Rate of Chemical Reaction Fill in the blanks

1. The rate of a chemical reaction is defined as the change in _____ per unit time.
   Answer: concentration
2. Precipitation of silver chloride is an example of an _____ reaction.
   Answer: instantaneous
3. The negative sign in the rate expression of reactants indicates a decrease in _____.
   Answer: concentration
4. Instantaneous rate is obtained when the time interval Δt approaches _____.
   Answer: zero
5. The slope of the tangent drawn on a concentration-time graph gives the _____ rate of reaction.
   Answer: instantaneous
6. In gaseous reactions, rate may also be expressed in terms of change in _____ pressure.
   Answer: partial
7. For the reaction $2HI \rightarrow H_2 + I_2$, the rate of disappearance of HI is _____ times the rate of formation of H_2.
   Answer: two
8. Average rate of reaction depends on change in concentration and the time _____.
   Answer: interval

9. In the reaction $Hg + Cl_2 \rightarrow HgCl_2$, the rates of disappearance and appearance are _____ because all stoichiometric coefficients are one.
   Answer: equal
10. The unit of reaction rate when concentration is expressed in mol L^{-1} and time in seconds is _____.
    Answer: mol L^{-1} s^{-1}

QAs

1. **What is meant by rate of a chemical reaction?**
   The rate of a chemical reaction is the change in concentration of reactants or products per unit time.

2. **Why is rusting of iron considered a slow reaction?**
   Rusting occurs gradually over a long period of time, so it is considered a slow reaction.

3. **Why is precipitation of silver chloride called an instantaneous reaction?**
   Silver chloride forms immediately when silver nitrate and sodium chloride solutions are mixed.

4. **What is average rate of reaction?**
   Average rate of reaction is the change in concentration of reactants or products over a specific time interval.

5. **What is instantaneous rate of reaction?**
   Instantaneous rate is the rate of reaction at a particular moment of time.

6. **Why is a negative sign used in the rate expression for reactants?**
   The negative sign is used because the concentration of reactants decreases during the reaction.

7. **What are the units of reaction rate?**
   The units of reaction rate are mol L^{-1} s^{-1}.

8. **How is instantaneous rate determined graphically?**
   It is determined by calculating the slope of the tangent drawn on the concentration-time graph.

9. **Why are stoichiometric coefficients used in rate expressions?**
   Stoichiometric coefficients are used to make the rates of disappearance and appearance equal.

10. **How can the rate of a gaseous reaction be expressed?**
    The rate of a gaseous reaction can also be expressed in terms of change in partial pressure with time.

MCQS

1. **Rate of reaction is the change in:**
   A) Temperature
   B) Concentration per unit time
   C) Pressure only
   D) Volume only

Answer: B) Concentration per unit time

Explanation: Reaction rate measures how quickly the concentration of reactants or products changes with time.

2. **Which is a very fast reaction?**
   A) Rusting of iron
   B) Hydrolysis of starch
   C) Precipitation of AgCl
   D) Inversion of cane sugar

Answer: C) Precipitation of AgCl

Explanation: Ionic precipitation reactions occur almost instantly when the solutions are mixed.

3. **Rusting of iron is a:**
   A) Fast reaction
   B) Slow reaction
   C) Instantaneous reaction
   D) Explosive reaction

Answer: B) Slow reaction

Explanation: Rusting takes place gradually over a long period of time.

4. **Inversion of cane sugar is a:**
   A) Slow reaction
   B) Moderate reaction
   C) Instant reaction
   D) Very fast reaction

Answer: B) Moderate reaction

Explanation: Inversion of cane sugar proceeds at a moderate speed.

5. **Average rate of disappearance of reactant is:**

$$-\frac{\Delta[R]}{\Delta t}$$

A) Δ[R]/Δt
B) –Δ[R]/Δt
C) d[R]/dt
D) Δt/Δ[R]

Answer: B) –Δ[R]/Δt

Explanation: Reactant concentration decreases with time, so a negative sign is used to express the rate as positive.

6. **Negative sign in rate of reactant is used because:**
   A) Time decreases
   B) Product decreases
   C) Reactant concentration decreases
   D) Pressure increases

Answer: C) Reactant concentration decreases

Explanation: During a reaction, reactants are consumed, so their concentration decreases.

7. **Rate of appearance of product is:**
   $$\frac{\Delta[P]}{\Delta t}$$

   A) Positive
   B) Negative
   C) Zero
   D) Infinite

Answer: A) Positive

Explanation: Product concentration increases as the reaction proceeds.

8. **Unit of reaction rate is:**
   A) mol L^{-1} s^{-1}
   B) mol^2 s^{-1}
   C) L mol^{-1}
   D) s mol^{-1}

Answer: A) mol L^{-1} s^{-1}

Explanation: Rate = concentration/time, so its unit is molarity per second.

9. **For gaseous reactions, rate may be expressed in:**

A) kg s^{-1}
B) atm s^{-1}
C) m s^{-1}
D) joule s^{-1}

Answer: B) atm s^{-1}

Explanation: For gases, concentration can be represented in terms of partial pressure.

