Chemical kinetics worksheet pdf

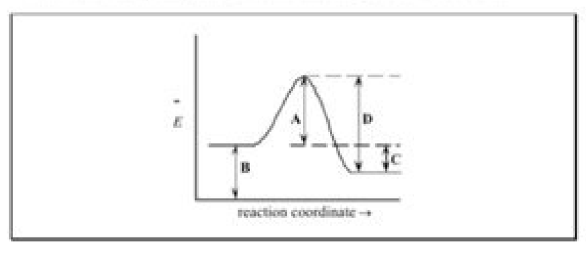
Worksheet 2 – Chapter 14 – Chemical Kinetics

1. The rate equation for a chemical reaction is determined by

(A) theoretical calculations.
(B) measuring reaction rate as a function of concentration of reacting species.
(C) determining the equilibrium constant for the reaction.
(D) measuring reaction rates as a function of temperature

2.

Which line in the diagram represents the activation energy for a forward reaction?



(A) **A** (B) **B** (C) **C** (D) **D**

3. The rate law for the reaction **A + B → C + D**

is first order in [**A**] and second order in [**B**]. If [**A**] is halved and [**B**] is doubled, the rate of the reaction will

(A) remain the same.
(B) be increased by a factor of 2.
(C) be increased by a factor of 4.
(D) be increased by a factor of 8.

4. Bimolecular reactions (e.g. A + B => C) generally occur at much slower rates than one would predict from the rate of collision between molecules as calculated from the gas kinetic theory. The discrepancy can be explained in terms of

(A) intermolecular repulsions.
(B) nonspherical molecular shapes.
(C) erroneous estimates of molecular size.
(D) activation energies of reaction.
(E) the uncertainty principle.

5. If a reaction proceeding by the mechanism **A + B → C + D**

occurs at a rate *x*, and if the concentrations of **A** and **B** are both doubled, what will be the new rate of reaction?

(A) *x* (B) 2*x* (C) 4*x* (D) 8*x* (E) 16*x*

Chemical Kinetics Worksheet I Chemistry 108
Name__________________________ Sec.____

1. Which of the following can be used to determine the rate equation for a chemical reaction?
   1. Measuring the rate of the reaction as a function of the concentration of reacting species.
   1. Measuring the rate of the reaction as a function of temperature.

2. Using the rate equation, Rate = k [A]^2[B], define the order of the reaction with respect to A and B. What is the total order of the reaction?

order w.r.t [A] = 2 order w.r.t [B] = 1 overall order = 3

3. A reaction has the experimental rate law, Rate = k [A]^2. How will the rate change is the concentration of A is tripled? Increased 9x. If the concentration of A is halved? Decreased by 1/4
4. Show the relationship between the rate of disappearance of reactants and formation of products for each of the following reactions.
   1. 2 O_3(g) → 3 O_2(g)
   2. 2 HOF(g) → 2 HF(g) + O_2(g)

