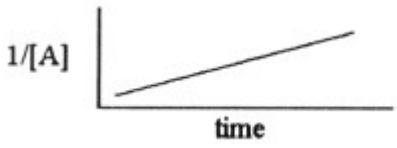
1. chem10b 14.2-16

Which one of the following graphs shows the correct relationship between concentration and time for a reaction that is second order in [A]?

Student Response
A.
B.
C.
D.  This is right answer.
E.

2. chem10b 14.2-1

A burning splint will burn more vigorously in pure oxygen than in air because

Student Response
A. oxygen is a product of combustion.
B. oxygen is a reactant in combustion and concentration of oxygen is higher in pure oxygen than is in air.
C. oxygen is a catalyst for combustion.
D. nitrogen is a reactant in combustion and its low concentration in pure oxygen catalyzes the combustion.
E. nitrogen is a product of combustion and the system reaches

equilibrium at a lower temperature.

3. chem10b 14.5-9

SO_2Cl_2 decomposes in the gas phase by the reaction

$SO_2Cl_2\ (g) \rightarrow SO_2\ (g) + Cl_2\ (g)$

The reaction is first order in SO_2Cl_2 and the rate constant is $3.0 \times 10^{-6}\ s^{-1}$at 600 K. A vessel is

charged with 3.3 atm of at 600 K. The partial pressure of SO_2 at is _____ atm.

Student Response
A. 3.7
B. 2.0
C. 3.0
D. 1.3
E. 2.1

4. chem10b 14.2-42

A catalyst can increase the rate of a reaction _____.

Student Response
A. by lowering the activation energy of the reverse reaction
B. by lowering the overall activation energy (E_a) of the reaction
C. by providing an alternative pathway with a lower activation energy
D. by changing the value of the frequency factor (A)
E. All of these are ways that a catalyst might act to increase the rate of reaction.

5. chem10b 14.2-5

Of the units below, _____ are appropriate for a first-order reaction rate constant.

Student Response
A. $M^{-1}\ s^{-1}$
B. $M\ s^{-1}$
C. mol/L
D. $L\ mol^{-1}\ s^{-1}$
E. s^{-1}

6. chem10b 14.4-9

Heterogeneous catalysts have different phases from reactants.

Student Response

7. chem10b 14.2-36

The overall reactions and rate laws for several reactions are given below. Of these, only _____ could represent an elementary step.

Student Response
A. $A + 2B \rightarrow P$ rate = $k[A]^2$
B. $A + B \rightarrow P$ rate = $k[A][B]$
C. $2A \rightarrow P$ rate = $k[A]$
D. $A + 2B \rightarrow P$ rate = $k[A][B]$
E. $A + B + C \rightarrow P$ rate = $k[A][C]$

Score: 1/1

8. chem10b 14.2-19

The reaction A → B *is first order in* [A]. *Consider the following data.*

time (s)	[A] (M)
0.0	1.60
10.0	0.40
20.0	0.10

The half-life of this reaction is _____ s.

☐tudent Response
A. 4.9
B. 0.97
C. 7.1
D. 3.0
E. 0.14

9. chem10b 14.1-18

At elevated temperatures, methylisonitrile (CH_3NC) isomerizes to acetonitrile (CH_3CN):

$CH_3NC\ (g) \rightarrow CH_3CN\ (g)$

At the start of an experiment, there are 0.200 mol of reactant and 0 mol of product in the reaction vessel. After 25 min, 0.108 mol of reactant (CH_3NC) remain. There are _____ mol of product (CH_3CN) in the reaction vessel.

Student ☐esponse
A. 0.540
B. 0.200
C. 0.308
D. 0.092
E. 0.022

Score: 1/1

10. chem10b 14.1-3

Which substance in the reaction below either appears or disappears the fastest?

