

TestGenie
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Chemistry — Class 12
Chapter(s): Chemical Kinetics

Maximum Marks: 39

Time Allowed: 1 Hour 10 Minutes

Advanced Question Type: Diagram/Graph (39 marks · 19 questions · same layout as Standard)

Section A — MCQ & Assertion-Reason (1 mark each)

Q1. For a first order decomposition $A(g) \rightarrow B(g) + C(g)$ carried out at constant T and V, a manometer gives total pressure $p_t = 1.20$ atm at time t, while initial pressure of A was $p_0 = 1.00$ atm. What is the partial pressure of A, p_A , at time t? [1 mark]

- A) 0.20 atm
- B) 0.80 atm
- C) 0.60 atm
- D) 1.10 atm

Q2. In collision theory for an elementary bimolecular reaction, Rate $P \cdot Z \cdot e^{E_a/RT}$. If a modification of reactant geometry decreases the steric factor P by a factor of 10 without changing E_a , which change is most consistent for k at the same temperature? [1 mark]

- A) k decreases by a factor of 10
- B) k increases by a factor of 10
- C) k remains unchanged because only E_a matters
- D) k decreases by a factor of e^{10}

Q3. The rate constants of a reaction are $k_1 = 2.0 \times 10^{-3} \text{ s}^{-1}$ at 300 K and $k_2 = 8.0 \times 10^{-3} \text{ s}^{-1}$ at 330 K. Assuming Arrhenius behavior, the activation energy (in kJ mol^{-1}) is closest to: ($R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$) [1 mark]

- A) 19.8 kJ mol^{-1}
- B) 39.6 kJ mol^{-1}
- C) 59.4 kJ mol^{-1}
- D) 79.2 kJ mol^{-1}

Q4. A catalyst is added to a reversible reaction at equilibrium (constant T). Which statement is necessarily true? [1 mark]

- A) Equilibrium constant K increases because forward reaction is accelerated.
- B) ΔG° changes because activation energy decreases.
- C) Time to reach equilibrium decreases but equilibrium composition remains unchanged.
- D) Only forward rate constant increases; backward rate constant remains same.

Q5. A plot of $\ln k$ versus $1/T$ for a reaction is a straight line with slope = $-1.20 \times 10^4 \text{ K}$.

The activation energy is: ($R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$) [1 mark]

- A) 9.98 kJ mol^{-1}
- B) 49.9 kJ mol^{-1}
- C) 99.8 kJ mol^{-1}
- D) 120 kJ mol^{-1}

Q6. Assertion (A): For the decomposition $2\text{HI(g)} \rightarrow \text{H}_2\text{(g)} + \text{I}_2\text{(g)}$, the rate of reaction can be written as $\text{Rate} = -(1/2) \text{d}[\text{HI}]/\text{dt} = \text{d}[\text{H}_2]/\text{dt} = \text{d}[\text{I}_2]/\text{dt}$.

Reason (R): Dividing by the stoichiometric coefficient makes the rates of disappearance/appearance of different species equal to the same reaction rate. [1 mark]

- A) Both A and R are true and R is the correct explanation of A.
- B) Both A and R are true but R is not the correct explanation of A.
- C) A is true but R is false.
- D) A is false but R is true.

Q7. Assertion (A): The order of a reaction may be fractional or even zero, but molecularity cannot be zero or fractional.

Reason (R): Order is obtained from experimentally determined rate law, whereas molecularity is defined only for an elementary step as the number of species colliding simultaneously. [1 mark]

- A) Both A and R are true and R is the correct explanation of A.
- B) Both A and R are true but R is not the correct explanation of A.
- C) A is true but R is false.
- D) A is false but R is true.

Q8. Assertion (A): A catalyst does not change the equilibrium constant K of a reaction at a given temperature.

Reason (R): A catalyst provides an alternative pathway with lower activation energy for both forward and backward reactions to the same extent. [1 mark]

- A) Both A and R are true and R is the correct explanation of A.
- B) Both A and R are true but R is not the correct explanation of A.
- C) A is true but R is false.
- D) A is false but R is true.

Q9. Assertion (A): For a first order reaction, the half-life $t_{1/2}$ is independent of the initial concentration of reactant.

