Department of Chemistry

Course Structure (w.e.f. 2021)

Semester –I

Part	Components	nents Course H	Hrs/	Credits	Max.Marks			
I ui t	Components	Code	Course Frace	Week	Creates	CIA	ESE	Total
Ι	Tamil	21ULTA11	,f;fhy ,yf;fpak					
			nra;As>, yf ;fzk	6	3	40	60	100
	French	21ULFA11	,yt;tpatuyhW>ciueiL					
			rpwnj					
			Introductory French					
			Course					
Π	General English	21UGEN11	Poetry, Prose, Extensive	6	3	40	60	100
			Reading and					
			Communicative					
			English – I					
	Core I	21UCHC11	General Chemistry - I	6	5	40 60		100
-	Core Practical I	21UCHCR1	Quantitative Analysis	2				
ш	Allied I	21UMAA11	Allied Mathematics – I	6/4	4/3	40	60	100
		21UCBA11	Allied Biochemistry - I					
	Allied Practical	21UCBAR1	Allied Biochemistry	2				
			Practical					
	Skill Enhancemen	21UCHPE1	Professional English for	2	2	20	30	50
IV	Course – I		Chemistry– I					
	Ability	21UAVE11	Value Education	2	2	20	30	50
	Enhancement							
	Course – I							
		Total		30	19/18			

Semester II

Part	Components	Course Code	CourseTitle	Hrs/ Cred			Max.	.Marks
				Wee		CIA	ESE	Total
Ι	Tamil	21ULTA21	rka "yf;fpaq;fSk ePjp "yf;fpaq;fSk> nra;As; "yf;fzk> "yf;fpatuyhW>	б	3	40	60	100
	French	21ULFA21	ciueiLtho;f;if tuyhW Intermediate French Course					
П	General English	21UGEN21	Poetry, Prose, Extensive Reading and Communicative English – II	6	3	40	60	100
	Core II	21UCHC21	General Chemistry - II	6	5	40	60	100
	Core Practical II	21UCHCR1	Quantitative Analysis	2	2	40	60	100
Ш	Allied I	21UMAA21 21UCBA21	Allied Mathematics – II Allied Biochemistry - II	6/4	4/3	40	60	100
	Allied Practical I	21UCBAR1	Allied Biochemistry Practical	2	2	40	60	100
IV	Skill Enhancement Cour II	21UCHPE2	Professional English for Chemistry– II	2	2	20	30	50
	Ability Enhancement Course	21UAEV21	Environmental Studies	2	2	20	30	50
		Total		30	21/22			

Semester III

Part	Components	Course Code	CourseTitle	Hrs/	Credits		Max.	Marks
				Week		CIA	ESE	Total
Ι	Tamil French	21ULTA31 21ULFA31	fhg;gpa ,yf;fpak; nra;As>,yf;fzk;>ciueiL mWfij ,yf;fpatuyhW Advanced French Course	6	4	40	60	100
Π	General English	21UGEN31	CourseTitle Hrs/ Credits fhg;gpa , y f;fpak; nra;As>,yf;fzk;>ciueil, mWfij , yf;fpatuyhW 6 4 40 Advanced French Course 6 4 40 Poetry, Prose, Extensive Reading and Communicative English-III 6 4 40 Semi micro Inorganic Qualitative Analysis 1 40 40 Allied Physics-I 4 3 40 Allied Physics Practical 2 2 20 Dairy Chemistry 2 2 20 Women's Synergy 2 2 20 Chemistry for competitive exam 3 2 2 Remistry for competitive exam 3 4 4			40	60	100
	Core III	21UCHC31	Physical Chemistry - I	4	4	40	60	100
ш	Core Practical II	21UCHCR2	Semi micro Inorganic Qualitative Analysis	2				
	Allied II	21UPHA31	Allied Physics-I	4	3	40	60	100
111	Allied Practical II	21UPHAR1	Allied Physics Practical	2				
	Skill Based Elective	21UCHS31/ 21UCHS32	Agricultural Chemistry/ Dairy Chemistry	2	2	20	30	50
	NME I	21UCHN31	Every Day Chemistry	2	2	20	30	50
	Ability Enhancement Course	21UAWS31	Women's Synergy	2	2	20	30	50
IV	Self Study/ MOOC / Internship (Compulsory)	21UCHSS1/	Chemistry for competitive exam		2			50
		Total		30	23			

Semester IV

Part	Components	Course Code	CourseTitle	Hrs/ Credits		Max.Marks			
				Week		CIA	ESE	Total	
I	Tamil French General English	21ULTA41 21ULFA41 21UGEN41	rq;f ,yf;fpak: nra;As> ,yf;fzk;>ciueiL>tho;f; iftuyhW> ,yf;fpatuyhW Language through Literature Poetry, Prose, Extensive Reading and Communicative English – IV	6	4	40	60	100	
	Core IV	21UCHC41	Organic Chemistry - I	4	4	40	60	100	
	Core Practical II	21UCHCR2	Semi micro Inorganic Qualitative Analysis	2	2	40	60	100	
ш	Allied II	21UPHA41	Allied Physics-I	4	3	40	60	100	
	Allied Practical	21UPHAR1	Allied Physics Practical	2	2	40	60	100	
	Skill Based Elective	21UCHS41/	Medicinal Chemistry/	2	2	20	30	50	
		21UCHS42	Forensic Chemistry						
	NME II	21UCHN41	Industrial Chemistry	2	2	20	30	50	
	Ability	21UAYM41	Yoga & Meditation	2	2	20	30	50	
	Enhancement								