$4NH_3 + 7O_2 \rightarrow 4NO_2 + 6H_2O$

S☐udent Response
A. NH_3
B. NO_2
C. H_2O
D. O_2

E. The rates of appearance/disappearance are the same for all of these.

11. chem10b 14.1-11

The peroxydisulfate ion ($S_2O_8^{2-}$) *reacts with the iodide ion in aqueous solution via the reaction:*

$$S_2O_8^{2-}\,(aq) + 3I^- \rightarrow 2SO_4\,(aq) + I3^-\,(aq)$$

An aqueous solution containing 0.050 M *of* $S_2O_8^{2-}$ *ion and* 0.072 M *of* I^- *is prepared, and the progress of the reaction followed by measuring* $[I^-]$. *The data obtained is given in the table below.*

Time (s)	0	400	800	1200	1600
$[I^-]$ (M)	0.072	0.057	0.046	0.037	0.029

The average rate of disappearance of I^- between 400 s and 800 s is _____ M/s.

Student Response
A. 5.8×10^{-5}
B. 2.6×10^{-4}
C. 2.8×10^{-5}
D. 3.6×10^{4}
E. 1.4×10^{-5}

12. chem10b 14.2-44

_____ are used in automotive catalytic converters.

Student Response
A. Heterogeneous catalysts
B. Homogeneous catalysts
C. Enzymes
D. Nonmetal oxides
E. Noble gases

1. chem10b 14.1-9

A flask is charged with 0.124 mol of A *and allowed to react to form* B *according to the reaction* A(g) →B(g). *The following data are obtained for* [A] *as the reaction proceeds:*

Time (s)	1	10	20	30	40
Moles of A	0.124	0.110	0.088	0.073	0.054

How many moles of B are present at 10 s?

Student Response
A. 0.110
B. 1.4×10^{-3}
C. 0.220
D. 0.014
E. 0.011

2. chem10b 14.2-37

For the elementary reaction

$NO_3 + CO \rightarrow NO_2 + CO_2$

the molecularity of the reaction is _____, and the rate law is

Student Response
A. 2, $k[NO_2][CO_2]$
B. 4, $k[NO_3][CO][NO_2][CO_2]$
C. 2, $k[NO_3][CO]$
D. 2, $k[NO_3][CO]/[NO_2][CO_2]$
E. 4, $k[NO_2][CO_2]/[NO_3][CO]$

3. chem10b 14.2-45

The enzyme nitrogenase converts _____ into _____.

Student Response
A. nitrogen oxides, N_2 and O_2
B. CO and unburned hydrocarbons, H_2O and CO_2
C. nitrogen, ammonia
D. ammonia, urea
E. nitroglycerine, nitric acid, and glycerine

4. chem10b 14.1-35

The rate constant for a second-order reaction is 0.13 $M^{-1}s^{-1}$. If the initial concentration of reactant is 0.26 M it takes _____ s for the concentration to decrease to

Student Response
A. 0.017
B. 1.0
C. 0.50
D. 30
E. 4.4×10^{-3}

Score: 1/1

5. chem10b 14.1-19

At elevated temperatures, methylisonitrile (CH_3NC) isomerizes to acetonitrile (CH_3CN):

$CH_3NC\ (g) \rightarrow CH_3CN\ (g)$

At the start of the experiment, there are 0.200 mol of reactant (CH_3NC) and 0 mol of product (CH_3CN) in the reaction vessel. After 25 min of reaction, 0.108 mol of reactant (CH_3NC) remain. The average rate of decomposition of methyl isonitrile, CH_3NC, in this 25 min period is _____ mol/min.

Student Response

A. 0.092
B. 4.3×10^{-3}
C. 0.54
D. 2.3
E. 3.7×10^{-3}

Score: 0/1

---

6. chem10b 14.2-2

Of the following, all are valid units for a reaction rate except _____.

Student Response
A. mol/hr
B. M/s
C. mol/L-hr
D. mol/L
E. g/s

Score: 1/1

---

7. chem10b 14.2-36

The overall reactions and rate laws for several reactions are given below. Of these, only _____ could represent an elementary step.

Student Response
A. A + 2B → P rate = $k[A]^2$
B. A + B + C → P rate = k[A][C]
C. 2A → P rate = k[A]
D. A + B → P rate = k[A][B]
E. A + 2B → P rate = k[A][B]

Score: 1/1

---

8. chem10b 14.2-26

At elevated temperatures, nitrogen dioxide decomposes to nitrogen oxide and oxygen:
$NO_2\,(g) \rightarrow NO\,(g) + \frac{1}{2}\,O_2\,(g)$
The reaction is second order in NO_2 with a rate constant of 0.543 $M^{-1\,s-1}$ at 300 C. If the initial $[NO_2]$ is 0.26 M it will take _____ s for the concentration to drop to 0.100 M.