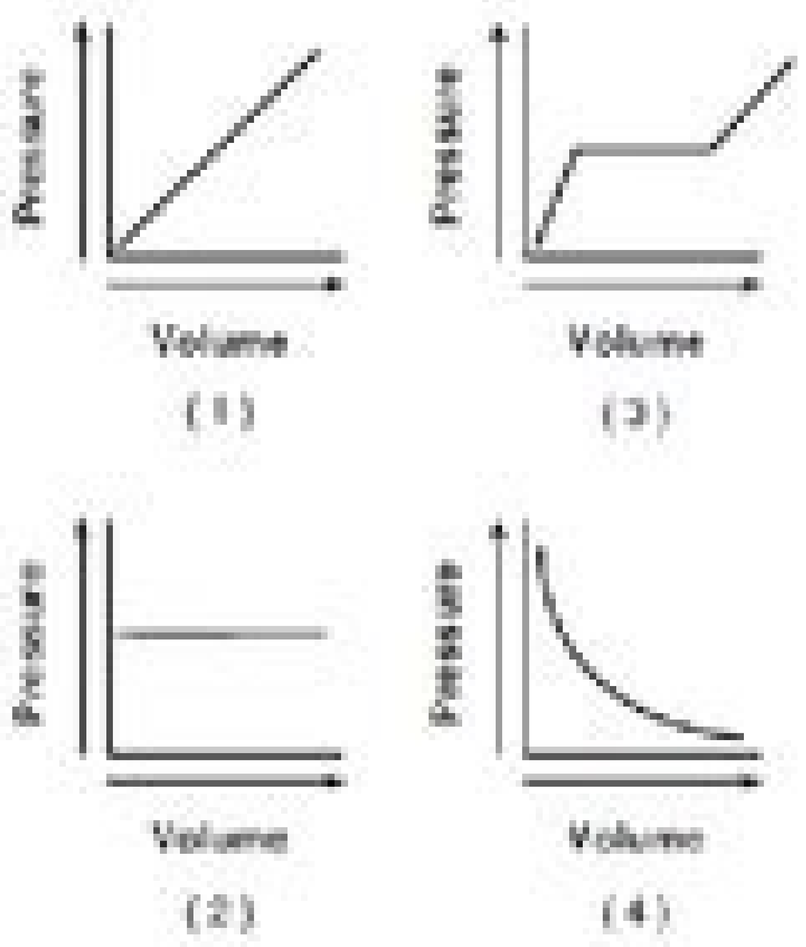
(A) Theoretical calculations

5. The reaction, 2 NO(g) + 2 H_2(g) → N_2(g) + 2 H_2O(g), was studied at 904°C, and the data are given below. **Reactant Concentration Rate of Appearance of N_2 (mol/L) (mol/L·s) [NO] [H_2]**

0.420 0.122 0.136
0.210 0.122 0.0339
0.210 0.244 0.0678
0.105 0.488 0.0339

a. Determine the order of the reaction with respect to each reactant. Write the Rate law for the reaction. Calculate the rate constant for the reaction. Calculate the rate of appearance of N_2 at the instant when [NO] = 0.350 M and [H_2] = [illegible]
a. 2nd order in NO, 1st order in H_2, 3rd
[illegible]

Chemistry Question Bank – Kinetic Molecular Theory and Gas Laws



The entropy of a sample of H2O increases as the sample changes from a

(1) gas to a liquid (3) liquid to a gas
(2) gas to a solid (4) liquid to a solid

(6/09)

A 1.0-mole sample of krypton gas has a mass of

(1) 19 g (3) 39 g
(2) 36 g (4) 84 g

Compared to the freezing point and boiling point of water at 1 atmosphere, a solution of a salt and water at 1 atmosphere has a

(1) lower freezing point and a lower boiling point
(2) lower freezing point and a higher boiling point
(3) higher freezing point and a lower boiling point
(4) higher freezing point and a higher boiling point

Under which conditions of temperature and pressure would a real gas behave most like an ideal gas?

12-3

- **Reaction Rate** = the change in concentration of reactant(s) or products per unit time.

↳ in the reaction on the last page (Table 12.1; Fig. 12-1) we have:

$$2\,NO_2(g) \longrightarrow 2\,NO(g) + O_2(g)$$

because being consumed (−)

$$\text{rate} = \frac{-\Delta[NO_2]}{\Delta t} \quad \text{or} \quad \text{rate} = \frac{\Delta[NO]}{\Delta t} \quad \text{or} \quad \text{rate} = 2\left(\frac{\Delta[O_2]}{\Delta t}\right)$$

because only half as much produced. See the balanced equation.

* so, the reaction rate, or "rate", can be written in terms of any of the reactants or in terms of any of the products.

↳ To be consistent however, it's customary to represent the reaction rate in terms of the reactant(s), so:

$$\text{rate} = \frac{-\Delta[NO_2]}{\Delta t}$$

- **An Examination of Figure 12-1 on the Previous Page.**

↳ at any single point on the NO_2 curve, we can calculate the instantaneous rate of the reaction.