IV	Course						
	Self Study /	21UCHSS2/	Applied Chemistry		+2		50
	On-line Course /						
	Internship						
	(Optional)						
	NCC, NSS &				1		
	Sports						
V	Extension Activities				+1		
	CDP						
Total					26+3		

Semester 7	V
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Part	Components	Course Code	Course Title	Hrs/	Credits		Max.	Max.Marks	
				Week		CIA	ESE	Total	
III	Core V (Common Core)	21UPCC51	Material Science	6	5	40	60	100	
	Core VI	21UCHC51	Inorganic Chemistry -I	4	4	40	60	100	
	Core VII	21UCHC52	Organic Chemistry –II	5	5	40	60	100	
	Core VIII	21UCHC53	Physical Chemistry –II	5	5	40	60	100	
	Core Practical III	21UCHCR3	Physical Chemistry Practical	5	3	40	60	100	
	Core Practical IV	21UCHCR4	Organic Analysis and Organic Preparation	3					
	Common Skill Based	21UCSB51	Computers for Digital Era and Soft Skills	2	2	20	30	50	
IV	Self Study / On-line Course/ Internship (Optional)	21UCHSS3/	Informative Chemistry		+2			50	
		Tot	al	30	24 + 2				

Semester VI

Part	Components	Course Code	Course Title	Hrs/	Credits	Max.Marks		
				Week		CIA	ESE	Total
	Core IX	21UCHC61	Inorganic Chemistry-II	4	4	40	60	100
	Core X	21UCHC62	Organic Chemistry-III	4	4	40	60	100
	Core XI	21UCHC63	Physical Chemistry-III	5	5	40	60	100
III	Elective	21UCHE61/	Polymer Chemistry/	40	60	100		
		21UCHE62	Essential topics in Chemistry					
	Core Practical I	21UCHCR4	Organic Analysis and Organic Preparation	3	3	40	60	100
	Core Practical	21UCHCR5	Gravimetry and Inorganic Preparation	5	3	40	60	100
IV	CoreXII/	21UCHC64	Analytical Chemistry/	5	4	40	60	100
	Project 21UCHP61 Project		Project					100
	Total				27			
	Total							

Semester	Hours	Credits	Extra Credits
I	30	19/18	
II	30	21/22	
III	30	21	2
IV	30	26	3
V	30	26	
VI	30	27	
Total	180	140	5

Courses	Number of	Hours / week	Credits	Extra
	Courses			Credits
Tamil	4	24	14	
English	4	24	14	
Core	12 T + 8 P	53 T + 24 P	50T + 13P	
Skill Based Elective	2	4	4	
Core Elective (Skill	1(2)	4	4	
based Elective)				
Group Project	1	5	4	
Allied	4 T + 4P	20T+8P	14T+4P	
NME	2	4	4	
Skill	2	4	4	
Enhancement				
Course				
Ability Enhancement	4	8	8	
Course				
Common Skill Based	1	2	2	
NCC, NSS & Sports			1	
Extension Activities				+1
Self Study Papers	2		+2	2
(Optional)				
Self Study Papers	1		2	
(Compulsory)				
Total				

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry
Semester	Ι
Subject Title	General Chemistry - I
Code	21UCHC11
Hours	6
Total Hours	90
Credits	5
Max Marks	100
Unit & Title	Unit: III – Basic quantum chemistry
Name of the Faculty	Dr. A.Parveen Sulthana
T-L tools	Lecture method, PPT

Prerequisite Knowledge:

Knowledge Knowing about the importance of Quantum numbers Micro -planning



1. Topic for Learning through motivation

The location of a person can be identified using the idea about district, street, and location of the plot by mention the address. These numbers are used to locate the position of an electron in an atom. Quantum numbers are a set of four numbers used to describe the energy, shape, and orientation of an electron in an atom. They are essential in understanding the behavior of electrons in atoms and molecules. Similarly, Students were asked to tell about the locations of their homes and correlate these numbers with the quantum numbers.

2.Topic Introduction:

Quantum numbers in Chemistry, are the sets of numbers that describe an electron's orbit and movement within an atom. When the quantum numbers of all the electrons in a given atom are added together, they must satisfy the Schrodinger equation.

Quantum numbers are the set of numbers used to describe the position and energy of an electron in an atom. There are four types of quantum numbers: principal, azimuthal, magnetic, and spin. Quantum numbers represent the values of a quantum system's conserved quantities.

Four quantum numbers can be used to fully describe all of the properties of a given electron in an atom; these are:

- 1. Principal quantum number
- 2. Orbital angular momentum quantum number (or Azimuthal quantum number).
- 3. Magnetic quantum number
- 4. The electron spin quantum number

In this above way the quantum numbers are used to describe the location of an electron in an atom

General Objective:

Enables the students to understand the quantum numbers

Specific Objectives:

Enables the students to:

- 1. Describe the types of quantum numbers
- 2. Comparing the nature of the electron
- 3. Shows the importance of these numbers
- 4. Distinguish the various orientation of electron

Taxonomy of objectives:

Taxonomy of Objectives									
Knowledge	The Cognitive	e Process Dimens	ion						
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create			
A. Factual	1								
Knowledge									
B. Conceptual		1,2							
Knowledge									
C. Procedural				3,4					
Knowledge									
D. Meta Cognitive					2,3,4				
Knowledge									

Key words:

Energy level, orientation, shell, spin

Key diagrams (if any):



Discussion:

The students will be asked questions regarding the quantum numbers. One of the students will be asked to draw any one quantum number studied during the class.