Reason (R): For first order kinetics, $t_{1/2} = 0.693/k$, and k does not depend on initial concentration at fixed temperature. [1 mark]

- A) Both A and R are true and R is the correct explanation of A.
- B) Both A and R are true but R is not the correct explanation of A.
- C) A is true but R is false.
- D) A is false but R is true.

Q10. Assertion (A): In collision theory, raising temperature increases the rate constant mainly because collision frequency Z increases.

Reason (R): Increasing temperature increases the fraction of molecules with energy $\geq E_a$, which enters as the factor $e^{-E_a/RT}$. [1 mark]

- A) Both A and R are true and R is the correct explanation of A.
- B) Both A and R are true but R is not the correct explanation of A.
- C) A is true but R is false.
- D) A is false but R is true.

Section B — Very Short Answer (2 marks each)

Q11. A first order reaction has $k = 2.50 \times 10^{-3} \text{ s}^{-1}$. Calculate (i) $t_{1/2}$ and (ii) time required for 90% completion. Write the final answers with SI units. [2 marks]

Q12. In a constant-temperature experiment, the rate constant of a reaction doubles when temperature changes from 300 K to 310 K. Estimate the activation energy E_a (kJ mol^{-1}) using Arrhenius equation (assume A constant). ($R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$) [2 marks]

Q13. A student claims that for a first order reaction, 99.9% completion takes exactly 10 half-lives. Verify this claim by calculation for a first order reaction (no numerical k needed). [2 marks]

Section C — Short Answer (3 marks each)
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Q14. A reactant A undergoes first order decomposition $A(g) \rightarrow B(g) + C(g)$ at constant T and V . The initial pressure of A is 0.60 atm. After 200 s, the total pressure becomes 0.90 atm.

In exactly three numbered steps, calculate: (i) partial pressure of A after 200 s, (ii) rate constant k , and (iii) half-life $t_{1/2}$ (with SI units). [3 marks]

Q15. In an industrial study, the rate constant k for a reaction is $1.5 \times 10^{-4} \text{ s}^{-1}$ at 400 K and $3.0 \times 10^{-3} \text{ s}^{-1}$ at 500 K.

In exactly three numbered steps, calculate: (i) activation energy E_a , (ii) Arrhenius

factor A, and (iii) k at 450 K. (Use $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$; give E_a in kJ mol^{-1} .) [3 marks]

Q16. A reaction has experimentally determined rate law: $\text{Rate} = k[\text{A}]^{12}[\text{B}]^{32}$.

In exactly three numbered points, determine: (i) overall order and units of k (using mol L^{-1} and s), (ii) how the rate changes if [A] is made 16 times and [B] is made 1/4th, and (iii) one mechanistic inference you can and cannot make from this rate law (order vs molecularity). [3 marks]

Section D — Long Answer (5 marks each)

Q17. The following table gives concentration of reactant R for a first-order reaction $\text{R(g)} \rightarrow \text{P(g)}$ at 300 K. Time, [t] / [s]: 0, 200, 400, 600, 800

[R] / mol L^{-1} : 0.100, 0.0819, 0.0670, 0.0549, 0.0449 (i) Using the integrated first-order rate law, calculate the rate constant k (s^{-1}) using any two non-zero time points (show full working).

(ii) Using the same k, predict [R] at $t = 1000 \text{ s}$.

(iii) State one graph that would give a straight line for this reaction and write its slope (with sign and unit). [5 marks]

Q18. An Arrhenius plot for a reaction is obtained by measuring k at different temperatures. The following data are recorded: [T] / [K]: 300, 320, 340

[k] / s^{-1} : 2.10×10^{-3} , 5.20×10^{-3} , 1.12×10^{-2} (i) Treating the reaction as Arrhenius-type, calculate the activation energy E_a (kJ mol^{-1}) using the 300 K and 340 K data (show full working).

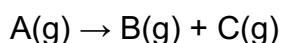
(ii) Using your E_a , calculate the pre-exponential factor A (s^{-1}) using the 300 K data.

