X | |  | c. | point Y | |  | d. | point Z | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-18 | | *KEYWORDS:* | activated complex | Chemistry | collision theory | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 119. If the reaction were reversible, would the forward or the reverse reaction have a higher activation energy?   |  |  |  | | --- | --- | --- | |  | a. | The diagram shows no indication of any activation energy. | |  | b. | The forward and reverse activation energies are equal. | |  | c. | The forward activation energy would be greater. | |  | d. | The reverse activation energy would be greater. | |  | e. | None of these. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-18 | | *KEYWORDS:* | activation energy | Chemistry | collision theory | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 120. What would happen if the kinetic energy of the reactants was not enough to provide the needed activation energy?   |  |  |  | | --- | --- | --- | |  | a. | The products would be produced at a lower energy state. | |  | b. | The rate of the reaction would tend to increase. | |  | c. | The activated complex would convert into products. | |  | d. | The reactants would continue to exist in their present form. | |  | e. | The products would form at an unstable energy state. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | activation energy | Chemistry | collision theory | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 121. The rate constant for a reaction at 40.0°C is exactly 3 times that at 20.0°C. Calculate the Arrhenius energy of activation for the reaction.   |  |  |  | | --- | --- | --- | |  | a. | 9.13 kJ/mol | |  | b. | 5.03 kJ/mol | |  | c. | 41.8 kJ/mol | |  | d. | 3.89 kJ/mol | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Arrhenius equation | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| Use the potential energy diagram shown to answer the following: |

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| 122. Which letter shows the activation energy (without use of a catalyst)?   |  |  |  | | --- | --- | --- | |  | a. | a | |  | b. | b | |  | c. | c | |  | d. | d | |  | e. | e |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-19 | | *KEYWORDS:* | activation energy | Chemistry | collision theory | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 123. Which letter shows the change in energy for the overall reaction?   |  |  |  | | --- | --- | --- | |  | a. | a | |  | b. | b | |  | c. | c | |  | d. | d | |  | e. | e |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-19 | | *KEYWORDS:* | Chemistry | collision theory | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 124. Which letter shows the activation energy using a catalyst?   |  |  |  | | --- | --- | --- | |  | a. | a | |  | b. | b | |  | c. | c | |  | d. | d | |  | e. | e |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.7 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-19 | | *KEYWORDS:* | activation energy | Chemistry | collision theory | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| The questions below refer to the following information: The rate constant *k* for the reaction shown below is 2.6 × 10–8 L/mol ⋅ s when the reaction proceeds at 300.0 K. The activation energy is 98000 J/mol. (The universal gas constant, *R*, is 8.314 J/mol·K)   |  |  | | --- | --- | |  | 2NOCl → 2NO + Cl2 | |

