CHAPTER 1: Chemical Equation

1. (i) Gram per litre = Normality x _____   1 mark   (2025, 2023)

   (ii) 88 g of CO_2 occupies _____ litre at STP. (2022)

   (iii) 32 g of oxygen is equal to _____ mole. (2022)

   (iv) 32 gram of methane contains_____ no of molecules. (2020)

   (v) The oxidation number of Fe in Fe_3O_4 is _____. (2020)

   (vi) 18 gram of water contains _____gram atom of hydrogen. (2020)

   (vii) 16 gram of methane gas occupies _____ litre at STP. (2019)

2. (a) 0.1 mole of HCl is equal to-
   - (i) 3.65 gram of HCl
   - (ii) 36.5 gram of HCl
   - (iii) 18 gram of HCl
   - (iii) 365 gram of HCl

   (b) 1 mole of hydrogen gas is equal to - (2023R)
   - (i) 1 gram of H_2
   - (ii) 2 gram of H_2
   - (iii) 1 molecule of H_2
   - (iii) 1 L of H_2 at STP
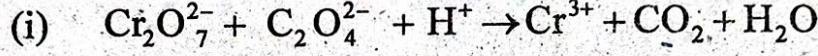
   (c) 1 mole of methane gas is equal to - (2019)
   - (i) 1 gram of methane
   - (ii) 16 gram of methane
   - (iii) 1 molecule of methane
   - (iii) 1 L at STP

3. What is a redox reaction? Give example of a redox reaction. 2 marks (2025.
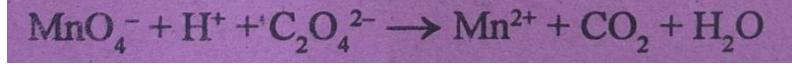
4. Balance the following chemical equation by ion electron method   3 marks (2025

   (i) $Cr_2O_7^{2-} + C_2O_4^{2-} + H^+ \rightarrow Cr^{3+} + CO_2 + H_2O$

   (ii) $Cr_2O_7^{2-} + H^+ + Cl^- \rightarrow Cr^{3+} + Cl_2 + H_2O$.
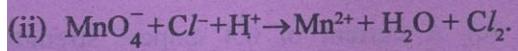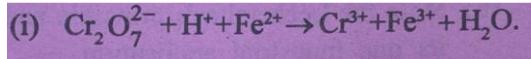
5. Define oxidation on the basis of electronic concepts.   1 mark (2024)

6. Balance the following chemical equation by ion electron method-

(i) 4marks (2024)

$$MnO_4^- + H^+ + C_2O_4^{2-} \rightarrow Mn^{2+} + CO_2 + H_2O$$

(ii) 3 marks (2023)

(i) $Cr_2O_7^{2-} + H^+ + Fe^{2+} \rightarrow Cr^{3+} + Fe^{3+} + H_2O$.

(ii) $MnO_4^- + Cl^- + H^+ \rightarrow Mn^{2+} + H_2O + Cl_2$.
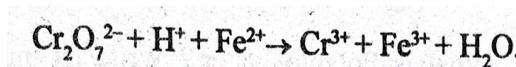
(iii) 4marks (2022)
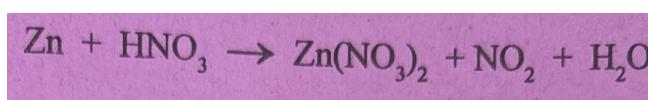
ion electron method : $MnO_4^- + C_2O_4^{2-} + H^+ \rightarrow CO_2 + Mn^{+2} + H_2O$

(iv) 3 marks (2021)

$$Cr_2O_7^{2-} + H^+ + Fe^{2+} \rightarrow Cr^{3+} + Fe^{3+} + H_2O$$
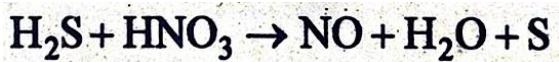
7. Balance the following chemical equation by Partial Equation method-

(i) 3 marks (2024)

$$Zn + HNO_3 \rightarrow Zn(NO_3)_2 + NO_2 + H_2O$$

(ii) (2023R)

$$H_2S + HNO_3 \rightarrow NO + H_2O + S$$
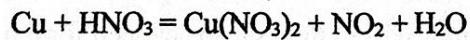
(iii) 3 marks (2020, 2019)

$$Cu + HNO_3 = Cu(NO_3)_2 + NO_2 + H_2O$$

8. State true or false- 1 mark each

(i) In a redox reaction oxidation and reduction takes place simultaneously. (2023, 2023R, 2019)

