



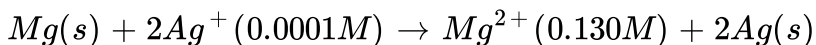
CHEMISTRY

BOOKS - VIKRAM PUBLICATION (ANDHRA PUBLICATION)

ELECTROCHEMISTRY & CHEMICAL KINETICS

Textual Examples

1. Represent the cell in which the following reaction takes place

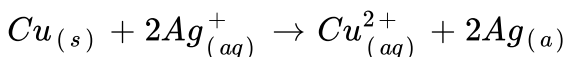


Calculates its E_{cell} if $E_{cell}^{\ominus} = 3.17V$



[Watch Video Solution](#)

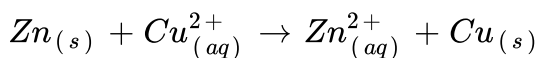
2. Calculate the equilibrium constant of the reaction :



$$E_{(cell)}^{\ominus} = 0.46V$$

 [Watch Video Solution](#)

3. The standard emf of Daniell cell is 1.1 V. Calculate the standard Gibbs energy for the cell reactions:



 [Watch Video Solution](#)

4. Resistance of a conductivity cell filled with 0.1molL^{-1} KCl solution is 100Ω . If the resistance of the same cell when filled with 0.02molL^{-1} KCl solution is 520Ω , calculate the conductivity and molar conductivity of 0.02molL^{-1} KCl solution. The conductivity of 0.1molL^{-1} KCl solution is 1.29 S/m .

 [View Text Solution](#)

5. The electrical resistance of a column 0.05molL^{-1} NaOH solution of diameter 1 cm and length 50 cm is 5.55×10^3 ohm. Calculate its resistivity, conductivity and molar conductivity.

 [Watch Video Solution](#)

6. Calculate Λ_m^0 for CaCl_2 and MgSO_4 from the data given in Table 3.4.

 [Watch Video Solution](#)

7. Λ_m^0 for NaCl, HCl and NaAc are 126.4, 425.0 and $91.0\text{Scm}^2\text{mol}^{-1}$ respectively. Calculate $\Lambda(0)$ for Hac.

 [Watch Video Solution](#)

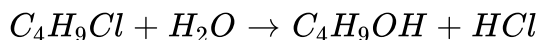
8. The conductivity of $0.001028 \text{ mol L}^{-1}$ acetic acid is $4.95 \times 10^{-5} \text{ S cm}^{-1}$. Calculate its dissociation constant if $\wedge (m)^0$ for acetic acid is $390.5 \text{ S cm}^2 \text{ mol}^{-1}$.

 [Watch Video Solution](#)

9. A solution of CuSO_4 is electrolysed for 10 minutes with a current of 1.5 amperes. What is the mass of copper deposited at the cathode?

 [Watch Video Solution](#)

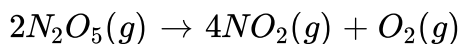
10. From the concentration of $\text{C}_4\text{H}_9\text{Cl}$ (butyl chloride) at different times given below, calculate the average rate of the reaction:



t/s	0	50	100	150	200	300	400	500	700	800
$[\text{C}_4\text{H}_9\text{Cl}]/\text{mol L}^{-1}$	0.100	0.0905	0.0820	0.0741	0.0671	0.0549	0.0439	0.0335	0.0210	0.017

 [Watch Video Solution](#)

11. The decomposition of N_2O_5 in CCl_4 at 318K has been studied by monitoring the concentration of N_2O_5 in the solution. Initially the concentration of N_2O_5 is 2.33molL^{-1} and after 184 minutes, it is reduced to 2.08molL^{-1} . The reaction takes place according to the equation



Calculate the average rate of this reaction in terms of hours, minutes and seconds. What is the rate of production of NO_2 during this period?

 [Watch Video Solution](#)

12. Calculate the overall order of a reaction which has the rate expression

a) Rate = $k[A]^{1/2}[B]^{3/2}$

d) Rate = $k[A]^{3/2}[B]^{-1}$

 [Watch Video Solution](#)

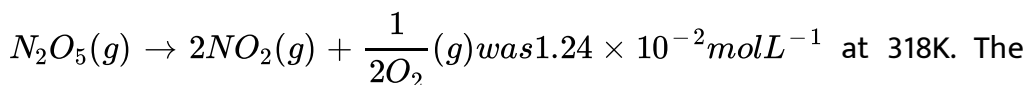
13. Identify the reaction order from each of the following rate constants.

i) $k = 2.3 \times 10^5 \text{ L mol}^{-1} \text{ s}^{-1}$

ii) $k = 3 \times 10^{-4} \text{ s}^{-1}$

 [Watch Video Solution](#)

14. The initial concentration of N_2O_5 in the following first order reaction

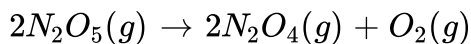


concentration of N_2O_5 after 60 minutes was $0.20 \times 10^{-2} \text{ mol L}^{-1}$.

Calculate the rate constant of the reaction at 138 K.

 [Watch Video Solution](#)

15. The following data were obtained during the first order thermal decomposition of N_2O_5 (g) at constant volume :



S.No.	Time/s	Total Pressure/(atm)
1	0	0.5
2	100	0.512

Calculate the rate constant.

 [Watch Video Solution](#)

16. A first order reaction is found to have a rate constant, $k = 5.5 \times 10^{-14} \text{ s}^{-1}$. Find the half-life of the reaction.