(iii) Write the equation of the straight line obtained on plotting $\ln k$ vs $1/T$ and identify the slope and intercept (with units where applicable). [5 marks]

Section E — Case Study (4 marks each)
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Q19. Read the following passage and answer the questions that follow: [4 marks]

A quality-control lab studies the decomposition of a liquid reactant X in a sealed vessel at constant volume. The analyst suspects first-order kinetics. She records the total pressure P_t of the gas mixture (in atm) as the reaction proceeds at 500 K. The reaction is:



Initially only A is present. Because one mole of A produces two moles of gaseous products, the total pressure increases with time even though the vessel volume and temperature are fixed. The following readings are obtained:

At $t = 0$ s, $P_0 = 0.800$ atm

At $t = 200$ s, $P_t = 1.040$ atm

At $t = 400$ s, $P_t = 1.200$ atm

For this reaction at any time t , if the initial pressure of A is P_0 and the total pressure is P_t , then the partial pressure of unreacted A is $P_A = 2P_0 - P_t$ (derived from stoichiometry and Dalton's law). The lab wants a single k value from the dataset to validate the first-order assumption and to estimate how quickly A disappears.

(i) Calculate the partial pressure of A, P_A (atm), at $t = 200$ s and $t = 400$ s. (1 mark)

(ii) Using first-order kinetics in terms of partial pressure, calculate k (s^{-1}) using $t = 400$ s data. (Use $k = (1/t) \ln(P_{A0}/P_{At})$ where $P_{A0} = P_0$.) (1 mark)

(iii) Using the k found in (ii), predict the time (s) required for P_A to become 0.200 atm, and comment whether the 200 s data is consistent with the same k (one quantitative check). (2 marks)

Chemistry — Class 12
Chapter(s): Chemical Kinetics

Section A — MCQ & Assertion-Reason (1 mark each)

A1.

Answer:

Correct option: (C)

0.60 atm

Explanation:

At time t , $p_t = p_A + p_B + p_C$ and for $A \rightarrow B + C$, if A decreases by x then $p_A = p_0 - x$ and $p_B = p_C = x$, so $p_t = (p_0 - x) + x + x = p_0 + x \Rightarrow x = p_t - p_0 = 0.20$ atm. Hence $p_A = p_0 - x = 1.00 - 0.20 = 0.60$ atm. Hence, option (C) is correct.

A2.

Answer:

Correct option: (A)

k decreases by a factor of 10

Explanation:

At fixed T and unchanged E_a , $e^{E_a/RT}$ is constant and Z is unchanged if concentrations/temperature are fixed; thus k (or rate proportionality) scales directly with P , so a 10-fold drop in P causes a 10-fold drop in k . Hence, option (A) is correct.

A3.

Answer:

Correct option: (B)

39.6 kJ mol⁻¹

Explanation:

Using $\ln(k_2/k_1) = E_a/R(1/T_1 - 1/T_2)$: $\ln(8.0 \times 10^{-3} / 2.0 \times 10^{-3}) = \ln 4 = 1.386$. Also $(1/300 - 1/330) = 0.00030303$ K⁻¹, so $E_a = [8.314 \times 1.386] / [0.00030303] = 3.80 \times 10^4$ J mol⁻¹ ≈ 38 kJ mol⁻¹, closest to 39.6 kJ mol⁻¹. Hence, option (B) is correct.

A4.

Answer:

Correct option: (C)

Time to reach equilibrium decreases but equilibrium composition remains unchanged.

Explanation:

A catalyst lowers activation energy for both forward and reverse paths similarly, so K (and ΔG°) remain unchanged while the system reaches equilibrium faster. Hence, option (C) is correct.

A5.

Answer:

Correct option: (C)

99.8 kJ mol⁻¹

Explanation:

From $\ln k = \ln A - E_a/(RT)$, slope of $\ln k$ vs $1/T$ is $-E_a/R$, so $E_a = R \times (1.20 \times 10^4) = 8.314 \times 1.20 \times 10^4 = 9.98 \times 10^4 \text{ J mol}^{-1} = 99.8 \text{ kJ mol}^{-1}$. Hence, option (C) is correct.

A6.

Answer:

Correct option: (A)

Both A and R are true and R is the correct explanation of A.

Explanation:

The definition of reaction rate uses stoichiometric normalization so that consumption/formation rates refer to one common rate; for $2\text{HI} \rightarrow \text{H}_2 + \text{I}_2$, HI is consumed twice as fast as H_2 or I_2 forms, hence the factor $\frac{1}{2}$. Hence, option (A) is correct.

A7.

Answer:

Correct option: (A)

Both A and R are true and R is the correct explanation of A.

