GOVERNMENT POLYTECHNIC, JAJPUR
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Discipline: Civil/Elect/Mech/Metallurgy/Mining/PME	Year: 1st	Name of the Teaching faculty: Tushar Ranjan Mohanta, Sr. Lect. (Chemistrty)
Subject:APPLIED CHEMISTRY & ENVIRONMENTAL SCIENCE	No of Days/Week Class alloted: 4	From:17/08/2026 To:17/04/2027 No. of weeks:32

Week	Class Day	Topic
1st	1st	**Unit-1:** Definition of pollution and pollutant; classification of pollutants (Primary and Secondary Pollutants).
	2nd	Natural and man-made sources of air pollution
	3rd	Air pollutants: Types, particulate pollutants: Effects & Control
	4th	Bag Filter
2nd	1st	Cyclone Separator
	2nd	Electrostatic Precipitator
	3rd	Gaseous Pollution Control: Catalytic converter
	4th	Air pollution due to Refrigerants (CFCs), I.C.and Boilers
3rd	1st	Noise Pollution: Definition, sources of pollution.
	2nd	Effects and control of noise pollution.
	3rd	**Unit-2:** Sources of water pollution
	4th	Types of water pollutants
4th	1st	Characteristics of water pollutants – Turbidity and pH
	2nd	Characteristics of water pollutants – Total Suspended Solids, Total Solids, BOD and COD
	3rd	Waste Water Treatment – Primary method: Sedimentation
	4th	Waste Water Treatment – Primary method: Froth Floatation
5th	1st	Waste Water Treatment – Secondary method: Activated Sludge Treatment
	2nd	Waste Water Treatment – Secondary method: Bioreactor
	3rd	Waste Water Treatment – Tertiary method: Membrane Separation Technology
	4th	Waste Water Treatment – Reverse Osmosis (RO)
6th	1st	Soil Pollution – Definition, Causes, Effects and Preventive Measures of soil pollution
	2nd	Effects of excessive use of Fertilizers, Pesticides, Insecticides, Irrigation and E-Waste on Soil Pollution
	3rd	**Unit-3:** Solid waste generation – Sources and characteristics of Municipal Solid Waste
	4th	Solid waste generation – Sources and characteristics of E-waste and Biomedical Waste
7th	1st	Solid waste generation – Metallic wastes and Non-metallic wastes (Lubricants, Plastics and Rubber) from industries
	2nd	Collection and disposal of Municipal Solid Waste (MSW)
	3rd	3R Principles
	4th	Energy recovery and Sanitary Landfill
8th	1st	Hazardous Waste
	2nd	Concept of Carbon Credit

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	3rd	Concept of Carbon Footprint
	4th	Environmental Management in Fabrication Industry
9th	1st	**Unit-4:** Electronic concept of oxidation, reduction and redox reactions
	2nd	Definition of electrolytes and non-electrolytes with suitable examples
	3rd	Faraday's First Law of Electrolysis
	4th	Faraday's Second Law of Electrolysis and simple numerical problems
10th	1st	Industrial Application of Electrolysis – Electrometallurgy
	2nd	Industrial Application of Electrolysis – Electroplating
	3rd	Industrial Application of Electrolysis – Electrolytic Refining
	4th	Application of redox reactions in electrochemical cells – Primary Cell -Dry Cell
11th	1st	Secondary Cell – Commercially used Lead Storage Battery
	2nd	Fuel Cells
	3rd	Introduction to corrosion of metals – Definition and types of corrosion (Chemical and Electrochemical)
	4th	H_2 liberation mechanism of electrochemical corrosion
12th	1st	O_2 absorption mechanism of electrochemical corrosion
	2nd	Factors affecting the rate of corrosion
	3rd	Internal corrosion preventive measures – Purification, Alloying and Heat Treatment
	4th	External corrosion preventive measures – a)Metal (Anodic, Cathodic) Coatings b) Organic Inhibitors
13th	1st	**Unit-5:** Definition of fuel and classification of fuels
	2nd	Calorific values (HCV and LCV)
	3rd	Liquid fuels – Petrol and Diesel
	4th	Fuel rating – Octane and Cetane numbers
14th	1st	Chemical composition, calorific values and applications of LPG and CNG
	2nd	Chemical composition, calorific values and applications of Water Gas and Coal Gas
	3rd	Chemical composition, calorific values and applications of Producer Gas and Biogas
	4th	Lubricant – Definition, function and classification with examples
15th	1st	Lubrication – Definition and Hydrodynamic Lubrication
	2nd	Boundary Lubrication
	3rd	Physical properties of lubricants – Viscosity, Viscosity Index and Oiliness
	4th	Physical properties of lubricants – Flash Point, Fire Point, Cloud Point and Pour Point
16th	1st	Chemical properties of lubricants – Coke Number, Total Acid Number and Saponification Value
	2nd	Characteristic properties of a good lubricant
	3rd	**Unit-6:** Rutherford model of atom
	4th	Failures of Rutherford model of atom
17th	1st	Bohr's theory of atom
	2nd	Hydrogen spectrum explanation based on Bohr's model of atom
	3rd	Quantum numbers
	4th	Orbital concept and shapes of s, p and d orbitals
18th	1st	Pauli's Exclusion Principle
	2nd	Heisenberg Uncertainty Principle
	3rd	Aufbau Principle