 [Watch Video Solution](#)

17. Show that in a first order reaction, time required for completion of 99.9 % is 10 times of half-life ($t_{1/2}$) of the reaction.

 [Watch Video Solution](#)

18. Hydrolysis of methyl acetate in aqueous solution has been studied by titrating the liberated acetic acid against sodium hydroxide. The concentration of the ester at different times is given below.

t / min	0	30	60	90
C / mol L ⁻¹	0.8500	0.8004	0.7538	0.7096

Show that it follows a pseudo first order reaction, as the concentration of water remains nearly constant (55molL^{-1}), during the course of the reaction. What is the value of k in this equation?

$$\text{Rate} = k' [\text{CH}_3\text{COOCH}_3][\text{H}_2\text{O}]$$

 [Watch Video Solution](#)

19. The rate constants of a reaction at 500 K and 700 K are 0.02s^{-1} and 0.04s^{-1} respectively. Calculate the values of E_a and A.

 [Watch Video Solution](#)

20. The first order rate constant for the decomposition of ethyl iodide by the reaction.

$C_2H_5I(g) \rightarrow C_2H_4(g) + HI(g)$ at 600 K is $1.60 \times 10^{-5} s^{-1}$. Its energy of activation is 209 kJ/mol. Calculate the rate constant of the reaction at 700 K.

 [Watch Video Solution](#)

Problems

1. The standard potentials of some electrodes are as follows. Arrange the metals in an increasing order of their reduction power.

1) $K^+ / K = -2.93V$ 2) $Ag^+ / Ag = 0.80V$ 3) $Cu^{2+} / Cu = 0.34V$
4) $Mg^{2+} / Mg = -2.37V$ 5) $Cr^{3+} / Cr = -0.74V$ 6) $Fe^{2+} / Fe = -0.44V$

 [Watch Video Solution](#)

2. Calculate the emf of the cell at $25^\circ C$

$Cr|Cr^{3+}(0.1M)||Fe^{2+}(0.01M)|Fe$, given that

$$E_{Cr^{3+}/Cr}^0 = -0.74V \text{ and } E_{Fe^{2+}/Fe}^0 = -0.44V$$

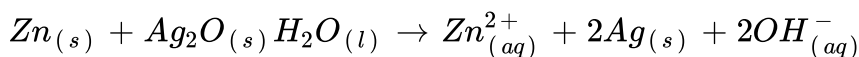
 [Watch Video Solution](#)

3. Calculate the potential of a $Zn - Zn^{2+}$ electrode in which the molarity of Zn^{2+} is $0.001M$. Given that $E_{Zn^{2+}/Zn}^0 = -0.76V$

$$R = 0.314JK^{-1}mol^{-1}, F = 96500Cmol^{-1}.$$

 [Watch Video Solution](#)

4. Determine ΔG^0 for the button cell used in the watches. The cell reactions is



$$E_{Ag^+/Ag}^0 = +0.80V, E_{Zn^{2+}/Zn}^0 = -0.76V.$$

 [Watch Video Solution](#)

5. Calculate the emf of the cell consisting the following half cells

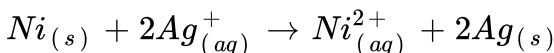
$Al / Al^{3+} (0.001M), Ni / Ni^{2+} (0.50M)$. Given that $E_{Ni^{2+} / Ni}^0 = -0.25V$

$$E_{Al^{3+} / Al} = -1.66V (\log 8 \times 10^{-6} = -5.0969).$$



Watch Video Solution

6. Determine the values of K_c for the following reacton



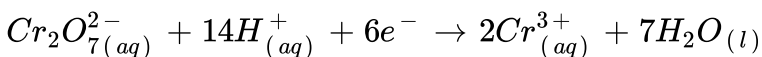
$$E^{\circ} = 1.05V$$



Watch Video Solution

7. Calculate the potential of the half-cell containing 0.1 M

$K_2Cr_2O_{7(aq)}, 0.2M Cr^{3+}_{(aq)}$ and $1.0 \times 10^{-4}MH^{+}_{(aq)}$. The half-reaction



$$(E^{\circ} \text{ of } Cr_2O_7^{2-} / Cr^{3+} = 1.33V)$$



Watch Video Solution

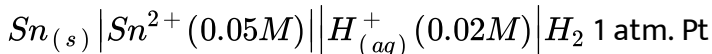
8. Calculate K_c for the reaction at 298 K



$$E_{\text{Zn}^{2+}/\text{Zn}}^0 = -0.76\text{V}, E_{\text{Cu}^{2+}/\text{Cu}}^0 = +0.34\text{V}.$$

 [Watch Video Solution](#)

9. Calculate the emf of the cell at 298 K



$$\text{Given that } E_{\text{sn}^{2+}/\text{Sn}}^0 = -0.144\text{V}$$

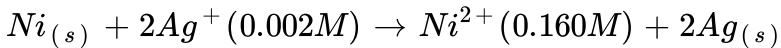
 [Watch Video Solution](#)

10. Calculate the concentration of silver ions in the cell constructed by using 0.1 M concentration of Cu^{2+} and Ag^+ ions. Cu and Ag metals are used as electrodes. The cell potential is 0.422 V.

$$[E_{\text{Ag}^{2+}/\text{Ag}} = 0.80\text{V}, E_{\text{Cu}^{2+}/\text{Cu}} = +0.34\text{V}]$$

 [Watch Video Solution](#)

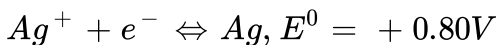
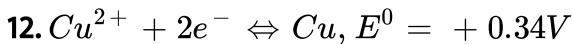
11. Calculate the emf of the cell with the cell reaction



$$E_{cell}^0 = 1.05V.$$



Watch Video Solution



For what concentration of Ag^+ ions will the emf of the cell be zero at $25^\circ C$. The concentration of Cu^{2+} is 0.1M. ($\log 3.919 = 0.539$).



