

C14 Practice Exam

Multiple Choice

Identify the choice that best completes the statement or answers the question.

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

Time (s)	0.00	10.0	20.0	30.0	40.0
Moles of A	0.124	0.110	0.088	0.073	0.054

- _____ 1. The average rate of disappearance of A between 10 s and 20 s is _____ mol/s.
- 2.2×10^{-3}
 - 1.1×10^{-3}
 - 4.4×10^{-3}
 - 454
 - 9.90×10^{-3}
- _____ 2. The average rate of disappearance of A between 20 s and 40 s is _____ mol/s.
- 8.5×10^{-4}
 - 1.7×10^{-3}
 - 590
 - 7.1×10^{-3}
 - 1.4×10^{-3}
- _____ 3. The average rate of appearance of B between 20 s and 30 s is _____ mol/s.
- $+1.5 \times 10^{-3}$
 - $+5.0 \times 10^{-4}$
 - -1.5×10^{-3}
 - $+7.3 \times 10^{-3}$
 - -7.3×10^{-3}
- _____ 4. The average rate disappearance of A between 20 s and 30 s is _____ mol/s.
- 5.0×10^{-4}
 - 1.6×10^{-2}
 - 1.5×10^{-3}
 - 670
 - 0.15
- _____ 5. How many moles of B are present at 10 s?
- 0.011
 - 0.220
 - 0.110
 - 0.014
 - 1.4×10^{-3}

6. How many moles of B are present at 30 s?

- a. 2.4×10^{-3}
- b. 0.15
- c. 0.073
- d. 1.7×10^{-3}
- e. 0.051

7. 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. zero
- b. first
- c. second
- d. third
- e. one-half

8. The kinetics of the reaction below were studied and it was determined that the reaction rate did not change when the concentration of B was tripled. The reaction is _____ order in B.



- a. zero
- b. first
- c. second
- d. third
- e. one-half

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

- a. remain constant
- b. increase by a factor of 27
- c. increase by a factor of 9
- d. triple
- e. decrease by a factor of the cube root of 3

10. 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 _____.

- a. remain constant
- b. increase by a factor of 27
- c. increase by a factor of 9
- d. triple
- e. decrease by a factor of the cube root of 3

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

- a. $\ln [A]_t, \frac{1}{t}$
- b. $\ln [A]_t, t$
- c. $\frac{1}{[A]_t}, t$
- d. $[A]_t, t$
- e. $t, \frac{1}{[A]_t}$

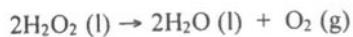
12. The rate constant for a particular second-order reaction is $0.47 \text{ M}^{-1}\text{s}^{-1}$. If the initial concentration of reactant is 0.25 mol/L , it takes _____ s for the concentration to decrease to 0.13 mol/L .

- a. 7.9
- b. 1.4
- c. 3.7
- d. 1.7
- e. 0.13

13. A first-order reaction has a rate constant of 0.33 min^{-1} . It takes _____ min for the reactant concentration to decrease from 0.13 M to 0.088 M .

- a. 1.2
- b. 1.4
- c. 0.51
- d. 0.13
- e. 0.85

14. The reaction below is first order in $[\text{H}_2\text{O}_2]$:



A solution originally at $0.600 \text{ M H}_2\text{O}_2$ is found to be 0.075 M after 54 min . The half-life for this reaction is _____ min.

- a. 6.8
- b. 18
- c. 14
- d. 28
- e. 54

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

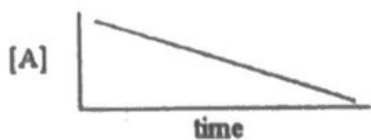
- a. oxygen is a reactant in combustion and concentration of oxygen is higher in pure oxygen than is in air.
- b. oxygen is a catalyst for combustion.
- c. oxygen is a product of combustion.
- d. nitrogen is a product of combustion and the system reaches equilibrium at a lower temperature.
- e. nitrogen is a reactant in combustion and its low concentration in pure oxygen catalyzes the combustion.

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

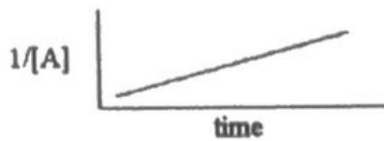
a.



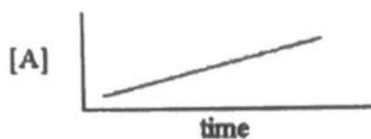
b.