(ii) 22 gram of CO2 occcupies 11.2 L at STP condition. (2023)

(iii) At STP the value of temperature is $273^{o}C$. (2022, 2020)

(iv) NH_4OH is an example of a strong base. (2021)

(v) $KMnO_4$ is a reducing agent. (2020)

(vi) Absolute zero temperature is $0^{o}C$. (2019)

(vii) Ozone is a oxidizing agent. (2019)

9. Discuss the electronic concept of oxidation and reduction with examples. 2 marks (2023)

10. Calculate the volume of oxygen at STP that would be required to convert 5.2 L of CO TO CO_2. 3 marks (2023R)

11. What do you mean by stoichiometry of a chemical equation? 2 marks (2022)

12. Give the significance of balance chemical equation. 3 marks (2022)

13. Calculate the numbers of moles and molecules present in 100ml of CO_2 at NTP. 3 marks (2021)

14. (2018)

Give one example of the following :

oxidizing agent, reducing agent, redox reaction.   3

CHAPTER 2: Solution, Acidimetry and Alkalimetry

1.(i) The colour of phenolphthalein indicator in alkaline medium is- <mark>1 mark</mark> (2025, 2023R)

    (i) Yellow   (ii) colourless

    (iii) pink   (iii) orange

(ii) The colour of potassium permanganate at neutral point is- <mark>1 mark</mark> (2022)

    (i) purple   (ii) colourless

    (iii) pink   (iii) yellow

(iii) The oxidation number of Cr in $K_2Cr_2O_7$ is- <mark>1 mark</mark> (2022)

    (i) 5   (ii) 6

    (iii) 7   (iii) 8

(iv) The colour of phenolphthalein indicator in acidic medium is- <mark>1 mark</mark> (2019)

    (i) Yellow   (ii) colourless

    (iii) pink   (iii) purple

2. What is alkalimetry? 50 ml of 0.1 N NaOH solution is diluted to make it 0.1 N solution. Calculate the amount of water added. <mark>1+2=3</mark> (2025,2022)

3. Write short notes on- normal solution and molar solution. <mark>3 marks</mark> (2025, 2023, 2023R, 2021)

4.Fill in the blanks-

(i) _____ is an example of a reducing agent. (2024)

(ii) Acidity of ammonium hydroxide is _____. (2023R)

(iii) $NaHSO_4$ is an example of a_____ salt. (2021)

(iv) Basicity of nitric acid is _____. (2019)

5. What is the equivalent weight of HCl. <mark>1mark</mark> (2024)

6. 106 gram of sodium carbonate is dissolved in 200 ml of water. Calculate the normality and molarity of the solution. <mark>3marks</mark> (2024)

7. State true or false-

(i) 1M sulfuric acid is a standard solution. (2023R)

(ii) Nitric acid is a reducing agent. (2023R)

(iii) Hyrolysis of ammonium chloride give acidic solution. (2023R)

(iv) 1N NaOH is a primary standard solution. (2022)

(v) Unit of mole fraction is gram per litre (g/L). (2022)

(vi) d orbital can accommodate 10 electrons. (2021)

(vii) 1M NaOH is a primary standard solution. (2019)

(viii) Hydrolysis of sodium carbonate gives alkaline solution. (2019)

8. How much NaOH is to be dissolved in water to prepare 250 ml of 0.1 N NaOH solution? <mark>3 marks</mark> (2023)

9. What are oxidation and reduction reaction. Give example. <mark>3 marks</mark> (2023R)

10. Define Standard solution. <mark>1 marks</mark> (2023R)

11. 50 ml of sulfuric acid containing 4.9 gram acid per litre neutralise by 25 ml sodium hydroxide solution. Find the strength of basic solution in terms of gram per litre. <mark>4 marks</mark> (2023R)

12. What is mole fraction? <mark>1 marks</mark> (2022)

13. (2022)

A Titration reveals that 11.6 mL of 3.0M sulfuric acid are required to neutralize the sodium hydroxide in 25.00 mL of NaOH solution. What is the molarity of the NaOH solution? 3

14. What is the equivalent weight of H_2SO_4. <mark>1mark</mark> (2024)

15. <mark>4 marks</mark> (2020)

25 ml of sodium carbonate solution is neutralized by 30 ml of sulphuric acid containing 4.9 grams per litre. Calculate the strength of sodium carbonate solution in terms of normality and in grams per litre.