Student Response
A. 0.299
B. 11.3
C. -0.611
D. 3.34
E. 8.8×10^{-2}

Score: 1/1

9. chem10b 14.5-8

The decomposition of N_2O_5 in solution in carbon tetrachloride proceeds via the reaction

$2N_2O_5\ (soln) \rightarrow 4NO_2\ (soln) + O_2\ (soln)$

The reaction is first order and has a rate constant of $4.82 \times 10^{-3}\ s^{-1}$ at 64°C. If the reaction is initiated with 0.058 mol in a 1.00-L vessel, how many moles remain after 151 s?

Student Response
A. 0.028
B. 0.060
C. 2.0×10^{3}
D. 0.055
E. 12

Score: 1/1

10. chem10b 14.2-38

The first step of a mechanism involving the reactant I_2 is shown below, where the equilibrium is established.

$I_2\ (aq) <-- > 2I\ (aq)$ K(1, -1)

The expression relating [I] to $[I_2]$ is [I] = _____.

Student Response
A. $(k_1/k^{-1})^{1/2}[I_2]^{1/2}$
B. $k_1[I_2]$

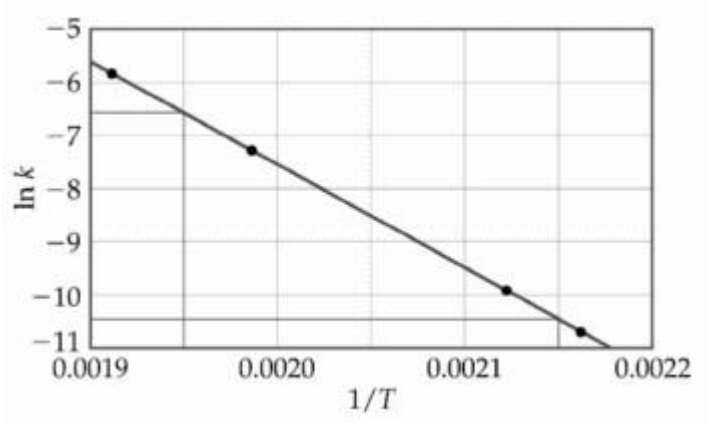
C. $(k_1/k^{-1})^2[I_2]^2$
D. $k_1[I_2]^{1/2}$
E. $(k_1/k^{-1})^2[I_2]^{1/2}$

11. chem10b 14.2-34

At elevated temperatures, methylisonitrile (CH_3NC) isomerizes to acetonitrile (CH_3CN):

$CH_3NC\ (g) \rightarrow CH_3CN\ (g)$

The dependence of the rate constant on temperature is studied and the graph below is prepared from the results.



The energy of activation of this reaction is _____ kJ/mol.

Student Response
A. 1.9×10^4
B. 160
C. 1.6×10^5
D. 4.4×10^{-4}
E. 4.4×10^{-7}

Score: 1/1

12. chem10b 14.2-35

The mechanism for formation of the product X is:

A + B → C + D (slow)
B + D → X (fast)

The intermediate reactant in the reaction is _____.

Student Response
A. A
B. B
C. C
D. D
E. X

1. chem10b 14.1-18

At elevated temperatures, methylisonitrile (CH_3NC) isomerizes to acetonitrile (CH_3CN):

$CH_3NC\ (g) \rightarrow CH_3CN\ (g)$

At the start of an experiment, there are 0.200 mol of reactant and 0 mol of product in the reaction vessel. After 25 min, 0.108 mol of reactant (CH_3NC) remain. There are _____ mol of product (CH_3CN) in the reaction vessel.