Explanation:

Order depends on exponents in the observed rate law and can be non-integer, but molecularity counts discrete colliding entities in one elementary event, so it must be a positive integer (1-3 typically). Hence, option (A) is correct.

A8.

Answer:

Correct option: (A)

Both A and R are true and R is the correct explanation of A.

Explanation:

K depends on ΔG° (thermodynamics) at fixed T, not on kinetics; a catalyst lowers E_a for both directions similarly, speeding equilibration without shifting equilibrium. Hence, option (A) is correct.

A9.

Answer:

Correct option: (A)

Both A and R are true and R is the correct explanation of A.

Explanation:

The integrated law gives $[R] = [R]_0 e^{kt}$, so setting $[R] = [R]_0/2$ yields $t_{1/2} = \ln 2/k$; since k is constant at

Given: T, $t_{1/2}$ is concentration-independent. Hence, option (A) is correct.

A10.

Answer:

Correct option: (D)

A is false but R is true.

Explanation:

While Z increases only mildly with temperature, the dominant temperature dependence of k comes from the exponential factor $e^{-E_a/RT}$ (fraction of molecules with energy $\geq E_a$). Hence, option (D) is correct.

Section B — Very Short Answer (2 marks each)

A11.

Answer:

$t_{1/2} = 0.693/k = 0.693/(2.50 \times 10^{-3} \text{ s}^{-1}) = 277 \text{ s}$. For 90% completion, $[R]_t/[R]_0 = 0.10$ so $t = (2.303/k) \log(10) = 2.303/(2.50 \times 10^{-3}) = 921 \text{ s}$.

For first order kinetics, half-life is derived from $[R]_t = [R]_0/2$ giving $t_{1/2} = \ln 2/k$, and fraction remaining gives $t = (2.303/k) \log([R]_0/[R]_t)$. Substituting k and the required fraction remaining (0.10) verifies the computed times in seconds (SI).

A12.

Answer:

$\ln(k_2/k_1) = \ln 2 = E_a/R(1/T_1 - 1/T_2) \Rightarrow E_a = [8.314 \times 0.693] / [1/300 - 1/310] = 5.76/(0.00010753) = 5.36 \times 10^4 \text{ J mol}^{-1} = 53.6 \text{ kJ mol}^{-1}$.

Arrhenius form gives $\ln(k_2/k_1)$ proportional to E_a and the change in $1/T$, so a modest 10 K rise can yield a large factor through the exponential term. Substituting $k_2/k_1 = 2$, $T_1 = 300$

K and T2 = 310 K verifies $E_a \approx 53.6 \text{ kJ mol}^{-1}$ with correct energy units.

A13.

Answer:

For 99.9% completion, fraction remaining = $[R]_t/[R]_0 = 0.001$, so $t = (2.303/k)\log(1000) = (2.303/k) \times 3 = 6.909/k$. Since $t_{1/2} = 0.693/k$, $t/t_{1/2} = [6.909/k] / [0.693/k] = 9.97 \approx 10$ half-lives.

This uses the integrated first order law $t = (2.303/k)\log([R]_0/[R]_t)$ and the half-life relation $t_{1/2} = 0.693/k$. Substituting $[R]_t/[R]_0 = 10^{-3}$ explicitly verifies the ratio is ~ 10 , showing the statement is an approximation (9.97).

Section C — Short Answer (3 marks each)
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A14.

Answer:

1) Partial pressure of A: For $A \rightarrow B + C$, if decrease in A is x, then $p_t = p_0 - x \Rightarrow x = 0.90 - 0.60 = 0.30 \text{ atm}$, so $p_A = p_0 - x = 0.60 - 0.30 = 0.30 \text{ atm}$.

2) Rate constant: $k = (2.303/t)\log(p_0/p_A) = (2.303/200 \text{ s})\log(0.60/0.30) = (2.303/200)\log 2 = (2.303/200)(0.3010) = 3.47 \times 10^{-3} \text{ s}^{-1}$.

3) Half-life: $t_{1/2} = 0.693/k = 0.693/(3.47 \times 10^{-3} \text{ s}^{-1}) = 2.00 \times 10^2 \text{ s}$.

The pressure method converts concentration change into pressure change at constant T and V; for $A \rightarrow B + C$, total pressure rise equals x, letting p_A be obtained by stoichiometry. Substituting p_0 and p_A into the first order integrated form $k = (2.303/t)\log(p_0/p_A)$ verifies k in s^{-1} . Using $t_{1/2} = 0.693/k$ then yields a half-life consistent with $p_A = p_0/2$ after one half-life.