Watch Video Solution

13. The conductivity of 0.20M solution of KCl at 298 K is $0.0248 S cm^{-1}$.

Calculate molar conductance.



Watch Video Solution

14. Calculate the degree of dissociation (α) of CH_3COOH at 298 K. It is

$$\Lambda_{CH_3COOH}^{\infty} = 11.75 \text{ cm}^2 \text{ mol}^{-1}$$

$$\Lambda_{CH_3COO^-}^{\infty} = 40.65 \text{ cm}^2 \text{ mol}^{-1}$$

$$\Lambda_{H^+}^0 = 349.15 \text{ cm}^2 \text{ mol}^{-1}$$

 [Watch Video Solution](#)

15. A reaction is 50% completed in 2 hours and 75% completed in 4 hours. What is the order of the reaction.

 [Watch Video Solution](#)

16. A reaction has a half-life of 10 minutes. Calculate the rate constant for the first order reaction.

 [Watch Video Solution](#)

17. In a first order reaction, the concentration of the reaction is reduced from 0.6 mol /L to 0.2 mol/L in 5 min. Calculate the rate constant (k).

 [Watch Video Solution](#)

18. The rate constant for a zero order reaction in A is $0.0030 \text{ mol L}^{-1} \text{ s}^{-1}$. How long it will take for the initial concentration of A to fall from 0.10 M to 0.075M.

 [Watch Video Solution](#)

19. A first order decomposition reaction takes 40min. For 30% decomposition. Calculate its $t_{1/2}$ value.

 [Watch Video Solution](#)

20. Calculate the half-life of first order reaction whose rate constant is 200s^{-1} .

 [Watch Video Solution](#)

21. The thermal decomposition of HCOOH is a first order reaction. The rate constant is $2.4 \times 10^{-3}\text{s}^{-1}$ at a certain temperature. Calculate how long will it take for 3/4 of initial quantity of HCOOH to decompose

 [Watch Video Solution](#)

22. The decomposition of a compound is found to follow first order rate law. If it takes 15 minutes for 20 % of original material to react, calculate the rate constant.

 [Watch Video Solution](#)

23. In a pseudo first order hydrolysis of ester in water, the following results are obtained

t (sec)	0	30	60	90
[ester] M	0.55	0.31	0.17	0.085

Calculate the average rate of reaction between the time interval 30 to 60 s.

 [Watch Video Solution](#)

24. The half-life for a first order reaction is 5×10^6 s. What percentage of the initial reactant will react in 2 hours ?

 [Watch Video Solution](#)

25. $H_2O_2(aq)$ decomposes to $H_2O(l)$ and $O_2(g)$ in a first reaction w.r.t. H_2O_2 . The rate constant is $k = 1.06 \times 10^{-3} \text{min}^{-1}$. How long it will take 15 % of the sample of decompose ?

 [Watch Video Solution](#)

26. Show that in the case of first order reaction, the time required for 99.9 % completion of the reaction is 10 times that required for 50 % completion ($\log 2 = 0.3010$)

 [Watch Video Solution](#)

27. The rate constant of a reaction is doubled when the temperature is raised from 298 K to 308 K. Calculate the activation energy.

 [Watch Video Solution](#)

28. The first order rate constant for the decomposition of ethyl iodide by the reaction.

$C_2H_5I(g) \rightarrow C_2H_4(g) + HI(g)$ at 600 K is $1.60 \times 10^{-5} s^{-1}$. Its energy of activation is 209 kJ/mol. Calculate the rate constant of the reaction at 700 K.

 [Watch Video Solution](#)

29. The activation energy for the reaction $2HI_{(g)} \rightarrow H_{2(g)} + I_{2(g)}$ at 581 K is 209.5 kJ/mol . Calculate the fraction of molecules having energy equal to or greater than activation energy. $[R = 8.31 \text{ JK}^{-1} \text{ mol}^{-1}]$

 [Watch Video Solution](#)

30. For a reaction $R \rightarrow P$, the concentration of a reactant changes from 0.03 M to 0.02 M in 25 minutes. Calculate the average rate of the reaction using the units of seconds.

 [Watch Video Solution](#)

31. In a reaction $2A \rightarrow \text{Products}$, the concentration of A decreases from 0.5 mol l^{-1} to 0.4 mol l^{-1} in 10 minutes. Calculate the rate during this interval.

 [Watch Video Solution](#)

32. For a reaction, $A + B \rightarrow \text{Product}$: the rate law is given by

$r = k[A]^{1/2}[B]^2$ What is the order of the reaction ?

A. 3

B. 2

C. 5/2

D. 5/4

Answer: C



[Watch Video Solution](#)

33. The conversion of molecules X to Y follows second order kinetics. If concentration of X is increased by three times, how will it affect the rate of formation of Y.