Student Response
A. 0.200
B. 0.092
C. 0.308
D. 0.540
E. 0.022

2. chem10b 14.2-26

At elevated temperatures, nitrogen dioxide decomposes to nitrogen oxide and oxygen:
$NO_2\ (g) \rightarrow NO\ (g) + ½\ O_2\ (g)$
The reaction is second order in NO_2 with a rate constant of 0.543 $M^{-1\ s-1}$ at 300°C If the initial

$[NO_2]$ is 0.260 M it will take _____ s for the concentration to drop to

Student Response
A. 0.299

B. 3.34
C. -0.611
D. 11.3
E. 8.8×10^{-2}

3. chem10b 14.4-5

The concentration of reactants or products at any time during the reaction can be calculated from the integrated rate law.

Student Response	Value	Correct Answer

4. chem10b 14.2-22

The rate constant of a first-order process that has a half-life of 225 s is _____ s^{-1}.

Student Response
A. 4.44×10^{-3}
B. 3.08×10^{-3}
C. 0.693
D. 12.5
E. 1.25

Score: 1/1

5. chem10b 14.5-9

SO_2Cl_2 decomposes in the gas phase by the reaction

$SO_2Cl_2\ (g) \rightarrow SO_2\ (g) + Cl_2\ (g)$

The reaction is first order in SO_2Cl_2 and the rate constant is 3.0×10^{-6} s^{-1}at 600 K. A vessel is

charged with 3.3 atm of at 600 K. The partial pressure of SO_2 at is _____ atm.

Student Response

A. 3.7
B. 2.1
C. 1.3
D. 3.0
E. 2.0

6. chem10b 14.5-8

The decomposition of N_2O_5 in solution in carbon tetrachloride proceeds via the reaction

$2N_2O_5$ (soln) $\rightarrow 4NO_2$ (soln) + O_2 (soln)

The reaction is first order and has a rate constant of 4.82×10^{-3} s^{-1} at 64°C. If the reaction is initiated with 0.058 mol in a 1.00-L vessel, how many moles remain after 151 s?

Student Response
A. 0.055
B. 2.0×10^3
C. 0.060
D. 12
E. 0.028

Score: 1/1

7. chem10b 14.2-19

The reaction A → B *is first order in* [A]. *Consider the following data.*

time (s)	[A] (M)
0.0	1.60
10.0	0.40
20.0	0.10

The half-life of this reaction is _____ s.

Student Response
A. 7.1
B. 0.14
C. 4.9

D. 3.0
E. 0.97

8. chem10b 14.1-4

Consider the following reaction:

$A \rightarrow 2C$

The average rate of appearance of C is given by $\Delta[C]/\Delta t$. Comparing the rate of appearance of C and the rate of disappearance of A, we get $\Delta[C]/\Delta t$ =

Student Response
A. +2
B. -1/2
C. +1
D. +1/2
E. -1

Score: 1/1

9. chem10b 14.2-8

The data in the table below were obtained for the reaction:

$2\ ClO_2\ (aq) + 2\ OH^-\ (aq) \rightarrow ClO_3^-\ (aq) + ClO_2^-\ (aq) + H_2O\ (1)$

What is the order of the reaction with respect to ClO_2?

Student Response
A. 4
B. 3
C. 2
D. 0
E. 1

10. chem10b 14.2-33

In general, as temperature goes up, reaction rate _____.

Student Response
A. goes up regardless of whether the reaction is exothermic or endothermic
B. stays the same regardless of whether the reaction is exothermic or endothermic
C. goes up if the reaction is endothermic
D. goes up if the reaction is exothermic
E. stays the same if the reaction is first order

11. chem10b 14.1-34

The initial concentration of reactant in a first-order reaction is 0.27 M. The rate constant for

the reaction is What is the concentration (mol/L) of reactant after

Student Response	Correct Answer
A. 3.8	
B. 2.0×10^{-2}	
C. 1.7	
D. 8.8×10^{-2}	
E. 0.135	

12. chem10b 14.4-1

Rates of reaction can be positive or negative.

Student Response	Value	Correct Answer

1. chem10b 14.1-37

The graph shown below depicts the relationship between concentration and time for the following chemical reaction.

The slope of this line is equal to _____.

Student Response	Correct Answer
A. $\ln[A]_o$	
B. 1/k	
C. -k	
D. -1/k	
E. k	

2. chem10b 14.1-23

The kinetics of the reaction below were studied and it was determined that the reaction rate increased by a factor of 9 when the concentration of B was tripled. The reaction is _____ order in B.

