

Lesson Plan for TH 3: APPLIED CHEMISTRY AND ENVIRONMENTAL SCIENCE, AY:2026-27

Subject: APPLIED CHEMISTRY AND ENVIRONMENTAL SCIENCE		Name of the Teaching Faculty: Sri Bijay Kumar Patra (Lect. in Chemistry, Stage-II)	
Course Duration: 17th Aug. 2026 to 17th April 2027		Course outcomes	1. Analyze real life problems associated with various environmental pollution, effects and controlling measures and to mitigate with solid wastes.
			2. Solve the engineering problems using concepts of electrochemistry, corrosion, fuel and lubricant for domestic and industrial applications.
			3.Solve various engineering problems applying the basic concepts of atomic structure, chemical bonding and solutions.
Curse Code: TH3	Period per Week: 04		4. Use relevant water treatment method to solve domestic and industrial problems.
			5. Solve the engineering problems using concepts of engineering materials and properties.
			6. Understand ecosystem and harnessing renewable energy from various sources.
Week	Period No.	UNIT	Contents/Topics to be covered
1st	1st	Unit 1: Air and Noise Pollution	Introduction, Definition of pollution and pollutant
	2nd		Classification of pollutant (primary and secondary)
	3rd		Natural and man-made sources of air pollution
	4th		Air Pollutants: Types
2nd	5th		Particulate Pollutants: Effects and control (Bag filter)
	6th		Particulate Pollutants: control (Cyclone separator, Electrostatic Precipitator)
	7th		Gaseous Pollution Control: Catalytic Converter
	8th		Effects of air pollution due to Refrigerants, I.C., Boiler
3rd	9th		Noise pollution: Definition, sources of pollution
	10th		Effects and control of Noise Pollution
	11th		Sources of water pollution
	12th		Types of water pollutants
4th	13th		Characteristics of water pollutants: Turbidity, pH
	14th		Characteristics of water pollutants: Total suspended solids, total solids BOD and COD

	15th	Unit 2: Water and Soil Pollution	Waste Water Treatment: Primary methods: sedimentation, froth floatation
	16th		Secondary methods, Activated sludge treatment, Bioreactor
5th	17th		Tertiary Method: Membrane separation technology, RO (reverse osmosis)
	18th		Soil Pollution: Definition, Causes
	19th		Effects and Preventive measures of Soil Pollution
	20th		Effects of Excessive use of Fertilizers
6th	21st		Effects of Pesticides and Insecticides, Irrigation
	22nd		Effects of E-Waste on soil pollution
	23rd		1st Monthly Assessment
	24th	Unit 3: Solid Waste Management	Solid waste generation- Sources
7th	25th		Solid waste generation- characteristics of: Municipal solid waste
	26th		E- waste, biomedical waste
	27th		Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries
	28th		Collection and disposal: MSW (3R, principles)
8th	29th		Collection and disposal: MSW (energy recovery, sanitary landfill)
	30th		Hazardous waste
	31st		Concept of Carbon Credit
	32nd		Concept of Carbon Footprint
9th	33rd		Environmental management in fabrication industry
	34th	Unit 4: Electro chemistry & Corrosion	Electronic concept of oxidation, reduction reactions
	35th		Electronic concept of redox reactions
	36th		Definition of terms: electrolytes, non-electrolytes with suitable examples
10th	37th		Faradays laws of electrolysis
	38th		Faradays laws of electrolysis and simple numerical problems
	39th		Industrial Application of Electrolysis –Electrometallurgy
	40th		Industrial Application of Electrolysis –Electroplating, Electrolytic refining

11th	41st	Unit 5: Chemistry of Fuels and Lubricants	Application of redox reactions in electrochemical cells
	42nd		Primary cells – dry cell
	43rd		Secondary cell - commercially used lead storage battery and fuel cells
	44th		Introduction to Corrosion of metals - definition
12th	45th		Types of corrosion (chemical and electrochemical)
	46th		H ₂ liberation and O ₂ absorption mechanism of electrochemical corrosion
	47th		Factors affecting rate of corrosion
	48th		Internal corrosion preventive measures –Purification, alloying and heat treatment
13th	49th		External corrosion preventive measures: a) metal (anodic, cathodic) coatings, b) organic inhibitors
	50th		2nd Monthly Assessment
	51st		Definition of fuel, classification of fuels
	52nd		Calorific values (HCV and LCV)
14th	53rd		Liquid fuels: petrol and diesel
	54th		Fuel rating (octane and cetane numbers)
	55th		Chemical composition, calorific values and applications of LPG, CNG, water gas
	56th		Chemical composition, calorific values and applications of coal gas, producer gas and biogas
15th	57th		Lubricant – Definition, function
	58th		Lubricant – classification with examples
	59th		Lubrication definition and mechanism (hydrodynamic and boundary lubrication)
	60th		Physical properties (viscosity and viscosity index, oiliness)
16th	61st		Physical properties (flash and fire point, cloud and pour point)
	62nd		chemical properties (coke number, total acid number) of lubricants
	63rd		chemical properties (saponification value) of lubricants
	64th		Characteristic properties of good lubricant
17th	65th		Rutherford model of atom and its failures
	66th		Bohr's theory (expression of energy and radius to be omitted)