[Watch Video Solution](#)

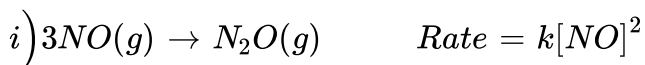
34. A first order reaction has a rate constant $1.15 \times 10^{-3} \text{ s}^{-1}$. How long will 5 g of this reactant take to reduce to 3 g ?

 [Watch Video Solution](#)

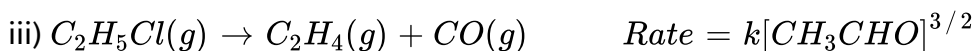
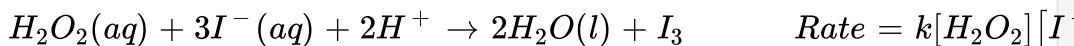
35. Time required to decompose SO_2Cl_2 to half of its initial amount is 60 minutes. If the decomposition is a first order reaction, calculate the rate constant of the reaction.

 [Watch Video Solution](#)

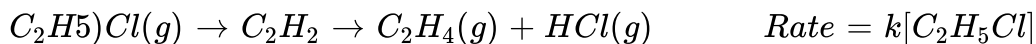
36. From the rate expression for the following reactions, determine their order of reaction and the dimensions of the rate constants.



ii)



iv)



 [Watch Video Solution](#)

37. For the reaction $2A + B \rightarrow A, B$, the rate = $K[A][B]^2$ with $k = 2.0 \times 10^{-6} \text{ mol}^{-2} \text{ L}^2 \text{ s}^{-1}$. Calculate the initial rate of the reaction when $[A] = 0.1 \text{ mol L}^{-1}$, $[B] = 0.2 \text{ mol L}^{-1}$, Calculate the rate of reaction after $[A]$ is reduced to 0.06 mol L^{-1} .

 [Watch Video Solution](#)

38. The decomposition of NH_3 on platinum surface is zero order reaction. What are the rates of production of N_2 and H_2 if $k = 2.5 \times 10^{-4} \text{ mol}^{-1} \text{ L s}^{-1}$.

 [Watch Video Solution](#)

39. The rate expression for the decomposition of dimethyl ether in terms of partial pressures is given as $\text{Rate} = k(p\text{CH}_3\text{OCH}_3)^{3/2}$. If the pressure is measured in bar and time in minutes, then what are the units of rate and rate constant ?

 [Watch Video Solution](#)

40. A reaction is second order with respect to a reactant. How is the rate of reaction is affected if the concentration of the reactant is i) doubled ii) reduced to half

 [Watch Video Solution](#)

41. A reaction is first order in A and second order in B.

i) Write the differential rate equation

ii) How is the rate affected on increasing the concentrations of B three times ?

iii) How is the rate effected when the concentrations of both A and B are doubled ?

 [Watch Video Solution](#)

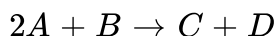
42. In a reactio between A and B, the initial rate of reaction (r_0) was measured for different initial concentrations of A and B as given below :

A/ mol L⁻¹	0.20	0.20	0.40
B/ mol L⁻¹	0.30	0.10	0.05
r_0/ mol L⁻¹s⁻¹	5.07×10^{-5}	5.07×10^{-5}	1.43×10^{-5}

What is the order of the reaction with respect to A and B?

 [Watch Video Solution](#)

43. The following results have been obtained during the kinetic studies of the reaction :



Experiment	[A] mol L ⁻¹	[B] mol L ⁻¹	Initial rate of formation of D / mol L ⁻¹ min ⁻¹
1.	0.1	0.1	6.0×10^{-3}
2.	0.3	0.2	7.2×10^{-2}
3.	0.3	0.4	2.88×10^{-1}
4.	0.4	0.1	2.40×10^{-2}

Determine the rate law and rate constant for the reaction.

 [Watch Video Solution](#)

44. The rate constant for a first order reaction is $60s^{-1}$. How much time will it take to reduce the initial concentration of the reactant to its $1/6^{th}$ value ?

 [Watch Video Solution](#)

45. For a first order reaction, k show that the time required for 99 % completion is twice the time required for completion of 99 % reaction.

 [Watch Video Solution](#)

46. For the decomposition of azosipropane to hexane and nitrogen at 543 k, the following data obtained.

t(sec)	P (mm of Hg)
0	35.0
360	54.0
720	63.0

Calculate the rate constant.

 [Watch Video Solution](#)

47. The following data were obtained during the first order thermal decomposition of SO_2Cl_2 at a constant volume.



Experiment	Time / s⁻¹	Total pressure / atm
1	0	0.5
2	100	0.6

Calculate the rate of reaction when total pressure is 0.65 atm.

 [Watch Video Solution](#)

48. The rate constant for the decomposition of hydrocarbons is $2.418 \times 10^{-5} \text{ s}^{-1}$ at 546 K. If the energy of activation is 179.9 kJ/mol .

What will be the value of pre-exponential factor ?

 [Watch Video Solution](#)

49. Consider a certain reaction $A \rightarrow \text{Products}$ with $k = 2.0 \times 10^{-2} \text{ s}^{-1}$.

Calculate the concentration of A remaining after 100 s if the initial concentration of A is 1.0 mol L^{-1} .

