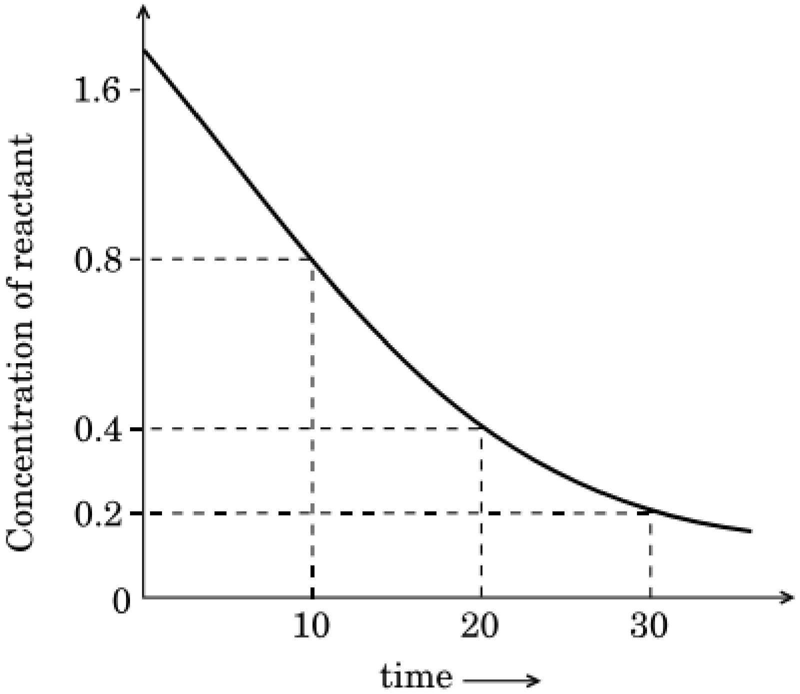
INDIAN SCHOOL AL WADI AL KABIR

Class: XII	DEPARTMENT: SCIENCE 2021 - 22 SUBJECT: CHEMISTRY		Date of completion: IV week of October, 2021
Worksheet No:10 with answers	TOPIC: CHEMICAL KINETICS		Note: A4 FILE FORMAT
NAME OF THE STUDENT		CLASS & SEC:	ROLL NO.

MULTIPLE CHOICE QUESTIONS

1.	Unit of rate constant of a second order is ………. a) mol^{-1} L s^{-1} b) mol L^{-1} s^{-1} c) s^{-1} d) mol^{-1} L s
2.	For a reaction, A + B → Product; the rate law is given by, Rate = k [A] $[B]^2$. What is the order of the reaction? a) 1 b) 2 c) 3 d) 0
3.	For a reaction, A + 2B → C + D, the rate law is given by, Rate = k $[A]^2$ [B] If concentrations of both A and B are doubled, how will it affect the rate of the reaction? a) Rate increases by 4 times b) Rate increases by 6 times c) Rate increases by 8 times d) Rate increases by 12 times

4.	Thermal decomposition of HI on gold surface is an example of ……………. a) first order reaction b) zero order reaction c) third order reaction d) second order reaction
5.	Analyse the given graph, drawn between concentration of reactant vs. time.  Predict the order of reaction. a) first order reaction b) zero order reaction c) third order reaction d) second order reaction
6.	The half-life of a reaction is …………… a) half the time for the reaction to go to completion. b) the time taken for the rate of reaction to halve. c) the time in which the concentration of a reactant is reduced to one half of its initial concentration d) None of these

7.	The number of reacting species taking part in an elementary reaction, which must collide simultaneously in order to bring about a chemical reaction is called ……………. a) order of a reaction. b) rate of a reaction. c) complexity of a reaction d) molecularity of a reaction
8.	Identify the incorrect statement. a) Order of a reaction is an experimental quantity. b) Order of a reaction can be zero and even a fraction. c) Order is applicable to elementary as well as complex reactions d) Molecularity is applicable to elementary as well as complex reactions
9.	The reactions taking place in one step are called ………………. a) zero order reactions b) first order reactions c) elementary reactions d) complex reactions
10.	Maximum molecularity that can be observed is …………. a) 2 b) 3 c) 1 d) 4