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| 125. Determine the magnitude of the frequency factor for the reaction.   |  |  |  | | --- | --- | --- | |  | a. | 1.2 × 108 | |  | b. | 4.6 × 109 | |  | c. | 3.0 × 109 | |  | d. | 2.7 × 108 | |  | e. | 9.1 × 109 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-20 | | *KEYWORDS:* | Arrhenius equation | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 126. If the temperature changed to 310 K, the rate constant *k* would change. The ratio of *k* at 310 K to *k* at 300.0 K is closest to what whole number?   |  |  |  | | --- | --- | --- | |  | a. | 1 | |  | b. | 2 | |  | c. | 3 | |  | d. | 4 | |  | e. | 5 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-20 | | *KEYWORDS:* | Arrhenius equation | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 127. Use the following information to determine the activation energy for the reaction shown here:   |  |  | | --- | --- | | **Temperature (K)** | **Rate Constant (L/mol·s)** | | 1400 | 0.143 | | 1500 | 0.693 |  |  |  |  | | --- | --- | --- | |  | a. | J/mol | |  | b. | J/mol | |  | c. | J/mol | |  | d. | J/mol | |  | e. | J/mol |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Arrhenius equation | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 128. When ethyl chloride, CH3CH2Cl, is dissolved in 1.0 *M* NaOH, it is converted into ethanol, CH3CH2OH, by the reaction:  At 25°C the reaction is first order in CH3CH2Cl, and the rate constant is 3.2 × 10–3 s–1. If the activation parameters are A = 3.4 × 1014 s–1 and *E*a = 100.0 kJ/mol, what will the rate constant be at 40.°C?   |  |  |  | | --- | --- | --- | |  | a. | s–1 | |  | b. | s–1 | |  | c. | s–1 | |  | d. | s–1 | |  | e. | s–1 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Arrhenius equation | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 129. Which of the following statements best describes the condition(s) needed for a successful formation of a product according to the collision model?   |  |  |  | | --- | --- | --- | |  | a. | The collision must involve a sufficient amount of energy, provided from the motion of the particles, to overcome the activation energy. | |  | b. | The relative orientation of the particles has little or no effect on the formation of the product. | |  | c. | The relative orientation of the particles has an effect only if the kinetic energy of the particles is below some minimum value. | |  | d. | The relative orientation of the particles must allow for formation of the new bonds in the product. | |  | e. | The energy of the incoming particles must be above a certain minimum value, and the relative orientation of the particles must allow for formation of new bonds in the product. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | collision theory | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 130. The rate constant for a reaction is 1.6 × 10–2 s–1 at 684 K and 4.3 × 10–2s–1 at 854 K. What is the activation energy?   |  |  |  | | --- | --- | --- | |  | a. | 12 kJ/mol | |  | b. | 28 kJ/mol | |  | c. | 560 kJ/mol | |  | d. | 3300 kJ/mol | |  | e. | This can't be solved without knowing the frequency factor. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Arrhenius equation | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 131. For the second-order reaction NO(*g*) + O3(*g*) → NO2(*g*) + O2(*g*), the rate constant has been measured to be 1.08 × 107 *M*–1 s–1 at 298 K and the activation energy has been measured to be 11.4 kJ/mol over the temperature range 195 K to 304 K. What is the rate constant at 207 K? (*R* = 8.3145 J K–1 mol–1)   |  |  |  | | --- | --- | --- | |  | a. | *M*–1 s–1 | |  | b. | *M*–1 s–1 | |  | c. | *M*–1 s–1 | |  | d. | *M*–1 s–1 | |  | e. | *M*–1 s–1 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Arrhenius equation | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:27 PM | | *DATE MODIFIED:* | 3/4/2016 4:27 PM | |

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| 132. The reaction 2H2O2 → 2H2O + O2 has the following mechanism:   |  |  | | --- | --- | | H2O2 + I– → H2O + IO– |  | | H2O2 + IO– → H2O + O2 + I– |  |   The catalyst in the reaction is:   |  |  |  | | --- | --- | --- | |  | a. | H2O | |  | b. | I– | |  | c. | H2O2 | |  | d. | IO– | |  | e. | There is no catalyst in this reaction. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.7 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | catalysis | Chemistry | general chemistry | rates of reaction | reaction mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 133. Which of the following statements is typically true for a catalyst?   |  |  | | --- | --- | | I. | The concentration of the catalyst will go down as a reaction proceeds. | | II. | The catalyst provides a new pathway in the reaction mechanism. | | III. | The catalyst speeds up the reaction. |  |  |  |  | | --- | --- | --- | |  | a. | I only | |  | b. | II only | |  | c. | III only | |  | d. | I and III | |  | e. | II and III |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.7 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | catalysis | Chemistry | general chemistry | rates of reaction | reaction mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 2/17/2017 4:19 AM | |