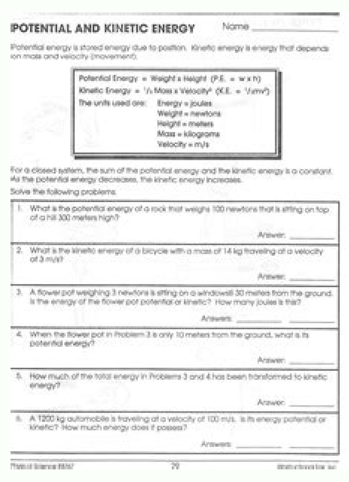
↳ = calculated by finding the slope (m) of the line tangent to the curve at the specific time (t).

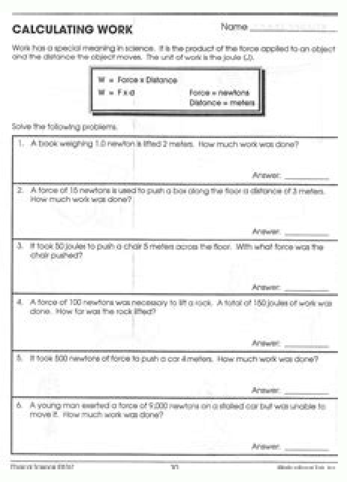
ex: Calculate the instantaneous rate of the reaction after 100. seconds has elapsed since the reaction started.

$$\text{slope} = m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-0.0026\ \text{mol/L}}{110\ \text{s}} \Longrightarrow m = -2.36 \times 10^{-5}\ \frac{\text{mol}}{\text{L}\cdot\text{s}}$$

note: these coordinates were not actually shown in Fig. 12-1. Only the results were shown.

↳ = instantaneous rate at t = 100. sec.





