INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad-500043

ELECTRICAL AND ELECTRONICS ENGINEERING

TUTORIAL QUESTION BANK

Course Title	**ENGINEERING CHEMISTRY**				
Course Code	AHSB03				
Programme	B.Tech				
Semester	I	CSE | IT | EEE			
	II	AE | ECE | ME | CE			
Course Type	Foundation				
Regulation	**IARE - R18**				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	1.5
Chief Coordinator	Dr. V Anitha Rani, Professor				
Course Faculty	Dr. C Mahendar, Professor Dr. Venkateshwar Rao, Associate Professor Mr. B Raju, Assistant Professor Ms. T Mallika, Assistant Professor Ms. M Malathi, Assistant Professor Mr. G Mahesh Kumar, Assistant Professor Ms. M Swathi, Assistant Professor				

COURSE OBJECTIVES:

The course should enable the students to:	
I	Apply the electrochemical principles in batteries, understand the fundamentals of corrosion.
II	Analysis of water for its various parameters and its significance in industrial and domestic applications.
III	Analyze microscopic chemistry in terms of atomic, molecular orbital's and Intermolecular forces.
IV	Analysis of major chemical reactions that are used in the synthesis of molecules.
V	Understand the chemistry of various fuels and their combustion.

COURSE OUTCOMES (COs):

CO 1	Describe and understand the operation of electrochemical systems for the production of electric energy, i.e. batteries.
CO 2	Explain the mode by which potable water is produced through the processes of screening, micro straining, aeration, coagulation and flocculation, sedimentation, flotation, filtration and disinfection.
CO 3	Recognize that molecular orbital theory is a method used by chemists to determine the energy of the electron in a molecule as well as its geometry.
CO 4	Demonstrate an ability to design, implement, and evaluate the results of experimentation using standard scientific methodologies such as hypothesis formulation and testing.
CO 5	Understand and analyze the combustion mechanisms of various fuels.

COURSE LEARNING OUTCOMES (CLOs):

AHSB03.01	Extrapolate the knowledge of electrolytic cell, electrochemical cell, electrode Potential and reference electrodes.
AHSB03.02	Use of primary and secondary batteries in various fields such as automobiles, railways, medical devices, aircrafts and day to day life.
AHSB03.03	Explain the characteristic factors of a metal and environment influencing the rate of Corrosion.
AHSB03.04	Use appropriate methods such as protective, metallic and organic coatings to Control corrosion in metals.
AHSB03.05	Evaluate the quality and utility of suitable water for industrial as well as domestic applications.
AHSB03.06	Use innovative methods to improve the quality of soft water for Potable and industrial purpose at cheaper cost.
AHSB03.07	Understand the basic tenets of molecular orbital theories.
AHSB03.08	Understand the different approaches to types of chemical bonding.
AHSB03.09	Recognize and draw structural isomers, stereoisomerism including enantiomers and diastereomers and racemic mixture.
AHSB03.10	Understand the mechanisms of major classes of organic reactions, including substitutions, eliminations and addition.
AHSB03.11	Retrieve and critically review information on drugs, including how to synthesize them, from literature resources.
AHSB03.12	Demonstrate comprehensive knowledge of conventional fuel properties on engine performance.
AHSB03.13	Understand the importance of cracking, knocking in IC engines and operations involved in petroleum refining.
AHSB03.14	Describe the physical and chemical properties of fuels like natural gas, LPG and CNG.
AHSB03.15	Determine efficiency of the fuel in terms of calorific value and combustion reactions of the fuel.