10. **Instantaneous rate is rate at:**
A) Long interval
B) Particular instant
C) Equilibrium only
D) Initial stage only

Answer: B) Particular instant

Explanation: Instantaneous rate gives the speed of reaction at a specific moment.

11. **Instantaneous rate is obtained when:**
A) $\Delta t \rightarrow \infty$
B) $\Delta t \rightarrow 0$
C) $t = 1$
D) $\Delta[R] = 0$

Answer: B) $\Delta t \rightarrow 0$

Explanation: Instantaneous rate is calculated for an infinitesimally small time interval.

12. **Instantaneous rate expression:** $-\frac{d[R]}{dt}$ represents:

A) Average rate
B) Instantaneous rate
C) Equilibrium constant
D) Order of reaction

Answer: B) Instantaneous rate

Explanation: Differential form gives the rate at a particular instant.

13. **Graphically instantaneous rate is given by:**
    A) Area under curve
    B) Slope of tangent
    C) Intercept
    D) Curve length

Answer: B) Slope of tangent

Explanation: The slope of the tangent to the concentration-time graph gives instantaneous rate.

14. **Average rate is:**
    A) Constant over interval chosen
    B) Always increasing
    C) Always decreasing
    D) Infinite

Answer: A) Constant over interval chosen

Explanation: Average rate is calculated over a fixed time interval.

15. **For reaction R → P, rate of disappearance of R equals:**
    A) Twice product rate

B) Half product rate
C) Rate of appearance of P
D) Zero

Answer: C) Rate of appearance of P

Explanation: One mole of R forms one mole of P, so both rates are equal.

16. **For $2HI \rightarrow H_2 + I_2$, rate expression contains factor:**
A) 1/2 for HI
B) 2 for H_2
C) 3 for I_2
D) 1/4 for HI

Answer: A) 1/2 for HI

Explanation: Stoichiometric coefficients are used to make all rates equal.

17. **In rate expression stoichiometric coefficients are used to:**
A) Change units
B) Make all rates equal
C) Increase speed
D) Stop reaction

Answer: B) Make all rates equal

Explanation: Dividing by coefficients gives a common reaction rate.

18. **For $aA + bB \rightarrow cC$, rate is divided by:**
A) Molecular masses

B) Stoichiometric coefficients
C) Atomic numbers
D) Temperature

Answer: B) Stoichiometric coefficients

Explanation: Stoichiometric coefficients balance the rates of reactants and products.

19. **In reaction $Hg + Cl_2 \rightarrow HgCl_2$, rates of disappearance and appearance are:**
A) Different
B) Equal
C) Zero
D) Unrelated

Answer: B) Equal

Explanation: All coefficients are 1, so the rates are equal.

20. **For gaseous reactions concentration is proportional to:**
A) Volume
B) Pressure
C) Density
D) Temperature only

Answer: B) Pressure

Explanation: At constant temperature, gas concentration is directly proportional to pressure.

21. **Hydrolysis of starch is:**
A) Very fast

B) Moderate
C) Instantaneous
D) Explosive

Answer: B) Moderate
Explanation: Hydrolysis reactions occur at a moderate speed.

22. **Which is not a unit of reaction rate?**
A) mol L^{-1} s^{-1}
B) atm s^{-1}
C) mol L^{-1}
D) concentration $time^{-1}$

Answer: C) mol L^{-1}

Explanation: Rate must include time in the denominator.

23. **Rate of reaction can be expressed in terms of:**
A) Reactant concentration
B) Product concentration
C) Both A and B
D) Catalyst only

Answer: C) Both A and B

Explanation: Rate may be expressed either by decrease in reactant or increase in product concentration.

24. **Average rate depends on:**
A) Change in concentration
B) Time interval

C) Both A and B
D) Pressure only

Answer: C) Both A and B

Explanation: Average rate is the ratio of concentration change to time interval.

25. **Instantaneous rate is more useful because it gives rate:**
A) Over long interval
B) At a specific moment
C) At equilibrium only
D) For products only

Answer: B) At a specific moment

Explanation: It gives the exact rate at a particular time.

26. **Rate of disappearance of reactants is generally:**
A) Positive
B) Negative in expression
C) Zero
D) Infinite

Answer: B) Negative in expression

Explanation: Reactant concentration decreases as reaction proceeds.

27. **Reaction rate generally:**
A) Always increases with time
B) Usually decreases with time

C) Remains infinite
D) Remains zero

Answer: B) Usually decreases with time

Explanation: Reactant concentration decreases with time, reducing collision frequency.

28. **Slope of concentration-time graph gives:**
A) Equilibrium constant
B) Reaction rate
C) Activation energy
D) Order

Answer: B) Reaction rate

Explanation: The slope represents change in concentration per unit time.

29. **If reactant concentration decreases rapidly, reaction is:**
A) Slow
B) Fast
C) Stopped
D) Reversible only

Answer: B) Fast

Explanation: Rapid decrease in concentration indicates high reaction speed.

30. **Chemical kinetics mainly studies:**
A) Rate of reaction
B) Reaction mechanism

C) Factors affecting rate
D) All of these
Answer: D) All of these

Explanation: Chemical kinetics includes reaction rates, mechanisms, and factors affecting the reaction speed.