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| 134. The catalyzed pathway in a reaction mechanism has a \_\_\_\_\_\_\_\_\_\_ activation energy and thus causes a \_\_\_\_\_\_\_\_\_\_ reaction rate.   |  |  |  | | --- | --- | --- | |  | a. | higher, lower | |  | b. | higher, higher | |  | c. | lower, higher | |  | d. | lower, steady | |  | e. | higher, steady |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.7 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | catalysis | Chemistry | general chemistry | rates of reaction | reaction mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 135. Which of the following statements about enzymes is incorrect?   |  |  |  | | --- | --- | --- | |  | a. | They are proteins that catalyze specific biologic reactions. | |  | b. | Several hundred are now known. | |  | c. | The molecules they react with are called substrates. | |  | d. | They are equal to inorganic catalysts in efficiency. | |  | e. | All of these are correct. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.7 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | catalysis | Chemistry | enzyme catalysis | general chemistry | rates of reaction | reaction mechanism | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 136. Determine (a) the rate equation and (b) the rate constant for the hypothetical reaction A + B → C given the following initial concentrations and initial rate data.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  | [A]0 | [B]0 | Initial Rate | |  | Run # | (mol/L) | (mol/L) | (mol/L·s) | |  | (1) | 0.100 | 0.100 | 0.18 | |  | (2) | 0.100 | 0.200 | 0.36 | |  | (3) | 0.200 | 0.200 | 1.44 |  |  |  | | --- | --- | | *ANSWER:* | a)  rate = *k*[A]2[B]     (b) 1.8 × 102 L2/mol2s  a)  Use method of initial rates to solve for exponents:         4 = [2]*n*; *n* = 2         2 = [2]*m*; *m* = 1      Therefore the rate law is: rate = *k*[A]2[B]  b)  To solve for k, use any set of experimental conditions in the rate law:      0.18 mol/L·s = *k*(0.100 mol/L)2(0.100 mol/L) *k* = 0.18 mol/L·s / (0.100)3 mol3/L3;  *k* = 1.8 × 102 L2/mol2s | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| A reaction represented by the equation was studied at a specific temperature and the following data were collected:                   3O2 (*g)* → 2O3 (*g*)   |  |  | | --- | --- | | Time (seconds) | Total pressure (atm) | | 0 | 1.000 | | 46.89 | 0.9500 | | 98.82 | 0.9033 | | 137.9 | 0.8733 | | 200.0 | 0.8333 | | 286.9 | 0.7900 | | 337.9 | 0.7700 | | 511.3 | 0.7233 | |

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| 137. What is the rate law for this reaction?   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *ANSWER:* | rate = *k*[O2]  Data given represents "total pressure," so it must be adjusted to consider only .                     3O2 → 2O3 Before        1.000          0 Change       -3*x*           +2*x* After        1.000 – 3*x*       2*x*  Total P = 1.000 – 3*x* + 2*x* = 1.000 – *x*  At *t*=46.89, P = 1.000 – *x* = 0.9500; *x* = 0.0500 Thus, PO2 = 1.000 – 3(0.0500) = 0.0850  The corrected table is:   |  |  | | --- | --- | | Time (seconds) | Total pressure (atm) | | 0 | 1.000 | | 46.89 | 0.850 | | 98.82 | 0.710 | | 137.9 | 0.620 | | 200.0 | 0.500 | | 286.9 | 0.370 | | 337.9 | 0.310 | | 511.3 | 0.170 |   This data will give a straight-line plot for versus time, indicating the reaction is first-order in O2. | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-21 | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 138. What is the value of the rate constant?   |  |  | | --- | --- | | *ANSWER:* | *k* = 3.47 x 10–3 sec–1 This is the slope of the straight line resulting from graph of versus time (see answer to previous problem). | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-21 | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 139. How many seconds would it take for the total pressure to be 0.7133 atm?   |  |  | | --- | --- | | *ANSWER:* | 567 s  Total pressure of 0.7133 atm must be corrected to reflect only (see answer to #123). 1.000-x = 0.7133; x = 0.287 1.000-3(0.287) = 0.140 atm (*k* = 0.00347 sec–1 from previous problem) ln(0.140) = –0.00347*t* + ln(1.000);  t = 567 s | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-21 | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| For the reaction aA → Products, use the following choices  a)  zero order in A b)  first order in A c)  second order in A d)  a, b, c e)  none of the above |