TUTORIAL QUESTION BANK

	MODULE- I			
	ELECTROCHEMISTRY AND BATTERIES			
	Part - A (Short Answer Questions)			
S No	**QUESTIONS**	**Blooms Taxonomy Level**	**Course Outcomes**	**Course Learning Outcomes (CLOs)**
1	What are conductors? Differentiate metallic conductors from electrolytic Conductors.	Understand	CO 1	AHSB03.01
2	What is single electrode potential? How do you determine the electrode potential of $Zn/ZnSO_4$?	Remember	CO 1	AHSB03.01
3	What is the role of the salt bridge in the voltaic cell?	Understand	CO 1	AHSB03.01
4	What is EMF of a galvanic cell? How to represent a galvanic cell.	Remember	CO 1	AHSB03.01
5	Define electrochemical series and write its applications?	Remember	CO 1	AHSB03.01
6	Write Nernst equation for the calculation of electrode potential.	Understand	CO 1	AHSB03.01
7	Write the advantages and limitations of quinhydrone electrode.	Understand	CO 1	AHSB03.01
8	Define batteries. How are they classified?	Remember	CO 1	AHSB03.02
9	Differentiate between Primary and Secondary cells with suitable examples.	Understand	CO 1	AHSB03.02
10	Write the discharging and charging reactions of a lead acid battery.	Understand	CO 1	AHSB03.02
11	Define corrosion of metals. Write any two causes and disadvantages of corrosion.	Remember	CO 1	AHSB03.03
12	What is pilling-bedworth rule?	Remember	CO 1	AHSB03.03
13	How corrosion takes place by different gases? Give examples.	Understand	CO 1	AHSB03.03
14	Differentiate between dry corrosion and wet corrosion.	Understand	CO 1	AHSB03.03
15	What is pitting corrosion? Give two examples.	Remember	CO 1	AHSB03.03
16	What is cathodic protection? Explain sacrificial anodic protection method.	Remember	CO 1	AHSB03.04
17	What is hot dipping? Give the importance of tinning in corrosion control.	Remember	CO 1	AHSB03.04
18	Impure metal corrodes faster than pure metal under identical conditions. Why?	Understand	CO 1	AHSB03.03
19	What is cementation of metal?	Remember	CO 1	AHSB03.04
20	What is galvanic corrosion? Give two examples.	Remember	CO 1	AHSB03.04
	Part - B (Long Answer Questions)			
1	What is Galvanic cell? Explain the construction of Galvanic cell with electrode reactions.	Understand	CO 1	AHSB03.01
2	Derive Nernst equation. Explain how it can be utilized to find the emf of an electrolyte concentration cell?	Understand	CO 1	AHSB03.01
3	Explain about Electrochemical series with its applications.	Remember	CO 1	AHSB03.01
4	Explain the construction of calomel electrode. How the potential of calomel electrode vary with concentration of KCl?	Understand	CO 1	AHSB03.01
5	What are reference electrodes? Explain the construction of Quinhydrone electrode?	Understand	CO 1	AHSB03.01
6	Differentiate between primary and secondary cells. Describe the construction and working of glass electrode with a neat diagram.	Understand	CO 1	AHSB03.01
7	What is battery? Explain about the construction and discharging reactions of dry cell.	Understand	CO 1	AHSB03.02
8	Explain the construction and working of lead-acid battery. Write the discharging, charging reactions and limitations of lead acid battery?	Understand	CO 1	AHSB03.02
9	Describe the construction of Lithium ion battery with relevant reactions. Mention its applications.	Understand	CO 1	AHSB03.02
10	What is oxidation corrosion and how does it takes place? Describe the mechanism of oxidation corrosion?	Understand	CO 1	AHSB03.03
11	Describe the mechanism of hydrogen evolution type corrosion and oxygen absorption type corrosion with a neat diagram.	Understand	CO 1	AHSB03.03
12	Explain about Galvanic corrosion and pitting corrosion with a neat diagram.	Understand	CO 1	AHSB03.03
13	Discuss how nature of metal influences the rate of corrosion in metals?	Understand	CO 1	AHSB03.03
14	Explain how nature of corroding environment influences the rate of corrosion in metals?	Understand	CO 1	AHSB03.03
15	Describe the process of galvanization. How does it prevent the corrosion of iron	Understand	CO 1	AHSB03.04