Mind Map:



Summary:

Students will be asked to understand quantum numbers and to know the rules for filling up of orbitals and predict electronic arrangement in orbits by using the mind map..

Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental idea about creating an e-content of quantum numbers
- Producing the e-content.
- Identify the quantum numbers and asked to mention in what ways it can be used

FAQ's:

Label that the	e orbital that is sy	mmetrically spherical.							
a) f	b)d c)r	d) s							
Match the sh	ape of p orbital.								
a) spherical	b) dumb bell c) de	ouble dumb bell d) trip	le dump bell						
List dxy, dy	z,dzx are called	orbitals.							
a) axial	b) non axial	c) symmetrical	d) unsymmetrical						
Label which	Label which orbital has the following quantum number $n = 2$, $l = 1$ and $m = 0$								
a) 2s	a) 2s b) 2p c) 2d d) 2f								
Find which orbital is having the lowest energy.									
	foldal is having the	10 11 0 20 0 1101 8)							

References

> Arun Bahl and Bahl B.S. Advanced Organic chemistry.S.Chand and Company Ltd.,

Reprint 2005

> Jain M. K and Sharma S. C. Modern Organic Chemistry. Vishal Publishing Company, 2008

Schangengen

Head of the Department

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Approved by HOD

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Dr. A. Parveen Sulthana

Verified by Subject Expert

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry		
Semester	Ι		
Course Title	Allied: Allied Biochemistry I		
Code	21UCBA11		
Hours	4		
Total Hours	60		
Credits	4		
Max Marks	75		
Unit & Title	Unit III: Vitamins		
Name of the Faculty	Dr.G. Amala Jothi Grace		
T-L tools	Lecture method, Audio Visual aid: videos about vitamins and it's		
	deficiency diseases. Visual aid: Picture of Scurvy, Rickets, Anaemia,		
	Xeropthalmia, multimedia approach and evaluated by oral questioning,		
	presenting the report of group discussion.		

Prerequisite Knowledge:

Knowledge about vitamins and biological role of vitamins in the human body.

Micro -planning



1. Topic for Learning through evocation

A Vitamin is an organic compound and an essential nutrient that an organism needs in small amounts. Different organisms have different vitamin needs. Vitamins are classified by both biological and chemical activity and not their structure. Some organisms do not require vitamins. All organisms do not need the same number or kind of vitamins. Vitamins must be included in the diet in optimum amount. Excess of vitamin or low level of vitamin causes disorders. The students will be asked to imagine themselves as a vitamin molecule. Then a question, How would you describe your journey from a citrus fruit to a human cell? will be asked.

2. Topic Introduction:

Vitamins are a group of essential nutrients that play a vital role in maintaining our overall health and well-being. They are micronutrients that our bodies need in small amounts, but are crucial for various bodily functions, such as energy production, immune function, and cell growth. Vitamins play a major role and it helps to regulate metabolism and energy production, support immune function and protect against infections, maintain healthy skin, hair, and eyes and also prevent some disorders.

2.1. General Objective:

Enable the students to understand vitamins, their classification and diseases caused due to lack of vitamins.

2.2. Specific Objectives:

Enable the students to:

- 1. identify the different types of vitamins.
- 2. describe the sources of vitamins and their importance for human health.
- 3. compare fat soluble and water soluble vitamins.
- 4. summarize the deficiency diseases.
- 5. give an outline of the food sources and deficiency symptoms of various vitamins.

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	Knowledge The Cognitive Process Dimension					
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	1			1,2,3	4	
Knowledge						
B. Conceptual		1, 2,3,4	2,5		2,34	
Knowledge						
C. Procedural				2		
Knowledge						
D. Meta Cognitive					5	
Knowledge						
_						

2.4: Key words:

Vitamins, Fat soluble vitamins, Water soluble vitamins, Deficiency diseases.

2.5: Key diagrams (if any):



Video link: <u>https://www.youtube.com/watch?v=ISZLTJH5IYg</u>



3. Discussion:

The students will be asked to do role play with the classification of vitamins. Quiz will be conducted regarding the deficiency diseases.

4. Mind Map:



5. Summary:

Using Mind map, students will be asked to classify vitamins. The chemical names of vitamins will be asked. Executing the acquired knowledge by asking questions like 'What vitamin will cause deficiency disease like anaemia? Name the vitamin which is responsible for scurvy.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about creating an e-content on vitamins
- Producing the e-content.
- Providing PPT to create visual impact for vitamin sources and its deficiency disease.

7. FAQ's:

1.	Xeropthalmia defect	is due to		
	(a) Vitamin A	(b) Vitamin B	(c) Vitamin B ₆	(d) Vitamin E
2.	Vitamin E functions	as an		
	(a) Antibiotics	(b) Oxidant	(c) Energy producer	(d) Anti-oxidant
3.	Which of the vitamin	n is essential for blood	clotting	
	(a) Vitamin A	(b) Vitamin K	(c) Vitamin B ₆	(d) Vitamin B ₃
4.	Vitamin B ₃ is a			
	(a) Mono peptide	(b) di peptide	(c) tri peptide	(d) penda peptide
5.	is essen	tial during pregnancy		
	(a) Folic acid	(b) nicotinic acid	(c) pantothenic acid	(d) riboflavin

8. References: (Books/Periodicals/Journals)

1. Dulsy Fatima, Narayanan L.M, MeyyanPillai R.P, Nallasingam K, Prasanna Kumar S and

Arumugam N Biochemistry.Saras Publications, 2010.