$A + B \rightarrow P$

Student Response	Correct Answer
A. zero	
B. first	
C. second	
D. third	
E. one-half	

3. chem10b 14.5-12

A particular first-order reaction has a rate constant of $1.35 \times 10^2\ s^{-1}$ at 25°C. What is the

magnitude of k at 75°C if

Student Response	Correct Answer
A. 3.85×10^6	
B. 670	
C. 1.36×10^2	
D. 1.93×10^4	
E. 3.47×10^4	

Score: 1/1

4. chem10b 14.2-9

The data in the table below were obtained for the reaction:

$2\ ClO_2\ (aq) + 2\ OH^-\ (aq) \rightarrow ClO_3^-\ (aq) + ClO_2^-\ (aq) + H_2O\ (1)$

What is the order of the reaction with respect to OH^-?

Student Response	Correct Answer
A. 0	
B. 1	
C. 2	
D. 3	
E. 4	

Score: 1/1

5. chem10b 14.1-26

A reaction was found to be zero order in A. Increasing the concentration of A by a factor of 3 will cause the reaction rate to _____.

Student Response	Correct Answer
A. increase by a factor of 27	

B. increase by a factor of 9
C. decrease by a factor of the cube root of 3
D. remain constant
E. triple

6. chem10b 14.5-11

A particular first-order reaction has a rate constant of $1.35 \times 10^2\ s^{-1}$ at 25°C. What is the magnitude of k at

Student Response	Correct Answer
A. 576	
B. 1.36×10^2	
C. 9.60×10^3	
D. 2.85×10^4	
E. 4.33×10^{87}	

7. chem10b 14.1-18

At elevated temperatures, methylisonitrile (CH_3NC) isomerizes to acetonitrile (CH_3CN):

$CH_3NC\ (g) \rightarrow CH_3CN\ (g)$

At the start of an experiment, there are 0.200 mol of reactant and 0 mol of product in the reaction vessel. After 25 min, 0.108 mol of reactant (CH_3NC) remain. There are _____ mol of product (CH_3CN) in the reaction vessel.

Student Response	Correct Answer
A. 0.022	
B. 0.308	
C. 0.540	
D. 0.092	
E. 0.200	

Score: 1/1

8. chem10b 14.5-6

The isomerization of methylisonitrile to acetonitrile

$CH_3NC\ (g) \rightarrow CH_3CN\ (g)$

is first order in CH_3NC. The half life of the reaction is 1.60×10^5 s at 444 K. The rate constant when the initial $[CH_3NC]$ is 0.030 M is _____ s^{-1}.

Student Response	Correct Answer
A. 4.33×10^{-6}	
B. 7.10×10^{7}	
C. 2.08×10^{-4}	
D. 4.80×10^{3}	
E. 2.31×10^{5}	

9. chem10b 14.1-30

For a first-order reaction, a plot of _____ versus _____ is linear.

Student Response	Correct Answer
A. t,	
B. $[A]_t$, t	
C. , t	
D. In $[A]_t$,	
E. ln $[A]_t$, t	

10. chem10b 14.1-27

The data in the table below were obtained for the reaction:

$A + B \rightarrow P$

The order of the reaction in A is _____.

Student Response	Correct Answer
A. 1	
B. 2	
C. 3	
D. 4	
E. 0	

11. chem10b 14.1-4

Consider the following reaction:

$A \rightarrow 2C$

The average rate of appearance of C is given by $\Delta[C]/\Delta t$. Comparing the rate of appearance of C and the rate of disappearance of A, we get $\Delta[C]/\Delta t$ =

Student Response	Correct Answer
A. +1/2	
B. +1	
C. -1	
D. -1/2	
E. +2	

12. chem10b 14.1-35

The rate constant for a second-order reaction is 0.13 $M^{-1}s^{-1}$. If the initial concentration of reactant is 0.26 M it takes _____ s for the concentration to decrease to

Student Response	Correct Answer
A. 0.50	
B. 0.017	

C. 1.0
D. 4.4×10^{-3}
E. 30