	and mention its applications.			
16	Explain the process of tinning. How does it prevent the corrosion of iron and mention its applications.	Understand	CO 1	AHSB03.04
17	What is cathodic protection? Explain sacrificial anodic protection method of controlling corrosion.	Understand	CO 1	AHSB03.04
18	Write in brief on impressed current cathodic protection method of controlling corrosion with a neat diagram.	Understand	CO 1	AHSB03.04
19	Describe the process of electroplating of copper and write the advantages of electroplating.	Understand	CO 1	AHSB03.04
20	Describe the process of electroless plating of copper and write the advantages of Electroless plating.	Understand	CO 1	AHSB03.04
	Part - C (Problem Solving and Critical Thinking Questions)			
1	Calculate the e.m.f of voltaic cell Fe| Fe^{2+}(aq) || Cu^{2+} (aq) | Cu. Given the Electrode potentials of copper and iron are 0.34 volt and -0.44 volt respectively.	Understand	CO 1	AHSB03.01
2	Calculate the EMF of a cell if the reduction potentials of the cell are -0.763V and 0.337V.	Understand	CO 1	AHSB03.01
3	Calculate the electrode potential of the copper wire dipped in 0.1 M $CuSO_4$ solution at 25^0c.The standard electrode potential of copper is 0.34 V.	Understand	CO 1	AHSB03.01
4	The standard reduction potentials of Zn^{+2}/ Zn and Cu^{+2}/ Cu are -0.76V and +0.34 V respectively. What is the e.m.f of the cell? Zn(s)/Zn^{+2} (0.05M) //Cu^{+2}(0.005M)|Cu(s)	Understand	CO 1	AHSB03.01
5	Write the overall cell reaction for Zn(s)/Zn^{2+}(0.2M)//Ag^{+}(0.002 M)/Ag(s) and Calculate the emf of the cell at 25^0C.The standard emf of the cell is 1.54 V.	Understand	CO 1	AHSB03.01
6	Why does corrosion of water filled steel tanks occur below the waterline?	Understand	CO 1	AHSB03.03
7	Galvanized container is not used for storage of food products, but tin coated container is used. Comment on the statement.	Understand	CO 1	AHSB03.04
8	How is cathodic protection of iron different from its galvanization?	Understand	CO 1	AHSB03.04
9	Why does a steel pipe in a large copper tank corrode and causing rapid destruction?	Understand	CO 1	AHSB03.03
10	Iron does not rust if the zinc coating is broken in a galvanized iron pipe, but rusting occurs much faster if the tin coating over iron is broken.	Understand	CO 1	AHSB03.04
	MODULE-II			
	WATER AND ITS TREATMENT			
	Part – A (Short Answer Questions)			
1	What is hard water? Give the disadvantages of hard water in domestic requirements.	Remember	CO 2	AHSB03.05
2	Differentiate between temporary and permanent hardness of water.	Understand	CO 2	AHSB03.05
3	What is the basic principle involved in estimation of hardness of water by EDTA method?	Remember	CO 2	AHSB03.06
4	Discuss internal treatment of hard water.	Understand	CO 2	AHSB03.06
5	What is colloidal conditioning?	Understand	CO 2	AHSB03.06
6	Describe the causes and harmful effects of hard water.	Understand	CO 2	AHSB03.05
7	Distinguish between soft water and hard water.	Understand	CO 2	AHSB03.05
8	What is soft water gives the examples of any two soft water sources.	Remember	CO 2	AHSB03.05
9	What is conditioning of water in boilers?	Remember	CO 2	AHSB03.06
10	What are the salts responsible for the temporary and permanent hardness of water?	Remember	CO 2	AHSB03.05
11	What is meant by softening of water?	Remember	CO 2	AHSB03.06
12	How permanent hardness is removed from hard water?	Understand	CO 2	AHSB03.05
13	How is natural water sterilized by bleaching powder?	Understand	CO 2	AHSB03.06
14	Discuss break point of chlorination in treatment of potable water.	Understand	CO 2	AHSB03.06
15	Write about calgon conditioning in internal treatment of boiler feed water.	Understand	CO 2	AHSB03.06
16	What is screening of potable water?	Remember	CO 2	AHSB03.06
17	What are the advantages of reverse osmosis?	Understand	CO 2	AHSB03.06
18	Write the advantages and disadvantages of ion exchange process.	Understand	CO 2	AHSB03.06
19	What is sedimentation?	Remember	CO 2	AHSB03.06
20	What is potable water? Write the specifications of potable water.	Remember	CO 2	AHSB03.06