- 2. Patricia trueman. Nutritional Biochemistry. MJP publisher, 2011.
- 3. Veerakumari L. Biochemistry. MJP Publishers, 2010.
- 4. Dr. Deb A.C. Concepts of *Biochemistry*. Kolkatta:New Central Book Agency, 2001.
- 5. Powar C.B, Chatwal G.R, *Biochemistry*. Himalaya Publishing Ltd, 2002.

9. Verified by Subject Expert

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Course In-charge Dr. G.Amala Jothi Grace

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Approved by HOD



LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry
Semester	Ι
Course Title	Skill Enhancement Course I: Professional English for Chemistry I
Code	21UCHPE1
Hours	2
Total Hours	30
Credits	2
Max Marks	50
Unit & Title	Unit II: Green House Gas Emission
Name of the Faculty	Dr. G. Amala Jothi Grace
T-L tools	Lecture method, Audio Visual aid: videos about green house gasses.
	Visual aid: Picture of green house gases and evaluated by oral
	questioning, presenting the report of group discussion.

Prerequisite Knowledge:

Knowledge about green house gases. Micro -planning



1. Topic for Learning through evocation

Greenhouse gases are gases in the Earth's atmosphere that trap heat. They allow sunlight to enter the atmosphere freely but prevent some of the heat that the sunlight brings from escaping back into space. This is called **the greenhouse effect** and it keeps our planet warm enough to support life. The students will be asked to think of gases. Then the following question will be asked. Picture yourself wrapped in a thick blanket on a chilly night—warmth is good, but too many blankets can make you uncomfortable. That's like what's happening with the buildup of greenhouse gases. Then the students will be framed into different groups. They will asked to think of greenhouse gases (like carbon dioxide, methane, and nitrous oxide) as team members of a blanket-making factory. Carbon dioxide is the main worker, but methane and nitrous oxide are the "overachievers," making the blanket much thicker despite their smaller numbers.

2. Topic Introduction:

Without greenhouse gases, Earth would be too cold for life as we know it. However, human activities are increasing the concentration of these gases, which is causing the planet to warm at an accelerated rate. This leads to problems such as:

- Global warming
- Melting ice caps and rising sea levels
- More extreme weather events
- Disruption of ecosystems

2.1. General Objective:

Enable the students to understand green house gas emissions and their problems

2.2. Specific Objectives:

Enable the students to:

- 1. identify the green house gases.
- 2. describe the major green house gases.
- 3. summarize the sources that cause emission of green house gases.
- 4. give an outline of the effect of green house gas emissions .

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cognitive	The Cognitive Process Dimension				
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	1			1,2,3	4	
Knowledge						
B. Conceptual		1,3,4	2		2,34	
Knowledge						
C. Procedural				2		
Knowledge						
D. Meta Cognitive					4	
Knowledge						

2.4: Key words:

Green house gas emissions, effects, climate change, industry

2.5: Key diagrams (if any):





3. Discussion:

The students will be asked to do role play as methane, nitrous oxide and fluorinated gases. Then they will realise the impact of green house gases such as global warming, melting ice and rising sea level, extreme weather events and ecosystem disruption.

4. Mind Map:



5. Summary:

Using Mind map, students will understand the green house gases that causes global warming. The sources of green house gases will be asked. Executing the acquired knowledge by asking questions like 'Why ice caps melts? Name activity that cause the release of CFC'S.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about GREEN HOUSE GASES
- Producing the e-content.
- Providing PPT to create visual impact of global warming

7. FAQ's:

1. Which of the following gases is the most prevalent greenhouse gas in Earth's atmosphere?

- A) Carbon dioxide (CO₂)
- B) Methane (CH₄)
- C) Nitrous oxide (N₂O)
- D) Water vapor (H₂O)

2. What is the primary source of methane emissions?

- A) Combustion of fossil fuels
- B) Agricultural activities, particularly livestock
- C) Industrial production of chemicals
- D) Deforestation

3. Which sector is the largest contributor to greenhouse gas emissions globally?

- A) Transportation
- B) Energy production and consumption
- C) Agriculture
- D) Waste management

4. What is the greenhouse effect?

A) A process where the ozone layer absorbs harmful ultraviolet radiation

- B) The trapping of heat in the Earth's atmosphere by greenhouse gases
- C) The cooling of the Earth's surface due to cloud formation
- D) The process of ozone depletion caused by CFCs

5. Which of the following activities is considered a natural source of greenhouse gas emissions?

A) Burning fossil fuelsB) Volcanic eruptions

- C) Industrial production of cement
- D) Deforestation

8. References: (Books/Periodicals/Journals)

Britannica, T. E. (Ed.) Marie Curie from Encyclopædia Britannica, (2020, April 16). Wikipedia, T. E. (Ed.).. Marie Curie, (16, June 2020) https://en.wikipedia.org/wiki/Carrot https://www.historyofinformation.com/detail.php?id=2928 https://www.britannica.com/biography/Antoine-Lavoisier Audio and Video link https://www.acs.org/content/acs/en/molecule-of-theweek/ archive/s/saccharin.html#:~:text=Saccharin%20was%20the%20first%20widely,sweet% 20taste%20on%20his%20hand. https://en.wikipedia.org/wiki/Marie_Curie https://en.wikipedia.org/wiki/Hydroxychloroquine https://www.ukessays.com/essays/chemistry/green-chemistry-and-its-applications.php https://www.discovermagazine.com/the-sciences/the-accidental-inventor https://theconversation.com/a-short-history-of-anaesthesia-from-unspeakable-agonytounlocking-consciousness-74748 https://edu.rsc.org/resources/collections/on-this-day-in-chemistry