 [Watch Video Solution](#)

50. Sucrose decompose in acid solution into glucose and fructose according to the first order rate law, with $t_{\frac{1}{2}} = 3.00$ hours. What fraction of sample of sucrose remains after 8 hours ?

 [Watch Video Solution](#)

51. The decomposition of hydrocarbon follows the equation

$$K = (4.5 \times 10^{11} \text{ s}^{-1}) e^{-18000K/T}. \text{ Calculate } E_a.$$

 [Watch Video Solution](#)

52. The rate constant for the first order decomposition of H_2O_2 is given by the following equation : $\log k = 14.34 - 1.25K/T$. Calculate E_a for this reactin and at what temperature will its half-life period be 256 minutes ?

 [Watch Video Solution](#)

53. The decomposition of A into product has value of k as $4.5 \times 10^3 \text{ s}^{-1}$ at $10^\circ C$ and energy of activation 60 kJ mol^{-1} . At what temperature would k be $1.5 \times 10^4 \text{ s}^{-1}$?

 [Watch Video Solution](#)

54. The time required for 10 % completion of a first order reaction at 298 K is equal to that required for its 25 % completion at 308K. If the value of A is $4 \times 10^{10} \text{ s}^{-1}$. calculate k at 318K and E_a ,

 [Watch Video Solution](#)

55. The rate of a reaction quadruples when temperature changes from 293 K to 312K, Calculate the energy of activation of the reaction assuming that it does not change with temperature.

 [Watch Video Solution](#)

Very Short Answer Questions

1. What is a galvanic cell or a voltaic cell ? Give one example.

 [Watch Video Solution](#)

2. Write the chemical reaction used in the construction of the Daniell cell together with the half-cell reactions.

 [Watch Video Solution](#)

3. Name the two half-cell reactions that are taking place in the Daniell cell.

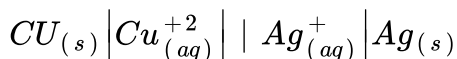
 [Watch Video Solution](#)

4. How is a galvanic cell represented on paper as per IUPAC convention ?

Give one example.

 [Watch Video Solution](#)

5. Write the cell reaction taking place in the cell



 [Watch Video Solution](#)

6. What is standard hydrogen electrode ?

 [Watch Video Solution](#)

7. Give a neat sketch of standard hydrogen electrode.

 [Watch Video Solution](#)

8. What is Nernst equation ? Write the equation for an electrode with electrode reaction $M^{n+}(aq) + e^{-} \rightleftharpoons M(s)$.

 [Watch Video Solution](#)

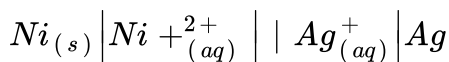
9. A negative E^0 indicates that the redox couple is ____ reducing couple than H^+ / H_2 , couple. (powerful or weak)

 [Watch Video Solution](#)

10. A positive E^0 indicates that the redox couple is a weaker _____ couple than H^+ / H_2 couple. (oxidising or reducing)

 [Watch Video Solution](#)

11. Write the Nernst equation for the EMF of the cell



 [Watch Video Solution](#)

12. Write the cell reaction for which $E_{cell} = E^0_{cell} - \frac{RT}{2F} \ln \frac{[Mg^{2+}]}{[Ag^+]^2}$

 [Watch Video Solution](#)

13. How is E^0 cell related mathematically to the equilibrium constant K_c of the cell reaction ?



 [Watch Video Solution](#)

14. How is Gibbs energy (G) related to the cell emf (E) mathematically ?

 [Watch Video Solution](#)

15. Define conductivity of a material. Give its SI units.

 [Watch Video Solution](#)

16. What is cell constant of a conductivity cell ?

 [Watch Video Solution](#)

17. Define molar conductivity Λ_m and how is it related to conductivity (K) ?

 [Watch Video Solution](#)

18. Give the mathematical equation which gives the variation of molar conductivity with Λ_m the molarity (c) of the solution ?

 [Watch Video Solution](#)

19. State Kohlrausch's law of independent migration of ions.

 [Watch Video Solution](#)

20. State Faraday's first law of electrolysis.

 [Watch Video Solution](#)

21. State Faraday's second law of electrolysis.

 [Watch Video Solution](#)

22. What are the products obtained at the platinum anode and the platinum cathode respectively in the electrolysis of fused or molten NaCl ?

 [Watch Video Solution](#)

23. Give the products obtained at the platinum electrodes (cathode and anode) when aqueous solution of K_2SO_4 is electrolysed.

 [Watch Video Solution](#)

24. Give the chemical equation that represents the reduction of liquid water $H_2O_{(l)}$ at the platinum cathode.

 [Watch Video Solution](#)

25. Give the chemical equation that represents the reduction of liquid water $H_2O_{(l)}$ at the platinum cathode.



[Watch Video Solution](#)

26. What is a primary battery ? Give one example.



[Watch Video Solution](#)

27. Give one example for a secondary battery. Give the cell reaction.



[Watch Video Solution](#)

28. Give the cell reaction of nickel-cadmium secondary battery.



[Watch Video Solution](#)

29. What are the fuel cells ? How are they different from galvanic cells ?

Give the construction of H_2 , O_2 fuel cell ?