Part - B (Long Answer Questions)				
1	Explain the following: i. Why do we express hardness of water in terms of $CaCO_3$equivalent? ii. Why hard water fails to produce lather with soap solution? iii Distinguish between Hard water and Soft water?	Understand	CO 2	AHSB03.05
2	Write the experimental procedure for the determination of total hardness by EDTA method.	Understand	CO 2	AHSB03.06
3	Write a brief account on i. Temporary hardness ii. Permanent hardness	Understand	CO 2	AHSB03.05
4	What are the different units in which the hardness of water is expressed?	Remember	CO 2	AHSB03.05
5	Explain the process of chlorination of potable water.	Understand	CO 2	AHSB03.06
6	What are requisites of drinking water? Explain about coagulation and filtration in treatment method of potable water.	Understand	CO 2	AHSB03.06
7	List the salts responsible for temporary hardness and permanent hardness. Mention the disadvantages of using hard water for domestic and industrial purpose.	Understand	CO 2	AHSB03.05
8	How is natural water sterilized by chlorine, bleaching powder, chloramines?	Understand	CO 2	AHSB03.06
9	Briefly describe disinfectation of municipal water?	Understand	CO 2	AHSB03.06
10	Describe Ion-Exchange method of demineralization of water. Mention the Advantages Ion-Exchange method.	Understand	CO 2	AHSB03.06
11	What is meant by sterilization of water? Explain how sterilization of water is Carried by chlorination and ozonization.	Understand	CO 2	AHSB03.06
12	Explain the reverse osmosis process with a neat labeled diagram. Mention its advantages.	Understand	CO 2	AHSB03.06
13	Explain the following internal treatment methods: i. Colloidal conditioning ii. Calgon conditioning iii Phosphate conditioning	Understand	CO 2	AHSB03.06
14	Compare the temporary and permanent hardness of water.	Understand	CO 2	AHSB03.05
15	How do you estimate the temporary and permanent hardness of water by complexometric method?	Understand	CO 2	AHSB03.06
16	What is hardness of water due to? What are its units? How are they related?	Understand	CO 2	AHSB03.05
17	What is desalination? Explain any one of the method available for desalination.	Understand	CO 2	AHSB03.06
18	Distinguish between internal and external treatment of boiler feed water.	Understand	CO 2	AHSB03.06
19	Discuss the basic principles involved in the estimation of hardness of water by EDTA method.	Understand	CO 2	AHSB03.06
20	Write a brief account on break point of chlorination.	Understand	CO 2	AHSB03.06
Part - C (Problem Solving and Critical Thinking Questions)				
1	Why do we add buffer solution during estimation of hardness of water by EDTA method?	Understand	CO 2	AHSB03.05
2	What happens when temporary hard water is boiled? Give reactions.	Understand	CO 2	AHSB03.05
3	How boiler feed water treated with internal treatment give the various chemical reactions?	Understand	CO 2	AHSB03.06
4	One liter of water sample collected from a water source in Telangana has shown the Following analysis. Mg (HCO_3) =14.6 mg, $MgSO_4$=12 mg,Ca $(HCO_3)_2$=16.2 mg, $CaCl_2$=22.2 mg, $MgCl_2$=9.5 mg and organic impurities 100 mg. Calculate temporary and permanent hardness in Degree French.	Understand	CO 2	AHSB03.06
5	One liter of water from an underground reservoir in Tirupathi Town in Andhra Pradesh showed the following analysis for its contents: $Mg(HCO_3)_2$=42 mg; $Ca(HCO_3)_2$=146 mg; $CaCl_2$=71 mg; $MgSO_4$=48 mg; Calculate temporary, permanent and total hardness of this sample of 10,000 liter of water.	Understand	CO 2	AHSB03.06
6	A sample of hard water contains the following dissolved salts per liter. Mg $(HCO_3)_2$=14.6mgs; $Ca(HCO_3)_2$=16.2mgs; $CaCl_2$=111mgs;$CaSO_4$=1.36mgs; silica=40 mgs; Turbidity=10 mgs. Calculate the temporary, permanent and total hardness of water in ppm, degree Clark and degree French.	Understand	CO 2	AHSB03.06
7	Calculate temporary and permanent hardness of a water sample which contains 6.8mg of $CaSO_4$, 33mg of $CaCl_2$, 40mg of $MgCl_2$,24mg of $MgSO_4$ per liter of the water sample.(Given Molar mass of Ca=40g,Mg=24g,S=32g,O=16g,Cl=35g).	Understand	CO 2	AHSB03.06