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| 140. The half-life is constant.   |  |  | | --- | --- | | *ANSWER:* | b  For a first-order reaction, the half-life is not dependent on concentration, but it is for zero-order and second-order reactions. See Sec 12.4, Zumdahl *Chemistry*. | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-22 | | *KEYWORDS:* | Chemistry | general chemistry | half-life of a reaction | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 141. A plot of [A] vs. *t* is a straight line.   |  |  | | --- | --- | | *ANSWER:* | a  The integrated rate law for a zero-order reaction is: [A] = -*kt* + [A]0 See Sec 12.4, Zumdahl *Chemistry*. | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-22 | | *KEYWORDS:* | Chemistry | general chemistry | graphing of kinetic data | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 142. [A] is constant.   |  |  | | --- | --- | | *ANSWER:* | e  [A] is the amount of reactant at any time during the reaction. If [A] is constant then there is no reaction occurring. See Sec. 12.4, Zumdahl *Chemistry*. | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-22 | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 143. The rate is constant over time.   |  |  | | --- | --- | | *ANSWER:* | a  For a zero-order reaction, the rate law only depends on *k*, and not at all on the amount of reactant present, so it is constant. See Sec. 12.4, Zumdahl *Chemistry*. | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 12-22 | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 144. Consider the reaction, 3 A + 5 B 4 C + 7 D.  If C is being produced at a rate of  4.46 mol/L s, at what rate is [A] decreasing?   |  |  |  | | --- | --- | --- | |  | a. | 3.35 mol/L s | |  | b. | 5.95 mol/L s | |  | c. | 22.2 mol/L s | |  | d. | –3.35 mol/L s | |  | e. | 4.46 mol/L s |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 145. Consider the reaction, 3 A + 5 B → 4 C + 7 D.  If C is being produced at a rate of  2.02 mol/L s, at what rate is [D] increasing?   |  |  |  | | --- | --- | --- | |  | a. | 3.54 mol/L s | |  | b. | 1.15 mol/L s | |  | c. | 2.4 mol/L s | |  | d. | –3.54 mol/L s | |  | e. | 2.02 mol/L s |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 146. The rate law of a particular reaction is found to be, rate = k[A]2[B].  Which of the following statements is FALSE?   |  |  |  | | --- | --- | --- | |  | a. | The reaction is third order overall. | |  | b. | The units of k could be (L2/mol2 s) | |  | c. | Tripling the concentration of A will result in a nine-fold increase in the rate. | |  | d. | The actual value of k will depend on the temperature | |  | e. | The actual value of k will depend on the concentrations of A and B. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rate law | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 147. The following data were obtained for the reaction, C + D + E → products.  Determine the rate law.  ​  Initial [C] mol/L   Initial [D] mol/L    Initial [E] mol/L     Initial rate (mol/Ls)  ​   0.15                          0.22                       0.34                       5.11 x 10-3   0.30                          0.22                       0.34                       1.02 x 10-2   0.45                          0.33                       0.34                       2.30 x 10-2   0.30                          0.22                       0.68                       1.03 x 10-2   |  |  |  | | --- | --- | --- | |  | a. | rate = k[C][D][E] | |  | b. | rate = k[C]2[D] | |  | c. | rate = k[C][D] | |  | d. | rate = k[C][E] | |  | e. | rate = k[E][D] |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 2/17/2017 5:38 AM | |

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| 148. The following data were obtained for the reaction, C + D + E → products.  Determine the value of k (do not include units)  ​  Initial [C] mol/L       Initial [D] mol/L      Initial [E] mol/L    Initial rate (mol/Ls)  ​   0.15                             0.22                         0.34                      5.11 x 10-3   0.30                             0.22                         0.34                      1.02 x 10-2   0.45                             0.33                         0.34                      2.30 x 10-2   0.30                             0.22                         0.68                      1.03 x 10-2   |  |  |  | | --- | --- | --- | |  | a. | 0.46 | |  | b. | 0.23 | |  | c. | 0.15 | |  | d. | 0.10 | |  | e. | 0.068 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 2/17/2017 5:46 AM | |