[Watch Video Solution](#)

30. Give the electrode reactions occurring at the anode and at the cathode in H_2, O_2 , fuel cell.

 [Watch Video Solution](#)

31. What is metallie corrosion ? Give one example.

 [Watch Video Solution](#)

32. Give the electro-chemical reaction that represents the corrosion or rusting of iron.

 [Watch Video Solution](#)

33. Define the speed or rate of a raction.

 [Watch Video Solution](#)

34. Assuming that the volume of the system is constant, derive the average rate of the system $R \rightarrow p$ in terms of R and P. [time = 't' sec] [R = reactant, P= product].

 [Watch Video Solution](#)

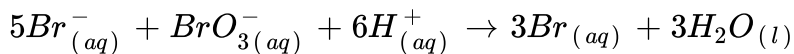
35. What are the units of rate of reaction ?

 [Watch Video Solution](#)

36. Draw the graphs that relate the concentrations (C) of the reactants and the reaction times (t) and the concentrations of the products(C) and the reaction times (t) in chemical reactions .

 [Watch Video Solution](#)

37. Write the equation for the rate of the reaction



 [Watch Video Solution](#)

38. What is rate law? Illustrate with an example.

 [Watch Video Solution](#)

39. Mention a reaction for which the exponents of concentration terms are not the same as their stoichiometric coefficients in the rate equation.

 [Watch Video Solution](#)

40. Define order of a reaction. Illustrate your answer with an example.

 [Watch Video Solution](#)

41. What are elementary reactions ?

 [Watch Video Solution](#)

42. What are complex reactions ? Name one complex reaction.

 [Watch Video Solution](#)

43. Give the units of rate constants for Zero, first order and second order reactions.

 [Watch Video Solution](#)

44. Define molecularity of a reaction, Illustrate with an example.

 [Watch Video Solution](#)

45. What is rate determining step in a complex reaction ?

 [Watch Video Solution](#)

46. Give the mechanism for the decomposition reaction of H_2O_2 in alkaline medium catalysed by I^- ions.

 [Watch Video Solution](#)

47. Write the equation relating $[R]$, $[R]_0$ and reaction time 't' for a zero order reaction. $[R]$ = concentration of reactant at time 't' and $[R]_0$ = initial concentration of reactant.

 [Watch Video Solution](#)

48. Draw the graph that the concentration 'R', of the reactant and 't' the reaction time for a zero Order reaction.

 [Watch Video Solution](#)

49. Give two examples for zero order reaction.

 [Watch Video Solution](#)

50. Write the intergrated equation for a first order reaction in terms of $[R]$, $[R]_0$ and 't'.

 [Watch Video Solution](#)

51. Give two examples for gaseous first order reactions.

 [Watch Video Solution](#)

52. For the reaction $A(g) \rightarrow B(g) + C(g)$, write the intergrated rate equation in terms of total pressure 'P' and the partial pressures

$P_A P_B P_C$.

 [Watch Video Solution](#)

53. What is half-life of a reaction? Illustrate your answer with an example.

 [Watch Video Solution](#)

54. Write the equation relating the half-life ($t_{1/2}$) of a reaction and the rate constant 'k' for first order reaction.

 [Watch Video Solution](#)

55. Write the equation useful to calculate half-life ($t_{1/2}$) values for zero and first order reactions.

 [Watch Video Solution](#)

56. What are pseudo first order reactions ? Give one example.

 [Watch Video Solution](#)

57. Write the Arrhenius equation for the rate constant (k) of a reaction.

 [Watch Video Solution](#)

58. By how many times the rate constant increases for a rise of reaction temperature by $10^{\circ}C$?

 [Watch Video Solution](#)

59. Explain the term 'activation energy' of a reaction with a suitable diagram.

 [Watch Video Solution](#)

60. Write the equation which relates the rate constants k_1 and k_2 at temperatures T_1 and T_2 of a reaction.

 [Watch Video Solution](#)

61. What is collision frequency (Z) of a reaction? How is rate related to it for the reaction $A + B \rightarrow$ Products.

 [Watch Video Solution](#)

62. Draw the graphs between potential energy - reaction coordinates for catalysed and uncatalysed reactions.

 [Watch Video Solution](#)

63. What is the effect of temperature on the rate constant?

 [Watch Video Solution](#)

Short Answer Questions

1. What are galvanic cells ? Explain the working of a galvanic cell with a neat sketch taking Daniell cell as example.

 [Watch Video Solution](#)

2. Give the construction and working of a standard hydrogen electrode with a neat diagram.

 [Watch Video Solution](#)

3. State and explain Nernst equation with the help of a metallic electrode and a non-metallic electrode.

 [Watch Video Solution](#)

4. Explain with a suitable example the relation between the gibbs energy of chemical reaction (G) and the functioning of the electrochemical cell.

 [Watch Video Solution](#)

5. On what factors the electrical conductance of an aqueous solution of electrolyte depends ?

 [Watch Video Solution](#)

6. How is molar conductivity of an aqueous electrolyte solution measured experimentally

 [Watch Video Solution](#)

7. Explain the variation of molar conductivity with the change in the concentration of the electrolyte. Give reasons.

 [Watch Video Solution](#)

8. State and explain Kohlrausch's law of independent migration of ions.

 [Watch Video Solution](#)

9. What is electrolysis ? Give Faraday's first law of electrolysis.

 [Watch Video Solution](#)

10. What are the products obtained at the cathode and anode during the electrolysis of the following when platinum electrodes are used in the electrolysis

a) Molten b) *Aq.* $CuSO_4$ solution c) *Aq.* K_2SO_4 solution

 [Watch Video Solution](#)

11. What are primary and secondary batteries ? Give one example for each.



[Watch Video Solution](#)

12. What are the fuel cells ? How are they different from galvanic cells ?

Give the construction of H_2, O_2 fuel cell ?