8	A sample water of 100 ml required 12.6 ml of 0.02M EDTA solution with EBT as indicator and 8.4 ml of 0.02 M EDTA for the same volume of water after removing the carbonate hardness. Calculate the total, permanent hardness in terms of calcium carbonate equivalents.	Understand	CO 2	AHSB03.06
9	How exhausted cation and anion-exchange resins are regenerated?	Understand	CO 2	AHSB03.06
10	Calgon treatment prevents scale formation in boilers. Why?	Understand	CO 2	AHSB03.06
	MODULE -III			
	MOLECULAR STRUCTURE AND THEORIES OF BONDING			
	Part - A (Short Answer Questions)			
1	Define atom?	Remember	CO 3	AHSB03.07
2	What are atomic orbitals? Draw the shapes of atomic orbitals?	Remember	CO 3	AHSB03.07
3	Write the molecular orbital electronic configuration of N_2 molecule?	Remember	CO 3	AHSB03.08
4	Define the term bond order and how is it calculated?	Remember	CO 3	AHSB03.08
5	Write the molecular orbital electronic configuration of O_2 molecule?	Remember	CO 3	AHSB03.07
6	Calculate the number of bonding and anti bonding molecular orbital's in CO and NO molecule?	Understand	CO 3	AHSB03.07
7	Calculate the bond order of O_2 molecule?	Understand	CO 3	AHSB03.08
8	Write a short note on LCAO?	Understand	CO 3	AHSB03.07
9	Define bonding, anti bonding molecular orbitals? Calculate the bond order of F_2 molecule?	Remember	CO 3	AHSB03.07
10	Calculate the bond order of N_2 molecule?	Understand	CO 3	AHSB03.08
11	Write a short note on crystal field splitting of octahedral geometry?	Understand	CO 3	AHSB03.08
12	How to calculate crystal field splitting energy for tetrahedral field?	Understand	CO 3	AHSB03.08
13	Write any two salient features for CFT?	Understand	CO 3	AHSB03.08
14	Write the splitting of the degenerate d-orbital's due to square planar ligand field?	Understand	CO 3	AHSB03.07
15	Write the splitting of the degenerate d-orbital's due to octahedral field?	Understand	CO 3	AHSB03.07
16	What are eg, t2g orbital's in crystal field theory?	Understand	CO 3	AHSB03.07
17	Write a short note on band structure of solids?	Understand	CO 3	AHSB03.08
18	How is n-type semiconductors produced?	Understand	CO 3	AHSB03.08
19	How is p-type semiconductors produced?	Understand	CO 3	AHSB03.08
20	Define doping? Write its types?	Remember	CO 3	AHSB03.08
	Part – B (Long Answer Questions)			
1	Explain with the neat diagrams the molecular energy level diagrams of following molecules N_2 and F_2?	Understand	CO 3	AHSB03.08
2	Calculate number of bonding and anti-bonding orbital's in O_2, N_2, F_2, CO & NO molecules?	Understand	CO 3	AHSB03.08
3	Explain the bond order and magnetic property in the following molecules N_2, O_2, F_2, CO & NO?	Understand	CO 3	AHSB03.08
4	Explain with the neat diagram molecular energy level diagrams of hetero diatomic molecules CO and NO?	Understand	CO 3	AHSB03.08
5	Write a short note on LCAO? Explain molecular energy level diagrams for F_2 molecule with the neat diagram?	Understand	CO 3	AHSB03.08
6	Define the following terms. i. Bond order ii. Bonding molecule orbital iii Anti-bonding molecule orbital	Understand	CO 3	AHSB03.08
7	Explain the shapes of atomic orbitals and its orientation with neat diagram?	Understand	CO 3	AHSB03.07
8	Explain molecular orbital theory? Draw the energy level diagram for one hetero molecule, one homo molecule?	Understand	CO 3	AHSB03.08
9	Explain molecular energy level diagrams for O_2 and N_2 molecule with the neat diagram?	Understand	CO 3	AHSB03.08
10	Explain molecular energy level diagrams for CO and NO molecule with the neat diagram?	Understand	CO 3	AHSB03.08
11	Give an account of the splitting of the degenerate d-orbital's in square planar?	Understand	CO 3	AHSB03.07
12	How crystal field splitting takes place in octahedral?	Understand	CO 3	AHSB03.08
13	Give the splitting of the degenerate d-orbitals of tetrahedral?	Understand	CO 3	AHSB03.07