A15.

Answer:

1) Activation energy: $\ln(k_2/k_1) = E_a/R(1/T_1 - 1/T_2)$; $\ln(3.0 \times 10^{-3} / 1.5 \times 10^{-4}) = \ln 20 = 2.996$. Also $(1/400 - 1/500) = 0.0005 \text{ K}^{-1}$, so $E_a = [8.314 \times 2.996] / [0.0005] = 4.98 \times 10^4 \text{ J mol}^{-1} = 49.8 \text{ kJ mol}^{-1}$.

2) Arrhenius factor: $k_1 = A e^{(-E_a/RT_1)} \Rightarrow A = k_1 e^{(E_a/RT_1)} = 1.5 \times 10^{-4} \times \exp(4.98 \times 10^4 / (8.314 \times 400)) = 1.5 \times 10^{-4} \times \exp(14.98) = 4.83 \times 10^2 \text{ s}^{-1}$.

3) k at 450 K: $k = A e^{(-E_a/RT)} = 4.83 \times 10^2 \times \exp(-4.98 \times 10^4 / (8.314 \times 450)) = 4.83 \times 10^2 \times \exp(-13.31) = 7.91 \times 10^{-4} \text{ s}^{-1}$.

A16.

Answer:

1) Order and units: Overall order $n = \frac{1}{2} + \frac{3}{2} = 2$; units of $k = [\text{mol L}^{-1} \text{ s}^{-1}] / [\text{mol L}^{-1}]^2 = \text{L mol}^{-1} \text{ s}^{-1}$.

2) Rate scaling: Factor = $(16)^{1/2} \times (1/4)^{3/2} = 4 \times (1/8) = 1/2$, so rate becomes half.

3) Inference limits: You can conclude the reaction is second order overall under these conditions (experimental order), but you cannot deduce the stoichiometric equation or molecularity of the overall reaction unless it is an elementary step.

The overall order comes from the sum of exponents in the experimentally measured rate law, and unit analysis verifies k has $\text{L mol}^{-1} \text{s}^{-1}$ for a second order process. Substituting the scaling factors checks the non-intuitive result that making one reactant much larger while decreasing the other can still reduce rate due to the stronger exponent on B. Finally, kinetics gives order (experimental), whereas molecularity is meaningful only for an elementary step, so mechanism cannot be uniquely inferred from this law alone.

Section D — Long Answer (5 marks each)

A17.

Answer:

A first-order reaction shows an exponential fall of concentration with time, so k can be obtained from $\ln([R]_0/[R]_t) = kt$.

1) Data selection (first-order test); Choose $t = 0 \text{ s}$ and $t = 800 \text{ s}$: $[R]_0 = 0.100 \text{ mol L}^{-1}$, $[R]_t = 0.0449 \text{ mol L}^{-1}$; This avoids small-time rounding and gives a stable k .

2)

Formula: (integrated first-order law); For $R \rightarrow \text{products}$: $k = (1/t) \ln([R]_0/[R]_t)$;
Here, $t = 800 \text{ s}$.

3)

Substitution: and

Calculation: (with units); $[R]_0/[R]_t = 0.100/0.0449 = 2.227$ (dimensionless);

$\ln(2.227) = 0.800$ (approx); So $k = 0.800/800 \text{ s} = 1.00 \times 10^{-3} \text{ s}^{-1}$.

4) Prediction at 1000 s; Use $[R]_t = [R]_0 e^{-kt}$; $[R]_{1000} = 0.100 \times e^{-(1.00 \times 10^{-3})(1000)}$
 $= 0.100 \times e^{-1.000}$; $= 0.100 \times 0.3679 = 3.68 \times 10^{-2} \text{ mol L}^{-1}$.

5) Straight-line graph and slope; Plot $\ln[R]$ versus t : it is a straight line with slope $= -k = -1.00 \times 10^{-3} \text{ s}^{-1}$.

Conclusion: The reaction is consistent with first-order kinetics with $k \approx 1.00 \times 10^{-3} \text{ s}^{-1}$ and $[R](1000 \text{ s}) \approx 3.68 \times 10^{-2} \text{ mol L}^{-1}$.