16. What is alkalimetry? <mark>1mark</mark> (2019)

17. (2019)

c. 30 ml of 0.12N acid solution is neutralised by 20 ml of NaOH. Calculate the strength of NaOH in gram/litre 3

CHAPTER 3: Atomic Structure and Chemical Bonding

1.Fill in the blanks-

(i) In covalent compounds the bond is formed due to _____of electrons   1 marks (2025)

(ii) The value of angular quantum number gives the _____ of orbitals. (2023R, 2019)

(iii) Neutron was discovered by_____. (2023R)

(iv) Sigma bond is _____ than pi bond. (2023R, 2021)

(v) Magnetic quantum number gives of the _____of orbitals. (2022, 2021)

(vi) The C-H bond in ethane is _____. (2022)

(vii) Electron was discovered by_____. (2022)

(viii) The melting and boiling point of covalent compounds are_____ than ionic compounds. (2020)

(ix) Dual nature of electron was proposed by_____. (2020)

(x) Ionic compounds are formed by _____ of electrons. (2019)

2. What do you mean by Heisenberg's Uncertainty Principle.   2 marks (2025

3.   (2025

Write down the electron dot structure of the following compound (any *three*) : 1×3=3

(i)   CaO   (ii) $MgCl_2$

(iii) NH_3 (iv) N_2.
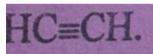
4. What is hydrogen bonding? Classify the different types of H-bonding with suitable examples. 1+2 (2025,2023, 2019)

5. Write short notes on- Quantum numbers and its significance. 3 marks (2025,2023, 2023 R, 2021, 2020, 2019)
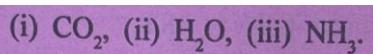
6. Write the electronic configuration of Mn, N, Cr and Cu.   4 marks (2024)

7. Draw the Lewis dot structure (also called electron dot structure) of-   1 mark each (2024, 2023)

(i)

$HC \equiv CH$.

(ii)

(i) CO_2, (ii) H_2O, (iii) NH_3.

(iii) (2023 R, 2020)

(i) HNO_3 (ii) H_2O_2 (iii) CO_2

(iv) 2021

(i) H_2O_2,   (ii) CO_2,   (iii) NH_3,

(iv) $CaCl_2$,   (v) N_2.
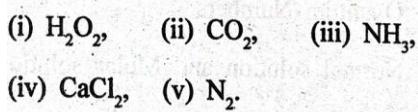
8. Give an example of a covalent compound.   1 mark (2024)

9. State True or false-

(i) KCN molecule contains only ionic bond. (2023)

(ii) The energies of different shells are in the order $K > L > M > N$ (2023R)

(iii) Covalent bond is formed by the transference of electrons. (2023R)

(iv) Quantum numbers are introduced by J. J. Thomson. (2022)

(v) Mass of proton is 1.6726219 x 10^{-27} kilograms. (2022)

10. (i) Neutron is present in all atoms except-   1 mark (2023R)

     (i) He   (ii) C

     (iii) H   (iii) Na

  (ii) Covalent compounds are-   1 mark (2023R)

     (i) non conductors   (ii) hard

     (iii) High melting   (iii) good conductor

(iii) Which one of the following is possible for n=2   1 mark (2022)

     (i) 2p   (ii) 2d

     (iii) 2f   (iii) 3f

(iv) The boiling point of HF is greater than HCl due to the presence of-   1 mark (2021)

     (i) covalent bond   (ii) ionic bond

     (iii) Hydrogen bond   (iii) metallic bond

(v) Ionic compounds are - (2019)

     (i) hard and rigid   (ii) non polar

     (iii) low melting   (iii) non electrolyte

11. (2023 R)

An atom has 2K, 8L and 2M electrons. Give its electronic configuration and find out (i) atomic number (ii) total number of principal quantum numbers (iii) total number of sub-shells.   3

12. Compare the characteristics of ionic and covalent compounds.   4 mark (2023R, 2019)

13. State Hund's rule with examples. 3 marks (2022)

14. State and explain Pauli's exclusion principle. 3 marks (2022)

15. Consider an electron is in one of the 3d orbitals. Find out the value of n, l, and m. 3 marks (2021)

16. What is the principal quantum number of the last electron of sodium? 1marks (2020)

17. Discuss with examples how ionic compounds are formed. 4 marks (2020)

18. State Aufbau Principle. 2 marks (2020, 2019)

CHAPTER 4: Chemical Equlibrium

1. Fill in the blanks-

(i) Chemical Equilibrium is_____ in nature.   (2025)