14	Write a brief account on the following: i. crystal field theory and magnetic properties of metal complexes ii strong and weak field ligands	Understand	CO 3	AHSB03.08
15	How crystal field splitting takes place in tetrahedral complexes?	Understand	CO 3	AHSB03.08
16	With the help of suitable illustrations explain the crystal field splitting of octahedral geometry?	Understand	CO 3	AHSB03.08
17	Explain the band structure of solids by taking Li as an example?	Understand	CO 3	AHSB03.08
18	How crystal field splitting takes place in square planar complexes?	Understand	CO 3	AHSB03.08
19	Explain about intrinsic and extrinsic semiconductors?	Understand	CO 3	AHSB03.08
20	Write short notes on p-type and n-type semiconductors?	Understand	CO 3	AHSB03.08
	Part – C (Problem Solving and Critical Thinking)			
1	Write the MO electronic configuration of a diatomic molecule (homo, hetero) having a bond order of three?	Understand	CO 3	AHSB03.08
2	Draw the molecular orbital energy level diagram of O_2 and find out the bond order and its magnetic behaviour?	Understand	CO 3	AHSB03.07
3	Give the reasons for the following. i. O_2 is paramagnetic ii. N_2 is diamagnetic iii. CO is diamagnetic iv NO is paramagnetic	Remember	CO 3	AHSB03.08
4	What is meant by bond order? How it is related to MOT energy level diagrams?	Understand	CO 3	AHSB03.07
5	Why O_2 and NO have same magnetic property explains with electronic configuration?	Understand	CO 3	AHSB03.08
06	Give the splitting of the degenerate d-orbital's of octahedral and tetrahedral?	Understand	CO 3	AHSB03.08
07	Give an account of the splitting of the degenerate d-orbital's in square planar and octahedral?	Understand	CO 3	AHSB03.08
08	How crystal field splitting takes place in square planar and tetrahedral?	Understand	CO 3	AHSB03.08
09	Explain the distribution of d-electrons in t2g and eg sets in both strong and weak octahedral ligand fields?	Understand	CO 3	AHSB03.08
10	Write short notes on the following: i. p-type semiconductors ii. n-type semiconductors	Understand	CO 3	AHSB03.08
	MODULE -IV			
	STEREOCHEMISTRY, REACTION MECHANISM AND SYNTHESIS OF DRUG MOLECULES			
	Part – A (Short Answer Questions)			
1	What is stereochemistry and its significance?	Remember	CO 4	AHSB03.09
2	Define isomers? Give examples	Remember	CO 4	AHSB03.09
3	What are constitutional isomers? Give examples.	Remember	CO 4	AHSB03.09
4	What are conformational isomers?	Remember	CO 4	AHSB03.09
5	What are configurational isomers? Give examples.	Remember	CO 4	AHSB03.09
6	Write any three characteristics of optical isomers.	Understand	CO 4	AHSB03.09
7	What are enantiomers? Give example.	Remember	CO 4	AHSB03.09
8	What are diastereomers? Give example.	Remember	CO 4	AHSB03.09
9	Which are called geometrical isomers?	Remember	CO 4	AHSB03.09
10	State Markovnikoff's rule with example.	Understand	CO 4	AHSB03.10
11	Write the structure of aspirin.	Remember	CO 4	AHSB03.11
12	State Anti Markovnikoff's rule with example.	Understand	CO 4	AHSB03.10
13	What are electrophiles? Give two examples.	Remember	CO 4	AHSB03.10
14	What are oxidation and reduction reactions?	Remember	CO 4	AHSB03.10
15	Define homolytic fission with example?.	Remember	CO 4	AHSB03.10
16	Define substitution reactions?	Remember	CO 4	AHSB03.10
17	What are addition reactions give one example?	Remember	CO 4	AHSB03.10
18	Define elecrophilic addition reactions?	Remember	CO 4	AHSB03.10
19	Write any two factors affecting SN^1 mechanism?	Understand	CO 4	AHSB03.10
20	What are Grignard reagents? Give one example.	Remember	CO 4	AHSB03.10
	Part – B (Long Answer Questions)			

