



# ARSD College, University of Delhi

## Model Course Handout/Lesson Plan

Course Name : B.Sc. (Hons) chemistry						
Semester	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
I	42171107 : CC – IC1: CORE COURSE INDUSTRIAL CHEMISTRY- 1	Industrial Chemicals & Environment	4			4
Teacher/Instructor(s)		Dr. Shivangi Sharma				
Session		2021-22 (Nov-March)				

### Course Objective:

The aim of this course is to make students aware of different industrial processes in detail. This course is basically designed to understand the chemistry of the industrial processes like Purification techniques, handling of important gases, acids, bases, pollutants, Industrial effluent and water treatment. The analytical approach of this course is to enhance the reasoning and to understand the mechanical part of the industry. The aim of this course is that the students will learn the conventional and latest techniques used in abatement of environmental pollution (air, water and industrial effluents).

### Course Learning Outcomes: By the end of this course, students will be able to:

- Know the various purification techniques used in industries like distillation, absorption, adsorption and solvent extraction. Draw the plausible structures and geometries of molecules using Radius Ratio Rules, VSEPR theory and MO diagrams (homo- & hetero-nuclear diatomic molecules).
- Understand the production, storage and handling of important gases like-oxygen, argon, helium, hydrogen and acetylene. Rationalize the conductivity of metals, semiconductors and insulators based on the Band theory.
- Understand and develop efficacy in handling and preparation of frequently used inorganic chemicals like acids, bases, oxidizing and disinfecting chemicals.
- Learn major causes of air pollution, its control and alarming problem of global warming.
- Know qualitative and quantitative measurements of water treatment, conservation and handling of industrial effluent.

**Lesson Plan:**

Unit No.	Learning Objective	Lecture No.	Topics to be covered
1.	<b>Chemical Technology</b>	1-3	Basic principles of distillation, solvent extraction
		4-7	Solid-liquid leaching and liquid-liquid extraction, separation by absorption and adsorption.
		8-11	An introduction into the scope of different types of equipment needed in chemical technology
		12-15	Including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry.
2.	<b>Industrial Gases and Inorganic Chemicals</b>	16-17	Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon.
		18-19	Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: neon, helium, hydrogen.
		20-22	Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: acetylene, carbon monoxide, chlorine
		23-25	Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: fluorine, sulphur dioxide and phosgene.
		26-28	Inorganic Chemicals: Industrial preparation with the help of flowchart, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid.
		29-30	Inorganic Chemicals: Industrial preparation with the help of flowchart, application, analysis and hazards in handling the following chemicals: caustic soda, common salt, borax, bleaching powder
		31-32	Inorganic Chemicals: Industrial preparation with the help of flowchart, application, analysis and hazards in handling the following chemicals: sodium thiosulphate, hydrogen peroxide, potash alum.
		33-35	Inorganic Chemicals: Industrial preparation with the help of flowchart, application, analysis and hazards in handling the following chemicals: chrome alum, potassium dichromate and potassium permanganate.
3.	<b>Environment</b>	36-37	Air Pollution: Pollutants and their sources, pollution by SO <sub>2</sub> , CO <sub>2</sub> , CO, NO <sub>x</sub> , H <sub>2</sub> S and other

			foul smelling gases.
		38-39	Methods of estimation of CO, NO <sub>x</sub> , SO <sub>x</sub> and their control procedures.
		40-42	Green house effect and global warming, Ozone depletion by oxides of nitrogen
		43-44	Chlorofluorocarbons and halogens, Removal of sulphur from coal.
		45	Removal of sulphur from coal. Contd...
		46	Particulate matter and its types.
		47-48	Water pollution and Water Quality Standards: Pollutants and their sources, Effluent treatment plants (primary, secondary and tertiary treatment).
		49-50	Water pollution and Water Quality Standards: Pollutants and their sources, Effluent treatment plants (primary, secondary and tertiary treatment) Contd...
		51-52	Industrial effluent from the following industries and their treatment: electroplating, textile, tannery
		53-54	Industrial effluent from the following industries and their treatment: dairy, petroleum and petrochemicals
		55-56	Industrial effluent from the following industries and their treatment: agrochemicals, fertilizer, Sludge disposal.
		57-58	Industrial effluent from the following industries and their treatment: Industrial waste management, incineration of waste.
		59-60	Water treatment and purification (reverse osmosis, electro dialysis, ion exchange) Contd...

**Evaluation Scheme:**

No.	Component	Duration	Marks
1.	Internal Assessment		25

	<ul style="list-style-type: none"> <li>• Quiz</li> <li>• Class Test</li> <li>• Attendance</li> <li>• Assignment</li> </ul>		
2.	End Semester Examination	3 hr	75

<b>Details of the Course</b>		
<b>Unit</b>	<b>Contents</b>	<b>Contact Hours</b>
<b>1.</b> <b>Chemical Technology</b>	Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid-liquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry.	15
<b>2.</b> <b>Industrial Gases and Inorganic Chemicals</b>	(a) Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene. (b) Inorganic Chemicals: Industrial preparation with the help of flowchart, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate.	20
<b>3.</b> <b>Environment</b>	(a) Air Pollution: Pollutants and their sources, pollution by SO <sub>2</sub> , CO <sub>2</sub> , CO, NO <sub>x</sub> , H <sub>2</sub> S and other foul smelling gases. Methods of estimation of CO, NO <sub>x</sub> , SO <sub>x</sub> and their control procedures. Green house effect and global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and halogens, Removal of sulphur from coal. Particulate matter and its types. (b) Water pollution and Water Quality Standards: Pollutants and their sources, Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluent from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, agrochemicals, fertilizer. Sludge disposal. Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electro dialysis, ion exchange). Water quality parameters for waste water, industrial water and domestic water.	25
	<b>Total</b>	<b>60</b>
<b>Suggested Books:</b>		

Sl. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
1	Stocchi, E. Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK	(1990)
2	Kent, J. A. (ed) Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.	(1997)
3	Pani, B. (2017), Textbook of Environmental Chemistry, I.K.International Publishing House.	(2017)
4	De, A. K., Environmental Chemistry, New Age International Pvt, Ltd, New Delhi.	(2012)
<b>Mode of Evaluation:</b>	Internal Assessment / End Semester Exam	