9. Verified by Subject Expert

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Course In-charge Dr. G.Amala Jothi Grace

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Approved by HOD

Head Department of Chemistry, St.Mary's College (Autonomout), Thoothubudi-620001

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Physics
Semester	Ι
Course Title	Allied: Allied Chemistry I
Code	21UCHA11
Hours	4
Total Hours	60
Credits	4
Max Marks	100
Unit & Title	Unit:1- Hydrogen Bonding
Name of the Faculty	Dr.B.Divya
T-L tools	Lecture method, Visual aid: PPT, Picture showing the structure of
	hydrogen bonding

Prerequisite Knowledge:

Knowledge of alloys and its characteristics

Micro -planning



1. Topic for Learning through evocation

Students will be asked about the increase in volume of water while freezing.

2. Topic Introduction:

Hydrogen bonding refers to the formation of hydrogen bonds, which are a special class of attractive intermolecular forces that arise due to the dipole-dipole interaction between a hydrogen atom that is bonded to a highly electronegative atom and another highly electronegative atom which lies in the vicinity of the hydrogen atom. For example, in water molecules (H₂O), hydrogen is covalently bonded to the more electronegative oxygen atom. Therefore, hydrogen bonding arises in water molecules due to the dipole-dipole interactions between the hydrogen atom of one water molecule and the oxygen atom of another H₂O molecule. In a molecule, when a hydrogen atom is linked to a highly electronegative atom, it attracts the shared pair of electrons more, and so this end of the molecule becomes slightly negative while the other end becomes slightly positive. The negative end of one molecule attracts the positive end of the other, and as a result, a weak bond is formed between them. This bond is called the hydrogen bond. As a result of hydrogen bonding, a hydrogen atom links the two electronegative atoms simultaneously, one by a covalent bond and the other by a hydrogen bond. The conditions for hydrogen bonding are as follows:

- 1. The molecule must contain a highly electronegative atom linked to the hydrogen atom. The higher the electronegativity, the more the polarization of the molecule.
- 2. The size of the electronegative atom should be small. The smaller the size, the greater the electrostatic attraction.

Examples of Hydrogen Bonding

Hydrogen Bonding in Hydrogen Fluoride

Fluorine, having the highest value of electronegativity, forms the strongest hydrogen bond.



Properties of Hydrogen Bonding

- Solubility: Lower alcohols are soluble in water because of the hydrogen bonding which can take place between water and alcohol molecules.
- Volatility: As the compounds involving hydrogen bonding between different molecules have a higher boiling point, they are less volatile.
- Viscosity and surface tension: The substances which contain hydrogen bonding exist as associated molecules. So, their flow becomes comparatively difficult. They have higher viscosity and high surface tension.
- The lower density of ice than water: In the case of solid ice, hydrogen bonding gives rise to a cage-like structure of water molecules. As a matter of fact, each water molecule is linked tetrahedral to four water molecules. The molecules are not as closely packed as they are in a liquid state. When ice melts, this

case-like structure collapses, and the molecules come closer to each other. Thus for the same mass of

water, the volume decreases and density increases. Therefore, ice has a lower density than water at 273

K. Because of this ice floats.

General Objective:

Enables the students to understand the structure responsible for hydrogen bonding and its effects

Specific Objectives:

Enables the students to:

- 1. describe the structure of H-bonding
- 2. categorize their types
- 3. Analyse their effects
- 4. Evaluate their properties

Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	Knowledge The Cognitive Process Dimension					
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1,2					
Knowledge						
B. Conceptual		2				
Knowledge						
C. Procedural			3	3,4		
Knowledge						
D. Meta Cognitive					4	
Knowledge						

Key words:

electropositive, association, H-bonding, electronegative, polar **Key points with diagrams**



Discussion:

The students will be asked questions regarding the effects of H-onding **Mind Map:**



3. Summary:

Students will be asked to summarize the characteristics of H-bonding

4. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Chart Display about the unknown facts of H-bonding
- Creating a video e-content.
- List some H-bonding molecules.

5. FAQ's:

1. Nitrogen, fluorine and oxygen are	_ in nature.
a) electronegative	
b) electropositive	
c) metallic	
d) semi-metallic	(Ans:a)
2. In a hydrogen bond, hydrogen has a positive cha	arge.
a) True	
b) False	(Ans: a)
3. Which of the following molecule can form a hydrogeneous sector of the	drogen bond with hydrogen?
a) Sodium	
b) Oxygen	
c) Aluminum	

d) Rubidium

hydrogen bonds.
(Ans:b)
noves away from hydrogen.

6. References

b) False

Text book:

1. Arun Bahl and B.S. Bahl. Advanced Organic Chemistry.S.Chand and Company Ltd., Reprint, 2005.

2. Puri B.R, Sharma L.R. and Kalia K.C. Principles of Inorganic Chemistry. Delhi: Milestone Publishers and

(Ans:a)

Distributers,2010.