(ii) P^H of acidic buffer is less than_____. (2020)

2. P^H of 0.001 M H_2SO_4 solution is   (2025,

    (i) 1   (ii) 2

    (iii) 3   (iii) 4

3. State the law of mass action.   1 mark (2025, 2023 R, 2021, 2020)

4. What is buffer solution. Explain the different types of buffer solutions with examples.   1+2marks (2025,2023, 2022)

5. Write true or false- 1 mark each

(i) Chemical Equilibrium is static in nature. (2025)

(ii) At equilibrium both backward and forward reaction stops. (2023R, 2019)

6. Write the relationship between K_P and K_C. 2marks (2024, 2022, 2021)

7. Derive the expression for equilibrium constant of the following chemical reaction.   3 marks (2024, 2023 R)

$$aA+bB \longrightarrow cC+dD$$

8. Write a short note on solubility Product.   2 marks (2024, 2022)

9. Find the P^H of 0.2 M NaOH.   2 marks (2024)

10. Define common ion effect. 2 marks (2022, 2021)

11. Derive an expression for equilibrium constant for a reversible reaction. 3 marks (2022, 2020, 2019)

12. Find the P^H of 0.001 M NaOH.   1 marks (2021)

13. State the Le Chetelier's principle and describe its one industrial application. 3 marks (2023, 2021)

14. What is a reversible reaction?   1 marks (2020)

15. Why chemical equilibrium is called dynamic equilibrium? 2 marks (2019)

CHAPTER 5: Catalysis

1.Fill in the blanks-

(i) Inversion of Cane sugar is catalysed by_____   (2025)

(ii) In a _____ catalytic reaction, the catalyst reactant and products are in the same phase. (2024)

(iii) In Haber's process for the manufacturing of ammonia _____ is used as catalyst promoter. (2023R, 2019)

2. What is catalyst and catalysis? Name the catalyst used in the synthesis of   3 marks (2025

(i) Ammonia by Haber's process

(ii) sulfuric acid by contact process.

3. Explain the industrial application of catalysis in the manufacturing of ammonia by Haber's process. 3 marks (2025)

4. True or false-

(i) Addition of a catalyst does not change the state of equilibrium of a chemical reaction. (2023)

(ii) During electrolysis no chemical change takes place. (2019)

5. What is homogeneous and heterogeneous catalysis? Explain with examples. 3 marks (2023, 2021,2019)

6. What are catalytic promoter and poisoner? Give one example each. 3 marks (2023R, 2021, 2020)

CHAPTER 6: Electrochemistry

1. Fill in the blanks-

(i) Ammonium hydroxide is an example of _____ electrolyte.   (2025)

(ii) 96500 C = _____ Faraday. (2024, 2023)

(iii) During electrolysis metal is liberated at _____ (2022, 2019)

(iv) E.C.E of Ag is_____ (2020)

 (v) Faraday is a unit of_____. (2020)

2. 10 ampere current is passed through a copper sulphate cell for 2 hours. Calculate the amount of copper deposited at the cathode.   3 marks (2025)

3. Write short note on- Primary cell and secondary cell   3 marks (2025)

4. State and explain Faraday's 2nd law of electrolysis. 3 marks (2024, 2022, 2021, 2020)

5. Calculate the amount of Ag deposited at cathode when 5 ampere is passed for 3 hours through an electrolyte of $AgNO_3$ (equivalent weight of Ag=108).   3 marks (2024)

6.Explain Electrorefining process.   3 marks (2024)

7. A current of 0.4 Ampere strength passing through $AgNO_3$ solution for 5 minutes deposits 0.2122 gm of Ag. Calculate the E.C.E of Ag. 3 marks (2023)

8. State the differences between electrolytic cell and electrochemical cell. 3 marks (2023, 2023 R, 2021)

9. State true or false- 1 mark each

(i) In a Daniel cell, the copper vessel serves as cathode. (2023R)

 (ii) Faraday's 2nd law deals with E.C.E of elements. (2021)

10. Draw an electrochemical cell with suitable labelling.   3 marks (2024)

11. (2023R)

50 ampere current is passed through a silver nitrate cell for 6 hours. Calculate the amount of silver deposited at cathode.   3

