

**UNIT TEST-7**  
**(CHEMICAL KINETICS)**

**CLASS : XII**  
**SUB : CHEMISTRY**

**MARK : 70**  
**TIME : 3.00 HRS**

**PART-I**

**I. Choose and write the correct answer :**

**15X 1 = 15**

1. The initial concentration of the reactant is doubled , the time for half reaction also doubled. Then the order
  - a) Zero
  - b) One
  - c) Two
  - d) Three
2. Unit of first order reaction is
  - a)  $\text{sec}^{-1}$
  - b)  $\text{min}^{-1}$
  - c)  $\text{time}^{-1}$
  - d) All of these
3. If 75% of a first order reaction was completed in 60 minutes , 50% of the same reaction under the same conditions would be completed in
  - a) 20 minutes
  - b) 30 minutes
  - c) 35 minutes
  - d) 75 minutes
4. A zero order reaction  $X \rightarrow \text{Product}$  , with an initial concentration 0.02M has a half life of 10 minutes. If one starts with concentration 0.04M , then the half life is
  - a) 10s
  - b) 5 min
  - c) 20 min
  - d) Cannot be predicted using the given information
5. For a first order reaction , the rate constant is  $6.909 \text{ min}^{-1}$  . The time taken for 75% conversion in minutes is
  - a)  $(3/2)\log 2$
  - b)  $(2/3)\log 2$
  - c)  $(3/2)\log (3/4)$
  - d)  $(2/3)\log (4/3)$
6. The addition of a catalyst during chemical reaction alters which of the following quantities
  - a) Enthalpy
  - b) Activation energy
  - c) Entropy
  - d) Internal energy
7.  $E_a$  of a reaction is zero the value of rate constant in
  - a) 0
  - b) A
  - c)  $E_a$
  - d)  $E_a/2$
8. The Unit of Zero order rate constant is
  - a)  $\text{litre mol}^{-1} \text{ sec}^{-1}$
  - b)  $\text{mol litre}^{-1} \text{ sec}^{-1}$
  - c)  $\text{sec}^{-1}$
  - d)  $\text{litre}^2 \text{ sec}^{-1}$
9. The rate law for a reaction is  $\text{rate} = k [A]^{1/2} [B]^{3/2}$  . Then the order of the reaction is
  - a) 0
  - b) 1
  - c) 1.5
  - d) 2
10. The half life period of a first order reaction is
  - a)  $t_{1/2} = \frac{2.303}{k} \log 2$
  - b)  $t_{1/2} = \frac{2.303}{k} \times 0.3010$
  - c)  $t_{1/2} = \frac{0.693}{k}$
  - d) all the above

11. If half life period of a first order reaction is 100 minutes, then rate constant of the reaction is  
 a)  $6.93 \times 10^3 \text{ min}^{-1}$     b)  $0.693 \times 10^{-3} \text{ min}^{-1}$     c)  $6.93 \times 10^{-3} \text{ min}^{-1}$     d)  $69.3 \times 10^{-2} \text{ min}^{-1}$
12. In the Arrhenius equation  $k = Ae^{-E_a/RT}$  the factor 'A' represents  
 a) Energy of activation    b) Frequency factor    c) Threshold energy    d) Rate constant
13. The activation energy of a reaction can be lowered by  
 a) lowering temperature    b) removing products  
 c) lowering pressure    d) adding a catalyst
14. Arrhenius equation is  
 a)  $k = Ae^{-1/RT}$     b)  $k = Ae^{-RT/E_a}$     c)  $k = Ae^{-E_a/RT}$     d)  $k = Ae^{E_a/RT}$
15. If half life period of a first order reaction is 20 min. The time taken for the completion of 99.9 % of the reaction is  
 a) 200 min    b) 2000 min    c) 250 min    d) 20 min

### PART-I

#### II. Answer any six questions (q.no.24 is compulsory)

6 x 2 = 12

16. Define rate law and rate constant.
17. Explain pseudo first order reaction with an example
18. Explain rate determining step with an example.
19. Write the rate law for the following reactions. (a) A reaction that is 3/2 order in x and zero order in y. (b) A reaction that is second order in NO and first order in Br<sub>2</sub>.
20. The rate constant for a first order reaction is  $1.54 \times 10^{-3} \text{ s}^{-1}$ . Calculate its half life time.
21. Identify the order for the following reactions  
 (i) Rusting of Iron    (ii) Radioactive disintegration of  ${}_{92}\text{U}^{238}$ .
22. Write Arrhenius equation and explain the terms involved.
23. Define order of reaction ?
24. Give the schematic representation of proper and improper alignment of reactant for a general reaction  $A_2 + B_2 \rightarrow 2AB$

**PART-III****III. Answer any six questions (q.no.33 is compulsory)****6 x 3 =18**

25. What is an elementary reaction? What are the differences between order and molecularity?
26. Derive integrated rate law for a zero order reaction .  $A \rightarrow \text{Product}$ .
27. The rate law for a reaction of A,B and C has been found to be  $\text{rate} = K[A]^2[B][C]^{3/2}$ . How would the rate change when i) [C] is quadrupled ii) [A] is halved iii) Concentration of both [A] and [B] are doubled.
28. The half life of a first order reaction  $x \rightarrow \text{Product}$  is  $6.932 \times 10^4$  s at 500K. What % of x would be decompose on heating at 500K for 100 minutes. ( $e^{0.06} = 1.06$ )
29. Give three examples for first order reaction.
30. Define half life of a reaction. Show that for a first order reaction half life is independent of initial concentration
31. write the difference between rate and rate constant of a reaction
32. Define order and molecularity of a reaction
33. Show that in case of first order reaction , the time required for 99.9% completion is nearly ten times the time required for half completion of the reaction

**PART-IV****IV. Answer all the questions .****5x5=25**

34. a) Derive an expression for rate law of first order reaction with its graphical representation
- (OR)
- b) i) Show that in case of first order reaction the time required for the completion 99% twice required for the completion of 99% of the reaction
- ii) Explain the effect of catalyst on reaction rate with an example
35. a) i) The rate of the reaction.  $x + 2y \rightarrow \text{product}$  is  $4 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$  if  $[x] = [y] = 0.2 \text{ M}$  and rate constant at 400K is  $2 \times 10^{-3} \text{ s}^{-1}$  what is the overall order of the reaction ?
- ii) rate constant of a reaction at 400 and 200 K are  $0.04$  and  $0.02 \text{ s}^{-1}$  respectively. Calculate the value of activation energy.
- (OR)
- b) Explain briefly the collision theory of bimolecular reaction

36. a) i) A first order reaction takes 8 hours for 90 % completion . Calculate the time required for 80 % completion .(log 5 =0.6989 ; log 10 =1)
- ii) Define – average rate and instantaneous rate.

(OR)

- b) i) A first order reaction takes 8 hours for 90 % completion calculate the time required for 80 % completion
- ii) What is activation energy ?

37. a) i) A zero order reaction is 20% complete in 20 minutes. Calculate the value of the rate constant. In what time will the reaction be 80% complete?
- ii) How do concentrations of the reactant influence the rate of reaction?

(OR)

- b) Derive Arrhenius equation to calculate  $E_a$  from rate constants  $k_1$  and  $k_2$  at temperature  $T_1$  and  $T_2$

Show

38. a) i) Show that the half life period of zero order reaction directly proportional to the initial concentration of the reaction
- ii) A first order reaction is 40% complete in 50 minutes. Calculate the value of the rate constant. In what time will the reaction be 80% complete?

(OR)

- b) Mention the factors affecting the rate of the reaction

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