3. Arun Bahl B.S. and Bahl, Tuli G.D. Essentials of Physical Chemistry.New Delhi: S.Chand&Company

Ltd.,2008.

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Department of Chemistry St. Mary's College (Autonomous) Thoothukudi

Approved by HOD

Verified by Subject Expert

LESSON PLAN SAMPLE FOR SCIENCE

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	Ι
Subject Title	Allied Chemistry I
Code	21UCHA12
Hours	4
Total Hours	60
Credits	3
Max Marks	100
Unit & Title	Unit IV: Biomolecules
Name of the Faculty	Dr.A.Parveen Sulthana
T-L tools	Lecture method, Audio Visual aid: videos about proteins and it's
	classification. Visual aid: Pictures of polypeptide linkage, amino acids,
	structure of proteins, multimedia approach and evaluated by oral
	questioning, presenting the report of group discussion.

Prerequisite Knowledge:

Knowledge about Proteins and its classification. Micro –planning : 60 minutes

Evocation – 3 minutes

Prerequisites – 2 minutes

General objective 1 – 10 minutes

Formative assessment 1 – 5 minutes

General objective 2 – 10 minutes

Formative assessment 2 – 5 minutes

General objective 3 – 10 minutes

Formative assessment 3 – 5 minutes

General objective 4 – 10 minutes

Formative assessment 3 – 5 minutes

Discussion – 5 minutes

Mind map – 3 minutes

Summary – 2 minutes



1. Topic for Learning through evocation

Proteins are defined as amino acid polymers. Since the amino acids are attached with each other through peptide linkage, they are otherwise known as polypeptides. Proteins are classified on the basis of their composition, solubility and other physical properties into Simple proteins, Conjugated proteins and Derived proteins. Proteins are primarily used for muscular activity, they are known as Building block of muscle. Then a question, If We eat high amounts of protein, will it make us bulk out? Will be asked.

2. Topic Introduction

Proteins are large molecules made up of amino acids that perform many functions in living organisms. They are large, complex molecules that play many critical roles in the body. They do most of the work in cells and are required for the structure, function and regulation of the body's tissues and organs.

2.1. General Objective:

Enable the students to understand proteins and their classification.

2.2. Specific Objectives:

Enable the students to:

- 1. Identify the different types of proteins.
- 2. Describe the peptide linkage.

- 3. Compare simple protein and conjugated protein.
- 4. Summarize the molecular structure and behaviour of protein.
- 5. Give an outline of the prosthetic group present in conjugated protein.

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	edge The Cognitive Process Dimension					
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	1			1,2,3	4	
Knowledge						
B. Conceptual		1, 2,3,4	2,5		2,34	
Knowledge						
C. Procedural				2		
Knowledge						
D. Meta					5	
Cognitive						
Knowledge						

2.4: Key words:

Proteins, Polypeptide, Prosthetic group, Molecular structure.

2.5: Key diagrams:



3. Discussion:

The students will be asked to do role play with the structure of protein. Quiz will be conducted regarding the classification of proteins.

4. Mind Map:



5. Summary:

Using Mind map, students will be asked to classify proteins. The functions of proteins will be asked. Executing the acquired knowledge by asking questions like 'What proteins are involved in hair growth? Name the protein which is responsible for muscular activity.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about creating an e-content on Proteins
- Producing the e-content.
- Providing PPT to create visual impact for proteins and its classification.

7. FAQ's:

1. The repeating units of proteins are (c)Fatty acid (d) peptides (a) Amino acids (b)Glucose 2. Amino acids are joined by (c) Glycosidic bond (d) Peptide bond (a) Hydrogen bond (b)Ionic bond 3. Myoglobin is a (a) Primary structure (b)Tertiary structure(c)Secondary structure(d) All of these 4. The 3-D structure of protein can be determined by (d) X- ray crystallography (a) Spectroscopy (b)NMR (c)Both a and b 5. Total numbers of amino acids are involved in protein synthesis in plants (a) 20 (b)12 (c)25 (d) 28

8. References:

1. Arun Bahl and B.S. Bahl.. Advanced Organic Chemistry. S.Chand and Company Ltd., Reprint, 2005

2. Puri, B.R., Sharma, L.R. and K.C.Kalia, Principles of Inorganic Chemistry. Milestone Publishers and Distributers, Delhi, 2010.

3. Arun Bahl, B.S. and Bahl, G.D.Tuli. Essentials of Physical Chemistry. S.Chand & Company Ltd., New Delhi, 2008.

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Head of the Department

A. Pawean Sulthare

Dr. A. Parveen Sulthana

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St.Mary's College (Autonomous) Thoothukudi-528001

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc., Chemistry
Semester	Ι
Course Title	Ability Enhancement Course -Value Education
Course Code	21UAVE11
Hours/Week	2
Total Hours	30
Credits	2
Unit & Title	Unit I: Introduction to Value Education/
	Benefits of Value Education-Characteristics of
	Values
Name of the Faculty	Dr. Irudaya Antonat Sophia
T-L tools	Lecture method, PPT

Prerequisite Knowledge: know the importance of the word values




1.Topic for Learning through evocation

Values are principles, fundamental convictions, and ideals which act as general guide to behaviour or as a reference point in decision making. They are beliefs about what is right and what is wrong and what is important in life. They give strength to a person's character by occupying a central place in his life. It is like the rails which keep the train on track. Without values, life will be chaotic. The moral values present a true perspective of the development of any society or nation. They tell us to what extent a society or nation has developed itself.

