

Competitive Exams: Chemistry MCQs (Practice-Test 8 of 31)

1. Consider the following reaction in aqueous solution, $5\text{Br}^- (\text{aq}) + \text{BrO}_3^- (\text{aq}) + 6\text{H}^+ (\text{aq}) \rightarrow 3\text{Br}_2 (\text{aq}) + 3\text{H}_2\text{O} (\text{l})$ If the rate of appearance of Br_2 at a particular moment during the reaction is 0.025 M s^{-1} , what is the rate of disappearance (in M s^{-1}) of Br^- at that moment?
2. Consider the following reaction at 25°C $(\text{CH}_3)_3\text{COH} (\text{l}) + \text{HCl} (\text{aq}) \rightarrow (\text{CH}_3)_3\text{CCl} (\text{l}) + \text{H}_2\text{O} (\text{l})$ The experimentally determined rate law for this reaction indicates that the reaction is first-order in $(\text{CH}_3)_3\text{COH}$ and that the reaction is first-order overall. Which of the following would produce an increase in the rate of this reaction?
 - a. increasing the concentration of $(\text{CH}_3)_3\text{COH}$
 - b. increasing the concentration of HCl
 - c. decreasing the concentration of HCl
 - d. decreasing the concentration of $(\text{CH}_3)_3\text{CCl}$
 - e. It is impossible to tell.
3. A certain first-order reaction has a rate constant, k , equal to $2.1 \times 10^{-5} \text{ s}^{-1}$ at 355 K . If the activation energy for this reaction is 135 kJ/mol , calculate the value of the rate constant (in s^{-1}) at 550 K .
4. Which of the following influences the rate of a chemical reaction performed in solution?
 - a. temperature
 - b. activation energy
 - c. presence of a catalyst
 - d. concentrations of reactants
 - e. All of the above influence the rate.
5. Laughing gas, N_2O , can be prepared (ha, ha!) from H_2 and NO : $\text{H}_2 (\text{g}) + 2 \text{NO} (\text{g}) \rightarrow \text{N}_2\text{O} (\text{g}) + \text{H}_2\text{O} (\text{g})$ A study of initial concentration (ha, ha!) versus initial rate at a certain temperature yields the following data for this reaction (ha, ha!):

$[\text{H}_2], \text{M}$	$[\text{NO}], \text{M}$	Initial rate, M s^{-1}
0.10000	0.5000	2.560×10^{-6}
0.20000	0.3000	1.843×10^{-6}
0.10000	0.3000	9.216×10^{-7}
0.20000	0.6000	7.373×10^{-6}

 Which of the following is the correct rate law for this reaction (ha, ha!)?

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a. Rate = $k[\text{H}_2][\text{NO}]^2$

b. Rate = $k[\text{H}_2][\text{NO}]$

c. Rate = $k[\text{NO}]^2$

d. Rate = $k[\text{H}_2]^2$

e. Rate = k

6. Iodine-131, a radioactive isotope of iodine, is used medicinally as a radiotracer for the diagnosis and treatment of illnesses associated with the thyroid gland. The half-life of iodine-131 is 7×10^5 seconds. If a patient is given 0.45 g of iodine-131, calculate how long it would take (in seconds) for 90.0% of the iodine-131 to decay. Recall: Radioactive decay is a first-order process.

a. N/A

b. N/A

c. N/A

d. N/A

7. Consider a reaction which is first-order in A and first-order in B

a. N/A

b. N/A

c. N/A

d. N/A

8. The complex ion, $[\text{Cr}(\text{NH}_3)_5\text{Cl}]^{2+}$, reacts with OH⁻ ion in aqueous solution, $[\text{Cr}(\text{NH}_3)_5\text{Cl}]^{2+}(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow [\text{Cr}(\text{NH}_3)_5(\text{OH})]^{2+}(\text{aq}) + \text{Cl}^-(\text{aq})$ The following data were obtained for this reaction at 25°C $[\text{Cr}(\text{NH}_3)_5\text{Cl}]^{2+}$ concentration (M)

- 01.00
- 60.657
- 120.432
- 180.284
- 240.186
- 300.122
- 360.0805

The order of the reaction with respect to the $[\text{Cr}(\text{NH}_3)_5\text{Cl}]^{2+}$ ion is:

- a. zero order
- b. first order
- c. second order
- d. third order
- e. fourth order

9. A student determined the value of the rate constant, k , for a chemical reaction at several different temperatures. Which of the following graphs of the student's data would give a straight line?

- a. k versus T
- b. k versus $(1/T)$
- c. $\ln k$ versus $(1/T)$
- d. $\ln k$ versus T
- e. $\ln k$ versus E_a

10. In the experiment, "How Can Spectrophotometric Methods Be Used to Determine the Order of a Chemical Reaction" it is necessary to remove invalid data points towards the end of the reaction. Which of the following statements best explains why this is necessary?

- a. The Spectronic 20 becomes unstable towards the end of the reaction.
- b. Towards the end of the reaction, the temperature of the solution is significantly different than the initial temperature of the solution.
- c. Towards the end of the reaction, the concentrations of the reactants are so high that it is difficult to measure them accurately.
- d. Towards the end of the reaction, the concentrations of the products are sufficiently high that the reverse reaction competes with the forward reaction.
- e. None of these.

11. The next two questions are about this reaction: $2\text{N}_2\text{O}_5(\text{g}) \rightleftharpoons 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$ The rate law for the above reaction is:

- a. $\text{rate} = k [\text{N}_2\text{O}_5]^2$
- b. $\text{rate} = [\text{N}_2\text{O}_5]^2$
- c. $\text{rate} = k [\text{N}_2\text{O}_5]^2 / [\text{NO}_2]^4 [\text{O}_2]^1$

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d. $\text{rate} = k [\text{N}_2\text{O}_5]^x$

e. $\text{rate} = [\text{N}_2\text{O}_5]^x$

12. The next two questions are about this reaction: $2\text{N}_2\text{O}_5 (\text{g}) \rightleftharpoons 4\text{NO}_2 (\text{g}) + \text{O}_2 (\text{g})$ If the instantaneous rate of appearance of $\text{NO}_2 (\text{g})$ is 0.0400 M/s at some moment in time, what is the rate of disappearance of $\text{N}_2\text{O}_5 (\text{g})$ in M/s ?

a. N/A

b. N/A

c. N/A

d. N/A

13. The rate laws for certain enzyme-activated reactions in your body have a specific rate constant k , with units of M/s . What is the overall order of these reactions?

a. 0

b. 1

c. 2

d. 3

e. Cannot be determined.

14. The next two questions are about this reaction: $2\text{NO} (\text{g}) + \text{Cl}_2 (\text{g}) \rightleftharpoons 2\text{NOCl} (\text{g})$ The rate law for the above reaction has been determined to be $\text{rate} = k[\text{NO}][\text{Cl}_2]$. What is the overall order of the reaction?

a. 0

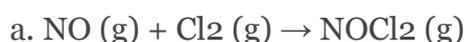
b. 1

c. 2

d. 3

e. Cannot be determined.

15. The next two questions are about this reaction: $2\text{NO} (\text{g}) + \text{Cl}_2 (\text{g}) \rightleftharpoons 2\text{NOCl} (\text{g})$ A mechanism involving the following steps has been proposed for the above reaction:



i. N/A

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ii. N/A

iii. N/A

iv. N/A