12. Metal used for galvanization process is-   1 mark (2022)

     (i) Lead   (ii) mercury

     (iii) Zinc   (iii) Iron

13. Draw a lead storage cell with proper labelling. 3 marks (2022)

14. 3 marks (2022)

Electrolysis of dilute aqueous NaCl solution was carried out by passing 10 milliampere current. What is the time required to liberate 0.01 mol of H_2 gas at the cathode ?   3

15. What is the SI unit of current? 1 mark (2021)

16. State and explain Faraday's 1st law of electrolysis. 3 marks (2021)

17. Give two examples of secondary cell. 1 mark (2020)

18. 3 marks (2020)

A current of 10 amperes is passed through a dilute solution of H_2SO_4 in water for 6 minutes, 26 seconds.Calculate the volume of hydrogen liberated in the electrode at NTP (3)

19. (2019)

b: 100 amps current is passed through an acid cell for 6 hours.
Calculate the amount of hydrogen gas liberated at the electrode? 3

20. What is electrochemical equivalent? 3 marks (2019)

CHAPTER 7: Engineering Materials – 12 marks

1. German silver is an alloy of - (2025)

      (i) Calcium   (ii) Silver

      (iii) Potassium   (iii) Sulphur

2. What is Rusting of iron? Write the mechanism of Rusting of iron.　1+2 (2025)

3. What is Portland cement? Write the function of lime and gypsum in Portland cement. 1+2 (2025)

4. Differentiate between calcination and roasting.　　　　　　　3 marks (2025)

5. What is homopolymer and co polymer? Give examples.　　　　3 (2025)

6. Write short notes on- classification of glass.　　　　3 marks (2025)

CHAPTER 8: Water

1. Water can be sterilized by – (2025)

      (i) Sulphur   (ii) Ozone

      (iii) Magnesium   (iii) Sodium

 (ii) deionised water is - (2019)
      (i) saline water   (ii) sterilized water

      (iii) Hard water   (iii) demineralised water

2. What is the difference between temporary and permanent hard water. 3 (2025, 2022)

3. What is sterilization of water? How water can be sterilized by using bleaching powder? 3 (2025

4. Write true or false-

(i) Removal of permanent hardness can't be done by boiling. (2024,2022)

5.Fill in the blanks- (one mark each)

(i) _____ is done remove harmful microorganisms from water. (2024)

(ii) Temporary hard water contains _____ of Ca and Mg. (2023, 2021)

(iii) Full form of EDTA is _____ (2023 R)

(iv) Water which does not produce lather with soap solution is called_____. (2023R)

(v) P^H of distilled water is _____. (2022, 2019)

6. Mention two problems that arise due to the use of hard water in boiler. 2marks (2024, 2023, 2023 R, 2022, 2019)

7. Which salts are present in permanent hardwater. 2 marks (2024)

8. Write a note on Ion exchange method of softening of hardwater. 3 marks (2024,2023)

9. Which indicator is used in the estimation of harness of water? (2023)

10. What is harness of water? 1 marks (2023)

11. Write a note on priming and foaming. 3 marks (2023R)

12. How is the hardness of water determined by EDTA process. 4 marks (2023R)

13. Write a note on Permutit method of softening of hardwater. 3 marks (2022, 2020, 2019)

14. State true or false-

(i) d ionised water is sterilised water. (2021)

15. What is potable water? Write down its characteristics. 3 marks (2021)

16. Write short notes on sterilization of water. 3 marks (2021)

17. Give reason for permanent hardness of Water. 2 marks (2019)

2025

3. Match the following Column – A with Column – B :   1×5=5

Column – A	Column – B
(a) CaO	(i) Electronic configuration
(b) Sulphur	(ii) Softening of water
(c) Aufbau principle	(iii) Basic flux
(d) Gram/Coulomb	(iv) Vulcanization of Rubber
(e) Ion-exchange process	(v) Electro-chemical equivalent.

2024

Match the following Columns :   1×5=5

Column – A	Column – B
a) Concentration of solution	(i) pi bond
b) Indicator	(ii) 6.022×10^{23} atoms
c) p-p orbital overlap	(iii) Molarity
d) 1 mole	(iv) Catalyst
e) Increase or decrease rate of reaction	(v) Phenolphthalein

2021

Match the following correctly :   1×5=5

(a) Aufbau principle	(i) Biological catalyst
(b) 6.023×10^{28} molecules	(ii) Charge
(c) Faraday	(iii) Water quality parameter
(d) B.O.D	(iv) Electronic configuration
(e) Enzyme	(v) One mole