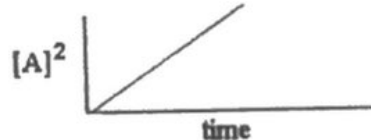
c.



d.



e.



The reaction $A \rightarrow B$ 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

17. The rate constant for this reaction is _____ s^{-1} .

- a. 0.013
- b. 0.030
- c. 0.14
- d. 3.0
- e. 3.1×10^{-3}

18. The half-life of this reaction is _____ s.

- a. 0.97
- b. 7.1
- c. 5.0
- d. 3.0
- e. 0.14

19. In the energy profile of a reaction, the species that exists at the maximum on the curve is called the _____.

- a. product
- b. activated complex
- c. activation energy
- d. enthalpy of reaction
- e. atomic state

20. Which of the following is true?

- a. If we know that a reaction is an elementary reaction, then we know its rate law.
- b. The rate-determining step of a reaction is the rate of the fastest elementary step of its mechanism.
- c. Since intermediate compounds can be formed, the chemical equations for the elementary reactions in a multistep mechanism do not always have to add to give the chemical equation of the overall process.
- d. In a reaction mechanism, an intermediate is identical to an activated complex.
- e. All of the above statements are true.

21. Of the following, _____ will lower the activation energy for a reaction.

- a. increasing the concentrations of reactants
- b. raising the temperature of the reaction
- c. adding a catalyst for the reaction
- d. removing products as the reaction proceeds
- e. increasing the pressure

22. The rate law of the overall reaction



is rate = $k[A]^2$. Which of the following will not increase the rate of the reaction?

- a. increasing the concentration of reactant A
- b. increasing the concentration of reactant B
- c. increasing the temperature of the reaction
- d. adding a catalyst for the reaction
- e. All of these will increase the rate.

C14 Practice Exam
Answer Section

MULTIPLE CHOICE

1. ANS: A	PTS: 1	DIF: 1	REF: Sec. 14.2
2. ANS: B	PTS: 1	DIF: 1	REF: Sec. 14.2
3. ANS: A	PTS: 1	DIF: 1	REF: Sec. 14.2
4. ANS: C	PTS: 1	DIF: 1	REF: Sec. 14.2
5. ANS: D	PTS: 1	DIF: 1	REF: Sec. 14.2
6. ANS: E	PTS: 1	DIF: 1	REF: Sec. 14.2
7. ANS: C	PTS: 1	DIF: 1	REF: Sec. 14.3
8. ANS: A	PTS: 1	DIF: 1	REF: Sec. 14.3
9. ANS: B	PTS: 1	DIF: 1	REF: Sec. 14.3
10. ANS: A	PTS: 1	DIF: 1	REF: Sec. 14.3
11. ANS: B	PTS: 1	DIF: 1	REF: Sec. 14.3
12. ANS: A	PTS: 1	DIF: 2	REF: Sec. 14.4
13. ANS: A	PTS: 1	DIF: 1	REF: Sec. 14.4
14. ANS: B	PTS: 1	DIF: 4	REF: Sec. 14.4
15. ANS: A	PTS: 1	DIF: 1	REF: Sec. 14.1
16. ANS: C	PTS: 1	DIF: 2	REF: Sec. 14.4
17. ANS: C	PTS: 1	DIF: 1	REF: Sec. 14.4
18. ANS: C	PTS: 1	DIF: 1	REF: Sec. 14.4
19. ANS: B	PTS: 1	DIF: 1	REF: Sec. 14.5
20. ANS: A	PTS: 1	DIF: 4	REF: Sec. 14.6
21. ANS: C	PTS: 1	DIF: 1	REF: Sec. 14.7
22. ANS: B	PTS: 1	DIF: 1	REF: Sec. 14.7

SHORT ANSWER

23. ANS:

- rate = $k[\text{NO}]^1[\text{Cl}_2]^2$
- 12 L²/mol²h
- 0.060 mol/Lh
- 9.0 mol/Lh

PTS: 1

24. ANS:

- $2\text{NO} + 2\text{H}_2 \rightarrow \text{N}_2 + 2\text{H}_2\text{O}$ show work with cancellations
- rate = $k[\text{NO}]^2[\text{H}_2]^1$
- step 3 explain
- rate = $k[\text{NO}]^2$

PTS: 1