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Name: ______________________________ Section: ___________________________ Student ID#:________________________ Work in groups on these problems. You should try to answer the questions without referring to your textbook. If you get stuck, try asking another group for help. 1 Write the rate expression in terms of D[reactant]/Dt and D[product]/Dt: rate = - D[N2]/Dt = - D[H2]/3Dt = D[NH3]/2Dt 2 Determine a) the order of each reactant: 1st order in A; zero order in B b) the order of the reaction: overall reaction is 1st ordered c) write the rate law: rate = k[A] d) calculate the rate constant, k: k = 1.75 x 10-2/s 3a. The decomposition of A2B3 is second order with a k = 6.5 x 10-5 M-1s -1 at 25oC. If the initial concentration is 0.50 M, the concentration after 3 min is: 0.497 M b. The half-life for the reaction in question 3a is: 3.08 x 104 s 4. The decomposition of AB is first order with a k = 2.3 x 10-7 s-1 at 45oC. If the initial concentration is 0.25 M, the concentration after 2.3 min is: 0.25 M b. The half-life for the reaction in question 4a is: 3.01 x 106 s 5a. The concentration of reactant after 2.5 minutes if the inital concentration was 0.100 M and k = 6.93 x 10-3 s-1 for a first order reaction is: 0.0354 M b. The half-life is: 100 s 6. For the first order reaction: \[SO_2Cl_2 \rightarrow SO_2 + Cl_2\] How long will it take to reach 0.31 x 10-3 M if the inital concentration was 1.25 x 10-3 M and k = 0.17/hr? 8.2 hrs 7. For the second order reaction \(A \rightarrow B\) (k = 1.5 x 10-2/Ms), if the initial concentration of A is 0.10M, the concentration of A after 4 min is: 0.074 M the half-life is: 667 s Read and download free pdf of CBSE Class 12 Chemistry Chemical Kinetics Worksheet Set E. Students and teachers of Class 12 Chemistry can get free printable Worksheets for Class 12 Chemistry in PDF format prepared as per the latest syllabus and examination pattern in your schools. 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This test paper with questions and answers for Grade 12 Chemistry will be very useful for exams and help you to score good marksClass 12 Chemistry Worksheet for Chemical KineticsCHEMICAL KINETICSQ1) Define a) rate of a reaction b) activation energyQ2) The decomposition of PH3 follows the following reaction4PH3 →P4 + 6H2Rate equation is → Rate = k [PH3]. The Half life of PH3 is 37.9 sec at 120°Ca) How much time is required for 3/4th of PH3 to decompose? Ans[75.82 sec]b) What fraction of the original sample of PH3 remains behind after one minute? Ans[2.995]Q3) Define a) order of reaction b) molecularity of a reactionQ4) the rate of a reaction increases four times when the temperature changes from 300K to 320K. Find the activation energy. (R=8.314 J/K/mol) Ans [35.34 KJ/mol]Q5) A reaction is of first order in reactant A and of second order in reactant B. How is the rate of this reaction affected when a) conc. Of B alone is increased to 3 times? b) the conc. A as well as B are doubled? Important Questions for NCERT Class 12 Chemistry Chemical KineticsQuestion. For reaction aA→ xP , when [A] = 2.2 mM, the rate was found to be 2.4 mMs–1. On reducing concentration of A to half, the rate changes to 0.6 mMs–1. The order of reaction with respect to A is : (a) 1.5(b) 2.0(c) 2.5(d) 3.0Question. For a first order reaction, to obtain a positive slope, we need to plot {where [A] is the concentration of reactant A} (a) – log10[A] vs t(b) – loge[A] vs t(c) log10[A] vs log t(d) [A] vs tAnswer   BQuestion. T50 of first -order reaction is 10 min. Starting with 10 mol L–1, rate after 20 min is (a) 0.0693 mol L–1 min–1(b) 0.0693 × 2.5 mol L–1 min–1(c) 0.0693 × 5 mol L–2 min–1(d) 0.0693 × 10 mol L–1 min–1Answer   BQuestion. The first order rate constant for a certain reaction increases from 1.667 × 10–6 s–1 at 727ºC to 1.667 × 10–4 s–1 at 1571ºC. The rate constant at 1150ºC, assuming constancy of activation energy over the given temperature range is[Given : log 19.9 = 1.299] (a) 3.911 × 10–5 s–1(b) 1.139 × 10–5 s–1(c) 3.318 × 10–5 s–1(d) 1.193 × 10–5 s–1Answer   CQuestion. In most cases, for a rise of 10K temperature the rate constant is doubled to tripled. This is due to the reason that(a) collision frequency increases by a factor of 2 to 3.(b) fraction of molecules possessing threshold energy increases by a factor of 2 to 3(c) Activation energy is lowered by a factor of 2 to 3.(d) none of theseAnswer   BQuestion. The rate constant for the reaction, 2N2O5 →4NO2 +O2 is 3.0x10-4 s-1 . If start made with 1.0 mol L–1 of N2O5, calculate the rate of formation of NO2 at the moment of the reaction when concentration of O2 is 0.1 mol L–1.(a) 2.7 x10-4 molL-1s-1 (b) 2.4x10-4 molL-1s-1(c) 4.8x10-4 molL-1s-1(d) 9.6x10-4 molL-1s-1Answer   DQuestion. A reaction which is of first order w.r.t. reactant A, has a rate constant 6 min–1. If we start with [A] = 0.5 mol L–1, when would [A] reach the value of 0.05 mol L–1(a) 0.384 min(b) 0.15 min(c) 3 min(d) 3.84 minAnswer   AQuestion. Half-lives of a first order and a zero order reaction are same. Then the ratio of the initial rates of first order reaction to that of the zero order reaction is (a) 1/0.693(b) 2 × 0.693(c) 0.693(d) 2/0.693Answer   BQuestion. Collision theory is used to explain how chemical species undergo a reaction. Using this theory and the kinetic molecular model, which of the following does NOT influence the rate of a chemical reaction?