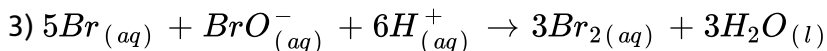
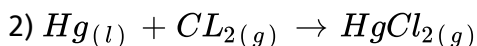
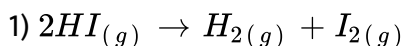
[Watch Video Solution](#)

13. What is metallic corrosion ? Explain it with respect to iron corrosion.



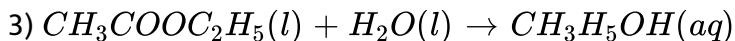
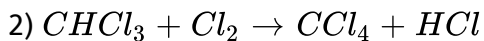
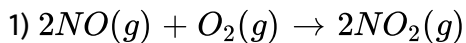
[Watch Video Solution](#)

14. Define average rate of a reaction. How is the rate of reaction expressed in term of change in the concentration of reactants and products for the following reactions.



[Watch Video Solution](#)

15. What is rate equation ? How is it obtained ? Write the rate equations for



 [Watch Video Solution](#)

16. Define and explain the order of a reaction. How is it obtained experimentally ?

 [Watch Video Solution](#)

17. What is "molecularity" of a reaction ? How is it different from the 'order' of a reaction? Name one bimolecular and one trimolecular gaseous reactions.

 [Watch Video Solution](#)

 Watch Video Solution

18. Derive the integrated rate equation for a zero order reaction.

 Watch Video Solution

19. Derive an integrated rate equation for a first order reaction.

 Watch Video Solution

20. Derive an integrated rate equation in terms of total pressure (P) and the partial pressures P_A, P_B, P_C for the gaseous reaction $A(g) \rightarrow B(g) + C(g)$.

 Watch Video Solution

21. What is half-life ($t_{1/2}$) of a reaction? Derive the equations for the 'half-life' value of zero and first order reactions.



[Watch Video Solution](#)

22. What is Arrhenius equation ? Derive an equation which describes the effect of rise of temperature (T) on the rate constant (k) of a reaction.



[Watch Video Solution](#)

23. Discuss the effect of catalyst on the kinetics of a chemical reaction with a suitable diagram.



[Watch Video Solution](#)

24. Give a detailed account of the Collision theory of reaction rates of biomolecular reaction.



[Watch Video Solution](#)

25. Explain the terms

a) Activation energy (E_a)

b) Collision frequency (Z)

c) Probability factor (P) with respect to Arrhenius equation.

 [Watch Video Solution](#)

Long Answer Questions

1. What are electro chemical cells ? How are they constructed ? Explain the working of the different types of galvanic cells ?

 [Watch Video Solution](#)

2. What is electrical conductance of a solution ? How is it measured experimentally ?

 [Watch Video Solution](#)

3. Give the applications of Kohlrausch's law of independent migration of ions.

 [Watch Video Solution](#)

4. Given the different types of batteries and explain the construction and working of each type of battery.

 [View Text Solution](#)

5. Explain the terms with suitable examples.

Average rate of a reaction

 [Watch Video Solution](#)

6. Explain the terms with suitable examples.

Slow and fast reactions



[Watch Video Solution](#)

7. Explain the terms with suitable examples.

Order of a reaction



[Watch Video Solution](#)

8. Explain the terms with suitable examples.

Molecularity of a reaction



[Watch Video Solution](#)

9. Explain the terms with suitable examples.

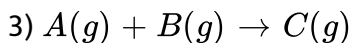
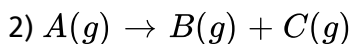
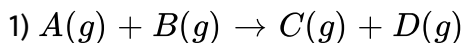
Activation energy of reaction.



[Watch Video Solution](#)

10. Give two examples for each of zero order and first order reactions.

Write the equations for the rate of reaction in terms of concentration changes of reactants and products for the following reactions.



 [Watch Video Solution](#)

11. Discuss the effect of temperature on the rate of a reaction. Derive necessary equations in this context.

 [Watch Video Solution](#)

12. Give a detailed account of the collision theory of reaction rates of bimolecular gaseous reactions.

 [View Text Solution](#)

1. How would you determine the standard electrode potential of the system Mg^{2+} / Mg ?

 [Watch Video Solution](#)

2. Can you store copper sulphate solutions in a zinc pot ?

 [Watch Video Solution](#)

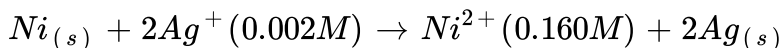
3. Consult the table on standard electrode potentials and suggest three substance that can oxidise ferrous ions under suitable conditions.

 [Watch Video Solution](#)

4. Calculate the potential of hydrogen electrode placed in a solution of pH 10.

 [Watch Video Solution](#)

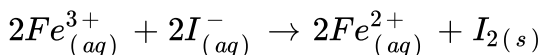
5. Calculate the emf of the cell with the cell reaction



$$E_{cell}^0 = 1.05V.$$

 [Watch Video Solution](#)

6. The cell in which the following cell reaction occurs,



has $E_{cell}^0 = 0.236V$ at 298 K. Calculate the standard Gibbs energy and the equilibrium constant of the cell reaction.