Read the given passage and answer the questions that follow:

Some reactions such as ionic reactions occur very fast, for example, precipitation of silver chloride occurs instantaneously by mixing of aqueous solutions of silver nitrate and sodium chloride. On the other hand, some reactions are very slow, for example, rusting of iron in the presence of air and moisture. Also, there are reactions like inversion of cane sugar and hydrolysis of starch, which proceed with a moderate speed. the speed of a reaction or the rate of a reaction can be defined as the change in concentration of a reactant or product in unit time.

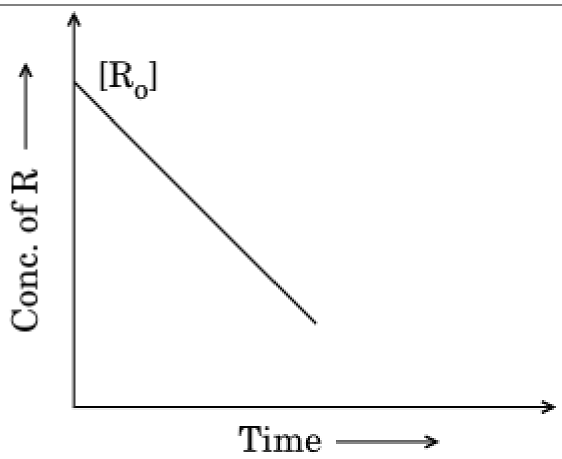
11.	Define rate law.
12.	What are complex reactions?
13.	Define order of reaction. Write the condition under which a bimolecular reaction follows first order kinetics.

Assertion and Reasoning Questions

14.	**Assertion:** The molecularity of the reaction $H_2 + Br_2 \rightarrow 2HBr$ appears to be 2. **Reason:** Two molecules of the reactants are involved in the given elementary reaction. a) Assertion and reason both are correct statements and reason is correct explanation for assertion. b) Assertion and reason both are correct statements but reason is not correct explanation for assertion. c) Assertion is correct statement but reason is wrong statement. d) Assertion is wrong statement but reason is correct statement.
15.	**Assertion:** Hydrolysis of an ester follows second order kinetics. **Reason:** Concentration of water remains nearly constant during the course of the reaction. a) Assertion and reason both are correct statements and reason is correct explanation for assertion. b) Assertion and reason both are correct statements but reason is not correct explanation for assertion. c) Assertion is correct statement but reason is wrong statement. d) Assertion is wrong statement but reason is correct statement.
16.	**Assertion:** The boiling of an egg in an open vessel takes more time at a hill station. **Reason:** At high altitudes, atmospheric pressure decreases, boiling point increases so cooking time increases. a) Assertion and reason both are correct statements and reason is correct explanation for assertion. b) Assertion and reason both are correct statements but reason is not correct explanation for assertion. c) Assertion is correct statement but reason is wrong statement. d) Assertion is wrong statement but reason is correct statement.

Question – Answer Type:

17.	A reaction is first order with respect to reactant A and second order with respect to reactant B. Give the rate law.	**1**
18.	Write any two factors that affect the rate of a chemical reaction.	**1**
19.	Give one point of difference between average rate and instantaneous rate.	**1**

20.	A first order reaction takes 25 minutes for 25% decomposition. Calculate $t_{1/2}$. [Given: log 2 = 0·3010, log 3 = 0·4771, log 4 = 0·6021]	**2**
21.	In the given reaction $A + 3B \rightarrow 2C$, the rate of formation of C is $2{\cdot}5 \times 10^{-1}$ mol L^{-1} s^{-1}. Calculate: (i) rate of reaction (ii) rate of disappearance of B.	**2**
22.	Show that in a first order reaction, time required for completion of 99.9% is 10 times of half-life of the reaction.	**2**
23.	A first order reaction is 40% complete in 80 minutes. Calculate the value of rate constant (k). In what time will the reaction be 90% completed? [Given: log 2 = 0·3010, log 3 = 0·4771, log 4 = 0·6021, log 5 = 0·6771, log 6 = 0·7782]	**3**
24.	 (i) Predict the order of reaction. (ii) What does the slope of the line indicate? (iii) What are the units of rate constant?	**3**
25.	The rate constant for a first order reaction is 60 s^{-1}. How much time will it take to reduce the initial concentration of the reactant to its 1/16 th value?	**3**