(a) The temperature of the system(b) The geometry or orientation of the collision(c) The velocity of the reactants at the point of collision(d) All of the above influence the rateAnswer   DQuestion. For the following reaction: NO2(g) + CO(g) → NO(g) + CO2(g), the rate law is: Rate = k [NO2]2.If 0.1 mole of gaseous carbon monoxide is added at constant temperature to the reaction mixture which of the following statements is true?(a) Both k and the reaction rate remain the same(b) Both k and the reaction rate increase(c) Both k and the reaction rate decrease(d) Only k increases, the reaction rate remain the sameAnswer   APlease click the link below to download full pdf file for CBSE Class 12 Chemistry Worksheet - Chemical Kinetics. Click to View or Download pdf file › Click for more Chemistry Study Material › UNESCO has declared 21st February of every year to be celebrated as International Mother Language day to promote dissemination of Mother Language of all, create awareness of linguistic and cultural traditions and diversity across the world and to inspire solidarity... 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This test paper with questions and answers for Grade 12 Chemistry will be very useful for exams and help you to score good marksClass 12 Chemistry Worksheet for Chemical KineticsONE MARK QUESTIONS1. Why does the rate of a reaction not remain constant throughout the reaction process? (2010)2. The rate of a reaction is 1.2 x 10-3 L/mol/s. What is the order of the reaction?TWO MARK QUESTIONS1.Define the following terms :a) Half-life of a reaction (t½)b) Rate constant (k) (2015)2.A first order decomposition reaction takes 40 minutes for 30% decomposition. Calculate its t1/2 value. (2008)3.Show that for a first order reaction, the time required for half the change is independent of initial concentration. (2010)THREE MARK QUESTIONS1.A reaction is first order in A and second order in B.a) Write differential rate equation.b) How is the rate affected when the concentration of A is tripled?c) How is the rate affected when the concentration of both A and B are doubled?2.For a certain chemical reaction, variation in the concentration, ln[R] Vs time(s) plot is given below: ln[R] T(s) For the reactiona) What is the order of the reaction?b) Give the relationship between k and t1/2c) What does the slope of the above line indicate? Important Questions for NCERT Class 12 Chemistry Chemical KineticsQuestion. The decomposition of phosphine (PH3) on tungsten at low pressure is a first-order reaction. It is because the(a) rate is proportional to the surface coverage(b) rate is inversely proportional to the surface coverage(c) rate is independent of the surface coverage(d) rate of decomposition is very slow.Question. The rate constant of the reaction A B is 0.6 × 10–3 mol L–1 s–1. If the concentration of A is 5 M, then concentration of B after 20 minutes is(a) 3.60 M(b) 0.36 M(c) 0.72 M(d) 1.08 M Question. For a reaction between A and B the order with respect to A is 2 and the order with respect to B is 3.The concentrations of both A and B are doubled, the rate will increase by a factor of(a) 12(b) 16(c) 32(d) 10Question. In a reaction, A + B → product, rate is doubled when the concentration of B is doubled, and rate increases by a factor of 8 when the concentration of both the reactants (A and B) are doubled, rate law for the reaction can be written as(a) rate = k[A][B]2(b) rate = k[A]2[B]2(c) rate = k[A][B](d) rate = k[A]2[B]Question. Which one of the following statements for the order of a reaction is incorrect?(a) Order can be determined only experimentally.(b) Order is not influenced by stoichiometric coefficient of the reactants.(c) Order of a reaction is sum of power to the concentration terms of reactants to express the rate of reaction.(d) Order of reaction is always whole number.Question. The unit of rate constant for a zero order reaction is(a) mol L–1 s–1(b) L mol–1 s–1(c) L2 mol–2 s–1(d) s–1Question. For the reaction, A + B → products, it is observed that(i) on doubling the initial concentration of A only, the rate of reaction is also doubled and(ii) on doubling the initial concentration of both A and B, there is a change by a factor of 8 in the rate of the reaction.The rate of this reaction is given by(a) rate = k[A][B]2(b) rate = k[A]2[B]2(c) rate = k[A][B](d) rate = k[A]2[B]Question. The rate of reaction between two reactants A and B decreases by a factor of 4 if the concentration of reactant B is doubled. The order of this reaction with respect to reactant B is(a) 2(b) –2(c) 1(d) –1Question. If the rate of the reaction is equal to the rate constant, the order of the reaction is(a) 0(b) 1(c) 2(d) 3 Question. 2A B → C, It would be a zero order reaction when(a) the rate of reaction is proportional to square of concentration of A(b) the rate of reaction remains same at any concentration of A(c) the rate remains unchanged at any concentration of B and C(d) the rate of reaction doubles if concentration of B is increased to double.Please click the link below to download full pdf file for CBSE Class 12 Chemistry Chemical Kinetics. 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