 [Watch Video Solution](#)

7. Why does the conductivity of a solution decrease with dilution ?

 [Watch Video Solution](#)

8. Suggest a way to determine the Λ_m^0 value of water .

 [Watch Video Solution](#)

9. The molar conductivity of 0.025molL^{-1} methanoic acid is $46.1\text{Scm}^2\text{mol}^{-1}$. Calculate its degree of dissociation and dissociation constant.

Given, $\lambda^0(H^+) = 349.6\text{Scm}^2\text{mol}^{-1}$

and $\lambda^0(HCOO^-) = 54.6\text{Scm}^2\text{mol}^{-1}$

 [Watch Video Solution](#)

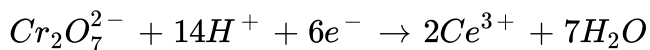
10. If a current of 0.5 ampere flows through a metallic wire for 2h, then how many electrons would flow through the wire ?

 [Watch Video Solution](#)

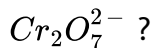
11. Suggest a list to metals that are extracted electrolytically.

 [Watch Video Solution](#)

12. Consider the reaction,



What is the quantity of electricity in coulombs needed to reduce 1 mole



 [Watch Video Solution](#)

13. Write the chemistry of recharging the lead stronge battery, highlighting all the materials that are involved during recharging.

 [Watch Video Solution](#)

14. Suggest two materials other than hydrogen that can be used as fuels in fuel cells.

 [Watch Video Solution](#)

15. Explain how rusting of iron is envisaged as electrochemical cell.

 [View Text Solution](#)

16. For the reaction, $R \rightarrow P$, the concentration of a reactant changes from 0.03 M to 0.02 in 25 min. Calculate the average rate of reaction using units of time both in minutes and second.

 [Watch Video Solution](#)

17. In a reaction $2A \rightarrow \text{Products}$, the concentration of A decreases from 0.5 mol l^{-1} to 0.4 mol l^{-1} in 10 minutes. Calculate the rate during this

interval.

 [Watch Video Solution](#)

18. For a reaction, $A + B \rightarrow \text{Product}$: the rate law is given by

$r = k[A]^{1/2}[B]^2$ What is the order of the reaction ?

 [Watch Video Solution](#)

19. The conversion of molecules X to Y follows second order kinetics. If concentration of X is increased by three times, how will it affect the rate of formation of Y.

 [Watch Video Solution](#)

20. A first order reaction has a rate constant $1.15 \times 10^{-3} \text{ s}^{-1}$. How long will 5 g of this reactant take to reduce to 3 g ?

 [Watch Video Solution](#)

21. Time required to decompose SO_2Cl_2 to half of its initial amount is 60 minutes. If the decomposition is a first order reaction, calculate the rate constant of the reaction.

 [Watch Video Solution](#)

22. What is the effect of temperature on the rate constant ?

 [Watch Video Solution](#)

23. The rate constant of the chemical reaction doubled for an increase of 10 K in absolute temperature from 298 K. Calculate E_a .

 [Watch Video Solution](#)

24. The activation energy for the reaction $2HI_{(g)} \rightarrow H_{2(g)} + I_{2(g)}$ at 581 K is 209.5 kJ/mol . Calculate the fraction of molecules having energy equal to or greater than activation energy. $[R = 8.31 \text{ JK}^{-1} \text{ mol}^{-1}]$

 [Watch Video Solution](#)

Dam Sure

1. Define conductivity of a material. Give its SI units.

 [Watch Video Solution](#)

2. State Faraday's second law of electrolysis.

 [Watch Video Solution](#)

3. State Kohlrausch's law of independent migration of ions.

 [Watch Video Solution](#)

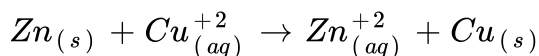
4. Define electrochemical equivalent (e.c.e).

 [Watch Video Solution](#)

5. State and explain Kohlrausch's law of independent migration of ions.

 [Watch Video Solution](#)

6. Define emf. Calculate the emf of the following galvanic cell :



$$E_{\text{Zn}^{+2}/\text{Zn}}^0 = 0.76\text{V}(\text{anode}), E_{\text{Cu}^{+2}/\text{Cu}}^0 = +0.34(\text{Cathode})$$

 [Watch Video Solution](#)

7. Write Nernst equation for a metal and non metal electrode.

 [Watch Video Solution](#)

8. What is Rate of a reaction

 [Watch Video Solution](#)

9. What is Rate equation (or) Rate expression (or) Rate Law ?

 [Watch Video Solution](#)

10. Write the difference between Order and Molecularity of a reaction.

 [Watch Video Solution](#)

11. A first order reaction is found to have a rate constant, $k = 5.5 \times 10^{-14} \text{ s}^{-1}$. Find the half-life of the reaction.

 [Watch Video Solution](#)

12. What is Zero Order reaction ?

 [Watch Video Solution](#)

13. What is First Order reaction ? Give example.

 [Watch Video Solution](#)

14. What are pseudo first order reactions ? Give one example.

 [Watch Video Solution](#)

15. What is Half life of a reaction ?

 [Watch Video Solution](#)

16. Give two example for gaseous first order reactions.

 [Watch Video Solution](#)

17. What is a second order reaction ? Give one example.

 [Watch Video Solution](#)

18. Explain the factors influencing rate of reaction.

 [Watch Video Solution](#)