2. Topic Introduction:

Characteristics of values

• Extremely practical-with an understanding of the strategic context not just techniques.

• Provide standards of competence and morality.

• Loaded with effective thoughts about objects, behaviours learnt early in life from family, friends, neighbourhood school, mass media, visual media and other sources within the society.

Judgmental in that they carry an individual's ideas as to what is right, good, or desirable.
Help in the integration and fulfilment of man's basic impulses and desires stably and consistently appropriate for his living.

- Build up societies, integrate social relations.
- Mould the ideal dimensions of personality and depth of culture.
- Influence people's behaviour and serve as criteria for evaluating the actions of others.
- Have a great role to play in the conduct of social life.

Socially shared, intensely felt values are a fundamental part of our lives. These values

become part of our personalities. They are shared and reinforced by those with whom we interact.

Several universal human values such as Truth, Righteous conduct, Peace, Love and Nonviolence are directly associated to physical, intellectual, emotional psyche and spiritual facets of human personality. There is need and urgency to reinforce these values for a better and humane society.

Benefits of Value Education

Value Education helps us to

- be honest
- be kind
- have friendship
- love one another
- work hard
- respect others
- be responsible
- be happy
- make timely decisions
- avoid violence

3.1. General Objective:

Enable the students to know about the concept of value education, its types and categories

3.2. Specific Objectives:

Enables the students to:

1.To improve the integral growth of human being.

2. To create attitudes and improvement towards sustainable lifestyle.

3. To increase awareness about our national history, our cultural heritage, constitutional

rights, national integration, and community development environment.

4. To create and develop awareness about the values and their significant roles.

5. To know about various living and non-living organisms and their interaction with

environment.

2.3 : Taxonomy of objectives:

Taxonomy of objectives:						
Knowledge	The Cognitive Proce	ess Dimension				
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		2				
Knowledge						
C. Procedural				2,3		
Knowledge						
D. Meta Cognitive					3,4	4,5
Knowledge						

2.4 : Key words: values, society, integral growth

2.5 : Key diagrams (if any):

Right Conduct	Peace	Truth	Love	Non-Violence
Manners	Patience	Truthfulness	Kindness	Consideration
Health	Concentration	Creativity	Friendship	Cooperation
Awareness				
Helpfulness	Positiveness	Honesty	Forgiveness	Global
				Stewardship
Responsibility	Self-Acceptance	Determination	Generosity	Loyalty
Independence	Self-Discipline	Fairness	Compassion	Active
				Citizenship
Perseverance	Thankfulness	Trust	Tolerance	Justice
Courage	Contentment	Reflection	Service	Respect

Equality of Gender	Punctuality	Sensitivity	Patriotism	National Integration
Courage	Dignity of	Tidiness,	Cleanliness,	Truthfulness,
	Labour	Determination	Love	Co-operation

Discussion: The students will be asked to list the values and catogorise them

4.Mind Map:



5. Summary:

Students will be asked to identify the types, categories and benefits of values using the mind map.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

• Asking the students to make a list of these values in a priority-wise manner and then arrange

the values as per the importance given to each value by them.

• creating an e-content

7. FAQ's:

1. _____ builds a person's overall character.

- (a) Explicit value education (b) Implicit value education
- (c) Value education (d) Formal education
- 2. ______ includes equality, justice, liberty, freedom, and national pride.
- (a) Political values (b) **Social values**
- (c) Economic values (d) Religious values

3. ______ are those around money, and may include beliefs around ownership of property.

(a) Political values	(b) Social values
(c) Economic values	(d) Religious values
4 are spiritual in nature and	include beliefs in how we should live.
(a) Political values	(b) Social values

(c) Economic values (d) **Religious values**

Books for Reference:

1. Indrani Majhi (Shit)Ganesh Das, Value Education, Laxmi Publication Pvt. Ltd.,

2017

2. Arumugam, N. S. Mohana, Lr.Palkani, Value Based Education, Saras Publication

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Dr. Irudaya Antonat Sophia

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Mrs. S. Rani Jeyamary

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Verified by Subject Expert

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry					
Semester	II					
Subject Title	General Chemistry - II					
Code	21UCHC21					
Hours	6					
Total Hours	90					
Credits	5					
Max Marks	100					
Unit & Title	Unit: III – Stereochemistry					
Name of the Faculty	Dr. A.Parveen Sulthana					
T-L tools	Lecture method , PPT					

Prerequisite Knowledge:

Knowledge Knowing about the importance of Stereochemistry

Micro - planning



1.Topic for Learning through motivation

Imagine the structure of ammonia and borontrifluoride, in that the atoms that surround the central ion are not placed in the plane, they are placed one above and one below the plane. Hence they may be arranged in the spatial arrangements. Likewise the chemistry that deals with the study of spatial arrangement is called stereochemistry.

2.Topic Introduction:

Stereochemistry is the branch of chemistry that studies the three-dimensional arrangement of atoms in molecules and the effects of this arrangement on chemical behavior. It plays an important role in determining the properties and reactions of molecules, particularly in organic chemistry. The spatial arrangement of atoms in a molecule impacts its pharmacological properties, affecting factors like potency, selectivity, and toxicity. The term "stereochemistry" is derived from the Greek "stereos" meaning solid—it refers to chemistry in three dimensions. Since nearly all organic molecules are three dimensional.