A18.

Answer:

Temperature affects k exponentially as per Arrhenius equation, so a straight line is obtained in $\ln k$ versus $1/T$.

- 1) Two-temperature Arrhenius relation; $\ln(k_2/k_1) = (E_a/R) (1/T_1 - 1/T_2)$.; Take: $T_1 = 300 \text{ K}$, $k_1 = 2.10 \times 10^{-3} \text{ s}^{-1}$; $T_2 = 340 \text{ K}$, $k_2 = 1.12 \times 10^{-2} \text{ s}^{-1}$; $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$.
- 2) Calculate $\ln(k_2/k_1)$; $k_2/k_1 = [1.12 \times 10^{-2}] / [2.10 \times 10^{-3}] = 5.333$.; $\ln(5.333) = 1.674$.
- 3) Compute $(1/T_1 - 1/T_2)$; $1/300 - 1/340 = [340-300] / [300 \times 340] = 40/102000 = 3.9216 \times 10^{-4} \text{ K}^{-1}$.
- 4) Activation energy; $E_a = R \cdot \ln[k_2/k_1] / [1/T_1 - 1/T_2]$; $= 8.314 \times 1.674 / (3.9216 \times 10^{-4})$; $= 3.546 \times 10^4 \text{ J mol}^{-1} = 35.5 \text{ kJ mol}^{-1}$.
- 5) Pre-exponential factor A (use $k = A e^{(-E_a/RT)}$); $A = k \cdot e^{(E_a/RT)}$ at 300 K .; $E_a/(RT) = [3.546 \times 10^4] / [8.314 \times 300] = 14.22$.; $e^{(14.22)} = 1.50 \times 10^6$.; So $A = 2.10 \times 10^{-3} \times 1.50 \times 10^6 = 3.15 \times 10^3 \text{ s}^{-1}$.; Line form:; $\ln k = \ln A - (E_a/R)(1/T)$.; Slope = $-E_a/R$ (unit: K), intercept = $\ln A$ (dimensionless).

Conclusion: $E_a \approx 35.5 \text{ kJ mol}^{-1}$ and $A \approx 3.15 \times 10^3 \text{ s}^{-1}$ for the

Given: data.

Section E — Case Study (4 marks each)
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A19.

(i) Calculate the partial pressure of A, P_A (atm), at $t = 200 \text{ s}$ and $t = 400 \text{ s}$.

Answer:

Use $P_A = 2P_0 - P_t$ with $P_0 = 0.800 \text{ atm}$.; At 200 s : $P_A = 2(0.800) - 1.040 = 1.600 - 1.040 = 0.560 \text{ atm}$.; At 400 s : $P_A = 1.600 - 1.200 = 0.400 \text{ atm}$.

(ii) Using first-order kinetics in terms of partial pressure, calculate k (s^{-1}) using $t = 400 \text{ s}$ data. (Use $k = (1/t) \ln(P_{A0}/P_{At})$ where $P_{A0} = P_0$.)

Answer:

Given: $P_{A0} = P_0 = 0.800 \text{ atm}$ and at 400 s , $P_{At} = 0.400 \text{ atm}$.; $k = (1/400)$

$\ln(0.800/0.400) = (1/400) \ln(2) = (1/400)(0.693) = 1.73 \times 10^{-3} \text{ s}^{-1}$.

(iii) Using the k found in (ii), predict the time (s) required for P_A to become 0.200 atm , and comment whether the 200 s data is consistent with the same k (one quantitative check).

Answer:

For first order: $k = (1/t) \ln(P_{A0}/P_{At}) \Rightarrow t = (1/k) \ln(P_{A0}/P_A)$.; Target $P_A = 0.200 \text{ atm}$; $P_{A0} = 0.800 \text{ atm}$.; $\ln(0.800/0.200) = \ln(4) = 1.386$.; So $t = 1.386/(1.73 \times 10^{-3}) = 8.01 \times 10^2 \text{ s} \approx 801 \text{ s}$.; Consistency check at 200 s : predicted $P_A = P_{A0} e^{-kt} = 0.800 e^{-(1.73 \times 10^{-3})(200)} = 0.800 e^{-0.346} = 0.800 \times 0.708 = 0.566 \text{ atm}$, which is very close to observed 0.560 atm , so data are consistent.