18th	67th	Unit 6: Atomic Structure, Chemical Bonding and Solutions	Hydrogen spectrum explanation based on Bohr's model of atom
	68th		Quantum numbers – orbital concept
	69th		Shapes of s, p and d orbitals
	70th		Pauli's exclusion principle, Heisenberg uncertainty principle
	71st		Aufbau principle, Hund's rule of maximum multiplicity
	72nd		Electronic configurations (up to atomic number 30)
19th	73rd		Concept of chemical bonding – cause of chemical bonding
	74th		Types of bonds: ionic bonding (NaCl example)
	75th		Covalent bond (H ₂ , F ₂ , HF)
	76th		Basic concept of orbital overlapping sigma and pi bonds
20th	77th		Concept of hybridization
	78th		hybridization in (BeCl ₂ , BF ₃ , CH ₄)
	79th		hybridization in (NH ₃ , H ₂ O)
	80th		Coordination bond in NH ₄ ⁺ ion
21st	81st		Metallic bonding, Hydrogen bond
	82nd		Anomalous properties of NH ₃ , H ₂ O due to hydrogen bonding
	83rd		Solution – idea of solute, solvent and solution
	84th		Methods to express the concentration of solution: normality, molarity, molality (with Simple numerical)
22nd	85th		Methods to express the concentration of solution: ppm, mass percentage, volume percentage and mole fraction (with Simple numerical)
	86th		3rd Monthly Assessment
	87th	Unit 7: Water and Water Treatment	Graphical presentation of water distribution on Earth (pie or bar diagram)
	88th		Classification as soft and hard water
23rd	89th		Causes of hardness, unit of hardness
	90th		Simple numerical on water hardness and conversion
	91st		Cause of poor lathering of soap in hard water
	92nd		problems caused by the use of hard water in boiler (scale and sludge, foaming)

24th	93rd		problems caused by the use of hard water in boiler (foaming and priming, corrosion etc.)
	94th		Quantitative measurement of water hardness by EDTA method
	95th		Total dissolved solids (TDS), alkalinity estimation
	96th		Water softening techniques – soda lime process
25th	97th		Water softening techniques – zeolite process
	98th		Water softening techniques – ion exchange process
	99th		Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization
	100th		Natural occurrence of metals – minerals, ores of iron, aluminium and copper
26th	101st	UNIT-8: Engineering Materials	Gangue (matrix) flux, slag
	102nd		Metallurgy – brief account of general principles of metallurgy
	103rd		Alloys – definition, purposes of alloying, ferrous alloys and nonferrous with suitable examples
	104th		Properties and applications of Brass, Bronze, Stainless Steel, Alnico, Duralumin
27th	105th		Polymers – monomer, homo and co polymers, degree of polymerization
	106th		Addition polymerization and condensation polymerization
	107th		Simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE)
	108th		Simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (nylon – 6, nylon-6,6 and Bakelite)
28th	109th		Rubber and vulcanization of rubber
	110th		Advantages of vulcanized rubber over natural rubber
	111th		4th Monthly Assessment
	112th		Structure of ecosystem, Biotic & Abiotic components
29th	113th	UNIT-9: Ecosystem	Food chain and food web
	114th		Aquatic (Lentic and Lotic) and terrestrial ecosystem (grassland, forest, desert)
	115th		Carbon cycle
	116th		Nitrogen cycle
30th	117th		Sulphur, Phosphorus cycle
	118th		Global warming -Causes, effects, process
	119th		Green House Effect, Ozone depletion

	120th	UNIT-10: Renewable sources of Energy	Solar Energy: Basics of Solar energy
31st	121st		Flat plate collector (Liquid & Air). Theory of flat plate collector
	122nd		Importance of coating. Advanced collector
	123rd		Solar pond. Solar water heater, solar dryer & Solar stills
	124th		Biomass: Overview of biomass as energy source
32nd	125th		Thermal characteristics of biomass as fuel
	126th		Anaerobic digestion
	127th		Biogas production mechanism and Utilization
	128th		Wind energy: Future prospects of wind energy
33rd	129th		Wind energy in India. Environmental benefits and problem of wind energy
	130th		New Energy Sources: Need of new sources
	131st		Different types new energy sources. Applications of (Hydrogen energy, Tidal energy conversion.)
	132nd		Concept, origin and power plants of geothermal energy
34th	133rd		Quiz
	134th		Revision of Unit 6
	135th		Revision of Unit 7
	136th		Revision of Unit 8
35th	137th		Revision of Unit 9
	138th		Revision of Unit 10
	139th		Discussion of previous years Questions
	140th		Discussion of previous years Questions


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