ANSWERS

1.	a) $mol^{-1}\ L\ s^{-1}$
2.	c) 3
3.	c) Rate increases by 8 times
4.	b) zero order reaction
5.	a) first order reaction
6.	c) the time in which the concentration of a reactant is reduced to one half of its initial concentration
7.	d) molecularity of a reaction
8.	d) Molecularity is applicable to elementary as well as complex reactions
9.	c) elementary reactions
10.	b) 3
11.	The representation of rate of a reaction in terms of concentration of the reactants is known as rate law.
12.	When a sequence of elementary reactions gives the products, the reactions are called complex reactions.
13.	Sum of powers of the concentration of the reactants in the rate law expression is called order of reaction. A bimolecular reaction follows first order kinetics when one of the reactants is present in large excess.
14.	a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
15.	d) Assertion is wrong statement but reason is correct statement.
16.	c) Assertion is correct statement but reason is wrong statement
17.	Rate = $k[A][B]^2$
18.	Concentration of reactants, Temperature, Pressure, Surface area and Catalyst (any two factors)
19.	Average rate is the rate of a reaction for a particular period or interval of time. Instantaneous rate is the rate of a reaction at a particular instant of time.
20.	$k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$ = 2.303/25 log 100/75 = 2.303/25 log 4/3

	= 2.303/25 (0.6021 – 0.4771) = 0.0115 min^{-1} $t_{1/2}$ = 0.693/k = 0.693/0.0115 = 60.26 min.
21.	Rate $= -\frac{\Delta[A]}{\Delta t} = -\frac{1}{3}\frac{\Delta[B]}{\Delta t} = \frac{1}{2}\frac{\Delta[C]}{\Delta t}$ (i) Rate $= \frac{1}{2}\frac{\Delta[C]}{\Delta t}$ 2x Rate $= \frac{\Delta[C]}{\Delta t} = 2.5 \times 10^{-4}$ Rate $= \frac{2.5 \times 10^{-4}}{2} = 1.25 \times 10^{-4}$ mol $l^{-1}s^{-1}$ ii) Rate $= -\frac{1}{3}\frac{\Delta[B]}{\Delta t}$ $1.25 \times 10^{-4} = -\frac{1}{3}\frac{\Delta[B]}{\Delta t}$ $-\frac{\Delta[B]}{\Delta t} = 3 \times 1.25 \times 10^{-4} = 3.75 \times 10^{-4}$ mol $l^{-1}s^{-1}$
22.	When reaction is completed 99.9%, $[R]_n = [R]_0 - 0.999[R]_0$ $k = \frac{2.303}{t}\log\frac{[R]_0}{[R]}$ $= \frac{2.303}{t}\log\frac{[R]_0}{[R]_0 - 0.999[R]_0} = \frac{2.303}{t}\log 10^3$ $t = 6.909/k$ For half-life of the reaction $t_{1/2} = 0.693/k$ $\frac{t}{t_{1/2}} = \frac{6.909}{k} \times \frac{k}{0.693} = 10$
23.	$k = \frac{2.303}{t}\log\frac{[R]_0}{[R]}$ $= \frac{2.303}{80}\log\frac{100}{60}$ $= \frac{2.303}{80} \times (1 - 0.7782)$ $= 0.0064\ min^{-1}$ t = 2.303/0.0064 log 100/10 = 360 min
24.	(i) zero order (ii) slope = - k (iii) molL^{-1} s^{-1}

25.	$k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$ = 2.303/ 60 log 1/16 = 0.046 s

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