	4th	Electronic configurations (up to atomic number 30)
19th	1st	Hund's Rule of Maximum Multiplicity
	2nd	Concept and cause of chemical bonding
	3rd	Ionic bonding (NaCl example)
	4th	Covalent bonding (H_2, F_2 and HF)
20th	1st	Basic concept of orbital overlapping, sigma (σ) and pi (π) bonds
	2nd	Concept of hybridization
	3rd	Hybridization in $BeCl_2$, BF_3 and CH_4
	4th	Hybridization in NH_3 and H_2O
21st	1st	Coordination bond in NH_4^+ ion and metallic bonding
	2nd	Hydrogen bond and anomalous properties of NH_3 and H_2O due to hydrogen bonding
	3rd	Solution – Idea of solute, solvent and solution; methods to express the concentration of solution: normality, molarity, molality, ppm, mass percentage, volume percentage and mole fraction (with simple numerical)
	4th	**Unit-7:** Graphical presentation of water distribution on Earth (Pie or Bar Diagram)
22nd	1st	Classification of water as Soft and Hard Water
	2nd	Causes of hardness and unit of hardness
	3rd	Simple numerical on water hardness and conversion
	4th	Cause of poor lathering of soap in hard water
23rd	1st	Problems caused by the use of hard water in boiler (Scale and Sludge)
	2nd	Problems caused by the use of hard water in boiler (Foaming, Priming and Corrosion)
	3rd	Quantitative measurement of water hardness by EDTA method
	4th	Total Dissolved Solids (TDS) and Alkalinity Estimation
24th	1st	Water softening technique – Soda Lime Process
	2nd	Water softening technique – Zeolite Process and Ion Exchange Process
	3rd	Municipal water treatment – Sedimentation and Coagulation
	4th	Municipal water treatment – Filtration and Sterilization
25th	1st	**Unit-8:** Natural occurrence of metals, minerals, ores of iron, aluminium and copper
	2nd	Gangue (Matrix), Flux and Slag
	3rd	Metallurgy – Brief account of general principles of metallurgy
	4th	Alloys – Definition, purposes of alloying, ferrous and non-ferrous alloys with suitable examples
26th	1st	Properties and applications of Brass and Bronze
	2nd	Properties and applications of Stainless Steel, Alnico and Duralumin
	3rd	Polymers – Monomer, Homo polymers, Co-polymers and Degree of Polymerization
	4th	Addition Polymerization and Condensation Polymerization
27th	1st	Preparation and applications of Thermoplastics and Thermosetting Plastics (PVC, PS, PTFE, Nylon-6, Nylon-6,6 and Bakelite)
	2nd	Rubber and Vulcanization of Rubber
	3rd	Advantages of Vulcanized Rubber over Natural Rubber
	4th	**Unit-9:** Structure of ecosystem, Biotic and Abiotic components
28th	1st	Food chain and Food web
	2nd	Aquatic ecosystem (Lentic and Lotic)

28th	3rd	Terrestrial ecosystem (Grassland, Forest and Desert)
	4th	Carbon cycle
29th	1st	Nitrogen, Sulphur and Phosphorus cycles
	2nd	Global warming – Causes, Effects and Process
	3rd	Green House Effect and Ozone Depletion
	4th	**Unit-10:** Solar Energy – Basics of Solar Energy
30th	1st	Flat Plate Collector (Liquid & Air)
	2nd	Theory of Flat Plate Collector and Importance of Coating
	3rd	Advanced Collector and Solar Pond
	4th	Solar Water Heater, Solar Dryer and Solar Stills
31st	1st	Biomass – Overview of Biomass as Energy Source and Thermal Characteristics of Biomass as Fuel
	2nd	Anaerobic Digestion
	3rd	Biogas Production Mechanism and Utilization
	4th	Wind Energy – Future Prospects of Wind Energy and Wind Energy in India
32nd	1st	Environmental Benefits and Problems of Wind Energy
	2nd	New Energy Sources – Need of New Sources and Different Types of New Energy Sources
	3rd	Applications of Hydrogen Energy and Tidal Energy Conversion
	4th	Concept, Origin and Power Plants of Geothermal Energy

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31/07/26
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