1	What is Markovnikoff's rule? Explain briefly with suitable example.	Understand	CO 4	AHSB03.10
2	Explain the structure, synthesis and applications of paracetamol.	Understand	CO 4	AHSB03.11
3	With the help of potential energy diagram, explain the conformational analysis of n-butane.	Understand	CO 4	AHSB03.09
4	Explain the Grignard additions on carbonyl compounds with suitable examples?	Understand	CO 4	AHSB03.10
5	Explain the addition of HBr to propene and hydroboration of olefins?	Understand	CO 4	AHSB03.10
6	What are the enantiomers and their significance?	Remember	CO 4	AHSB03.09
7	Write the structure, synthesis and applications of Aspirin.	Understand	CO 4	AHSB03.11
8	Explain the sequence rule for assigning absolute configuration?	Remember	CO 4	AHSB03.09
9	What are the diastereomers and their significance?	Understand	CO 4	AHSB03.09
10	Explain nucleophilic substitution bimolecular mechanism with suitable examples.	Understand	CO 4	AHSB03.10
11	What is Saytzeff rule? Explain the saytzeff rule with suitable example.	Understand	CO 4	AHSB03.10
12	Define Electrophiles? Write a short note on electrophilic addition reactions.	Understand	CO 4	AHSB03.10
13	What are the important conditions for the existence of geometrical isomerism?	Understand	CO 4	AHSB03.09
14	Explain about E1 and E2 elimination reactions with suitable examples.	Understand	CO 4	AHSB03.10
15	What is nucleophilic substitution? Explain the mechanism, factors affecting and rate of SN^1 mechanism.	Understand	CO 4	AHSB03.10
16	What is Anti-Markovnikoff's rule? Explain briefly with suitable example.	Understand	CO 4	AHSB03.10
17	Explain Nucleophilic substitution unimolecular mechanism with suitable examples.	Understand	CO 4	AHSB03.10
18	Give a brief account on reduction reactions of carbonyl compounds using $LiAlH_4$, NaBH4.	Understand	CO 4	AHSB03.10
19	Give a brief account on oxidation reactions of alcohols using $KMnO_4$.	Understand	CO 4	AHSB03.10
20	What is nucleophilic substitution? Explain the mechanism, factors affecting and rate of SN^2 mechanism.	Understand	CO 4	AHSB03.10
	Part – C (Problem Solving and Critical Thinking)			
1	How many types of addition reactions are there? Explain with suitable examples.	Understand	CO 4	AHSB03.10
2.	The concentration of an optically active compound dissolved in chloroform is 6.15/100ml. A portion of this solution in a5cm polarimeter tube produced an observed rotation of -1.2°.Calculate the specific rotation of the compound.	Understand	CO 4	AHSB03.09
3	The concentration of an optically active compound dissolved in chloroform is 8.25/100ml. A portion of this solution in a5cm polarimeter tube produced an observed rotation of -2.2°.Calculate the specific rotation of the compound.	Understand	CO 4	AHSB03.09
4	By selecting a suitable example explain the SN^1 mechanism.	Understand	CO 4	AHSB03.10
5	Explain the elimination reaction with suitable example?	Understand	CO 4	AHSB03.10
6	What are substitution reactions? Explain nucleophilic substitution SN^2 mechanism with suitable examples.	Understand	CO 4	AHSB03.10
7	How do you distinguish the following? i. Chiral carbon from achiral carbon ii. Enantiomers from diastereomers			AHSB03.09
8	How addition reactions are different from elimination reactions?	Understand	CO 4	AHSB03.10
9	The concentration of an optically active compound dissolved in chloroform is 7.32/100ml. 5ml of this solution produced an observed rotation of -2.4^0.Calculate the specific rotation of the compound.	Understand	CO 4	AHSB03.09
10	By selecting a suitable example explain the SN^2 mechanism.	Understand	CO 4	AHSB03.10
	MODULE -V			
	FUELS AND COMBUSTION			
	Part - A (Short Answer Questions)			
1	What is fuel? Give the characteristics of a good fuel.	Remember	CO 5	AHSB03.12
2	Write the significance of moisture and volatile matter in coal.	Understand	CO 5	AHSB03.12
3	Mention three factors taken into consideration while selecting coal for different uses.	Understand	CO 5	AHSB03.12
4	What is combustion? Write the combustion reactions for carbon and hydrogen.	Remember	CO 5	AHSB03.14
5	How sulphur is determined by ultimate analysis of a coal?	Understand	CO 5	AHSB03.13
6	What is meant by ignition temperature?	Remember	CO 5	AHSB03.14
7	What is cracking of petroleum? Give one suitable example for cracking	Remember	CO 5	AHSB03.13