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| 149. The following data were obtained for the reaction, C + D + E → products.  Determine the units of k.  ​  Initial [C] mol/L       Initial [D] mol/L   Initial [E] mol/L   Initial rate (mol/Ls)  ​   0.15                            0.22                      0.34                      5.11 x 10-3   0.30                            0.22                      0.34                      1.02 x 10-2   0.45                            0.33                      0.34                      2.30 x 10-2   0.30                            0.22                      0.68                      1.03 x 10-2   |  |  |  | | --- | --- | --- | |  | a. | mol/L | |  | b. | mol/L·s | |  | c. | 1/s | |  | d. | L/mol·s | |  | e. | L2/mol2·s |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 2/17/2017 5:54 AM | |

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| 150. Determine the rate law for the reaction: C2H4Br2 + 3KI → C2H4 + 2KBr +KI3, given the initial rate data below?  [C2H4Br2], M       [KI], M         Δ[KI3]/Δt (M min-1)      0.500                  1.80               0.269      0.500                  7.20               1.08      1.50                    1.80               0.807   |  |  |  | | --- | --- | --- | |  | a. | rate = k[KI] | |  | b. | rate = k[C2H4Br2] | |  | c. | rate = k[KI]2 | |  | d. | rate = k[KI][C2H4Br2] | |  | e. | rate = k[KI][C2H4Br2]2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 2/17/2017 7:17 AM | |

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| 151. Determine the value of k (without units) for the reaction: C2H4Br2 + 3KI → C2H4 + 2KBr +KI3, given the initial rate data below?  [C2H4Br2], M     [KI], M      Δ[KI3]/Δt (M min-1)      0.500               1.80                 0.269      0.500               7.20                 1.08      1.50                 1.80                 0.807   |  |  |  | | --- | --- | --- | |  | a. | 0.149 | |  | b. | 0.538 | |  | c. | 0.0830 | |  | d. | 0.299 | |  | e. | 0.598 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 2/17/2017 7:50 AM | |

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| 152. Determine the units of k for the reaction: C2H4Br2 + 3KI → C2H4 + 2KBr +KI3, given the initial rate data below?  [C2H4Br2], M      [KI], M       Δ[KI3]/Δt (M s-1)      0.500                 1.80                0.269      0.500                 7.20                1.08      1.50                   1.80                0.807   |  |  |  | | --- | --- | --- | |  | a. | mol/L | |  | b. | mol/L·s | |  | c. | 1/s | |  | d. | L/mol·s | |  | e. | L2/mol2·s |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | determining rate law | general chemistry | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 2/17/2017 7:52 AM | |

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| 153. Which statement is true about the reaction 2A→ B + C which is first order in A and first order overall?   |  |  |  | | --- | --- | --- | |  | a. | The rate of the reaction will decrease at higher concentrations of B and C. | |  | b. | The time required for one half of A to react is directly proportional to the quantity of A. | |  | c. | The rate of formation of C is twice the rate of reaction of A. | |  | d. | The rate of formation of B is the same as the rate of reaction of A. | |  | e. | The concentration of A will decrease exponentially. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 12.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | dependence of rate on concentration | general chemistry | rate law | rates of reaction | reaction rate | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |

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| 154. The first-order decomposition of H2O2 at -30 °C occurs with a half-life of 42.0 seconds.  What will be the residual concentration of 10.2 mol/L H2O2 after 3 minutes?   |  |  |  | | --- | --- | --- | |  | a. | 0.326 mol/L | |  | b. | 0.523 mol/L | |  | c. | 8.73 mol/L | |  | d. | 9.71 mol/L | |  | e. | 11.9 mol/L |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | first-order reaction | general chemistry | integrated rate laws | rates of reaction | reaction rate | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 2/17/2017 7:25 AM | |

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| 155. The dimerization of NO2 has a rate constant at 25 °C of 2.45 x 10-2 L/mol min.  What will be the concentration of NO2 after 120. seconds, given a starting concentration of NO2 of 11.5 mol/L?   |  |  |  | | --- | --- | --- | |  | a. | 0.331 mol/L | |  | b. | 0.608 mol/L | |  | c. | 7.36 mol/L | |  | d. | 10.95 mol/L | |  | e. | 12.1 mol/L |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 12.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | general chemistry | integrated rate laws | rates of reaction | reaction rate | second-order reaction | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:28 PM | | *DATE MODIFIED:* | 3/4/2016 4:28 PM | |