	process.			
8	Why gaseous fuels are more advantageous than solid fuels?	Understand	CO 5	AHSB03.12
9	Write the significance of fixed carbon and ash content in coal.	Understand	CO 5	AHSB03.12
10	What is CNG? Give the composition CNG.	Remember	CO 5	AHSB03.14
11	What are the various fractions obtained during refining of petroleum?	Understand	CO 5	AHSB03.13
12	Distinguish between gross and net calorific value of a fuel.	Understand	CO 5	AHSB03.15
13	Write n-octane, naphthalene and iso-octane in the increasing order of their knocking tendency.	Understand	CO 5	AHSB03.13
14	What is meant by calorific value of a fuel? Mention its units.	Remember	CO 5	AHSB03.15
15	What is LPG? Give its composition and applications.	Remember	CO 5	AHSB03.14
16	Distinguish between octane number and cetane number.	Understand	CO 5	AHSB03.13
17	Write any one anti-knocking agent added to petrol and explain how it works.	Remember	CO 5	AHSB03.13
18	How sulphur compounds are eliminated from crude oil?	Understand	CO 5	AHSB03.13
19	Why it is necessary to remove sulphur from oil and natural gas?	Understand	CO 5	AHSB03.14
20	Define the term knocking of petroleum? Give one anti knocking agent for diesel knock.	Understand	CO 5	AHSB03.13
Part - B (Long Answer Questions)				
1	What are fuels? Give complete classification of fuels with suitable examples.	Remember	CO 5	AHSB03.12
2	Explain the proximate analysis of coal. i. Moisture ii. Volatile matter iii. Ash content iv Fixed carbon.	Understand	CO 5	AHSB03.12
3	Define knocking. How it is related to octane number and gives the importance of TEL as an antiknocking agent?	Understand	CO 5	AHSB03.13
4	Explain how the percentage of carbon, hydrogen, sulphur and oxygen is estimated by ultimate analysis of coal.	Understand	CO 5	AHSB03.12
5	Explain the refining of petroleum by giving its composition, boiling ranges and uses of various fractions obtained during refining.	Understand	CO 5	AHSB03.13
6	Explain the composition, properties and applications of LPG and CNG.	Understand	CO 5	AHSB03.14
7	Explain the ultimate analysis of coal. i. Carbon and hydrogen ii. Nitrogen iii. Sulphur iv. Oxygen	Understand	CO 5	AHSB03.12
8	What is octane number and cetane number? Explain their significances.	Understand	CO 5	AHSB03.13
9	What is cracking? Explain about Fixed bed catalytic cracking with a neat diagram.	Understand	CO 5	AHSB03.13
10	What is a crude oil? Write a short note on refining of petroleum with various fractions obtained during refining and mention uses of each fraction.	Understand	CO 5	AHSB03.13
11	Discuss the advantages and disadvantages of solid, liquid and gaseous fuels.	Understand	CO 5	AHSB03.12
12	Define the terms Calorific value, High calorific value (HCV) and Low calorific value(LCV) and explain the their relation between HCV and LCV .	Understand	CO 5	AHSB03.15
13	What is a natural gas? Give the composition, properties and applications of natural gas.	Understand	CO 5	AHSB03.14
14	Differentiate the following i. HCV and LCV ii. CNG and LPG	Remember	CO 5	AHSB03.14
15	Write a brief account on the following i. Cracking ii. Knocking .	Understand	CO 5	AHSB03.13
16	Explain how the percentage of Moisture ,Volatile matter, Ash content and Fixed carbon by proximate analysis of coal.	Understand	CO 5	AHSB03.12
17	Define octane number of Gasoline. Why ethylene dibromide is added when TEL is use as antiknock?	Understand	CO 5	AHSB03.13
18	Define natural fuel and artificial fuel and write the characteristics of a good fuel.	Understand	CO 5	AHSB03.12
19	Explain the significances of proximate analysis and ultimate analysis?	Understand	CO 5	AHSB03.12
20	What is cetane number? Explain their significances.	Understand	CO 5	AHSB03.13
Part – C (Problem Solving and Critical Thinking)				
1	List the various steps involved in refining of petroleum. At what temperature kerosene, diesel and gasoline are obtained. How do they differ in their	Understand	CO 5	AHSB03.13

	composition?			
2	What is the importance of determining fixed carbon in coal?	Understand	CO 5	AHSB03.12
3	Gasoline containing TEL used in internal combustion engines. Why?	Understand	CO 5	AHSB03.13
4	Why a good fuel should possess low oxygen and high carbon percentage?	Understand	CO 5	AHSB03.13
5	Why is net calorific value less than gross calorific value?	Understand	CO 5	AHSB03.15
6	A sample of coal contains Carbon=60%,Hydrogen=6%,Oxygen=33%, Sulphur=0.5%, Nitrogen=0.2% and Ash=0.3%. Calculate the HCV and NCV calorific values of the fuel.	Understand	CO 5	AHSB03.15
7	Calculate the gross and net calorific values of a coal sample having the following composition Carbon=80%,Hydrogen=7%,Oxygen=3%, Sulphur=3.5%, Nitrogen=2% and Ash=5%.	Understand	CO 5	AHSB03.15
8	A sample of coal contains the following composition Carbon=84%, Hydrogen=12%, Oxygen=2%, Sulphur =1% and the remainder being ash. Calculate the gross and net calorific values of the fuel.	Understand	CO 5	AHSB03.15
9	A sample of coal was found to have the following percentage composition: C=75%, S=1.2%, H=5.2%, N=3.7%, O=12.8% and ash=2.1%. Oxygen in air is 23% by weight. Calculate the minimum amount of air required for complete combustion of 1kg of coal sample.	Understand	CO 5	AHSB03.15
10	Calculate the minimum amount of air required for complete combustion of 1kg of coal sample having the following compositions: C=80%, S=2%,H=5%,O = 3%, N=1% and ash=4%.Oxygen in air is 23% by weight.	Understand	CO 5	AHSB03.15

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