Stereoisomers

- Stereoisomers have the same sequence of bonds but the atoms or groups of atoms are oriented differently in space.
 - Conformers or conformational isomers are the stereoisomers in which the different orientations of atoms are a result of rotation around single bonds. The specific arrangement of atoms in a conformational isomer is also called conformation.
 - **Configurational** isomers are stereoisomers that can be interconnected only by breaking and making some bonds. The specific arrangement of atoms in a configuration isomer is also called **configuration**.

Conformers or conformational isomers

Conformers are the isomers that are the result of rotation around single bonds. They are also called different **conformations** of the same molecule. For example, rotation around C-C bond of ethane places a set of three H'_{S} on one C at different positions relative to H'_{S} on the other C, as illustrated below.



Illustration of rotation around C–C bond in ethane (Copyright; mailto:ralf@ark.in-berlin.de, CC BY 2.5 via Wikimedia Commons)

Different arrangements of H's in ethane due to rotation around C-C bond

Usually, the rotation around single bonds happens rapidly at room temperature. So, the conformers usually exist as a mixture and can not be easily separated.

Chirality

An object or molecule that cannot be superimposed on its mirror image by any translation, rotational, or conformational changes is a **chiral** object. This geometric property is called **chirality**.

Achiral is not chiral, i.e., the objects or molecules that are identical to their mirror image are achiral.

For example, an amino acid with four different groups attached to the same carbon and hand are chiral, having a non-superimposable mirror image as illustrated in Figure 3.1.2. Like left and right hands that have a thumb and fingers in the same order, but are mirror images and not the same, chiral molecules have the same things attached in the same order, but are mirror images and not the same, chiral molecules have the same things attached in the same order, but are mirror images and not the same.



General Objective:

Enables the students to understand the conformer, isomer in stereochemistry

Specific Objectives:

Enables the students to:

- 1. Describing the types isomers
- 2. Compare the nature of optical activity
- 3. Shows the importance of chirality
- 4. Distinguishing the chiral compounds

Taxonomy of objectives:

Taxonomy of Objectives								
Knowledge	The Cognitive	The Cognitive Process Dimension						
Dimension	Remember	Remember Understand Apply Analyse Evaluate Create						
A. Factual	1							
Knowledge								
B. Conceptual		1,2						
Knowledge								
C. Procedural				3,4				
Knowledge								
D. Meta Cognitive					2,3,4			
Knowledge								

Key words:

Isomer, chiral, optical activity, asymmetric

Key diagrams (if any):

Light that has been passed through a nicol prism or other polarizing medium so that all of the vibrations are in the same plane.



Discussion:

The students will be asked questions regarding the types of Conformers One of the students will be asked to draw any type of chiral carbon studied during the class.

Mind Map:



Summary:

Students will be asked to identify how the spatial arrangement takes place in the conformation, studied by

using the mind map..

Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental idea about the spatial arrangement of the conformer.
- Producing the e-content.
- Provided with different configuration of the isomer and asked to identify the nature of the stereoisomer

FAQ's:

The stereoisomers of a compound , which are non-superimposable mirror images of each other are termed					
a <u>)enantiomers</u> b) isomers c) mesomers d) diastereomers					
The dextrorotatory compound rotates the plane of polarization					
a) towards left b) towards right c) towards up d) towards down					
An object that is not superimposable on its mirror image is called					
<u>a)chiral</u> b) achiral c) diastereomer d) isomer					
The isomer with one stereogenic center is called					
a) enantiomer b) diastereomer c) meso form d) cis form					
The compounds are optically inactive.					
a) meso form b) diastereomer c) enantiomer d) cis form					

References

1. Kalsi P.S. Stereochemistry Conformation and Mechanism. New Age International, 2005.

2. ArunBahl, Bahl B.S, Tuli G.D. Essentials of Physical Chemistry.New Delhi:S.Chand and

Company Ltd., Revised edition 2008.

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Head of the Department

Verified by Subject Expert

A. Pawean Sulthare

Dr. A. Parveen Sulthana

Approved by HOD

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry				
Semester	Ι				
Course Title	Allied: Allied Biochemistry II				
Code	21UCBA21				
Hours	4				
Total Hours	60				
Credits	4				
Max Marks	75				
Unit & Title	Unit IV: Minerals				
Name of the Faculty	Dr.G. Amala Jothi Grace				
T-L tools	Lecture method, Audio Visual aid: videos about minerals and its				
	classification. Visual aid: Picture of minerals and its sources, multimedia				
	approach and evaluated by oral questioning, presenting the report of				
	group discussion.				

Prerequisite Knowledge:

Knowledge about minerals, it's classification and biological role of micro and macro elements.

Micro -planning



1. Topic for Learning through evocation

Minerals are naturally occurring inorganic substances that are the building blocks of rocks and the Earth itself. They are formed through geological processes and possess a distinct chemical composition and crystalline structure. Minerals are essential for life and industry, playing a vital role in everything from nutrition and agriculture to construction and technology. With over 5,000 known varieties, minerals can range from common ones like quartz and feldspar to rare gems like diamonds and emeralds.

The students will be asked to imagine the life of a mineral, such as quartz, forming deep within the Earth's crust under immense pressure and heat. The students will be asked to visualize its transformation through natural processes like erosion, transportation and deposition. The students will be splitted into groups and asked to explore how it's mined, processed and eventually used in items like watches, electronics, or even countertops. This approach sparks curiosity and connects geological concepts to real-world applications. Then the students will be asked to imagine themselves as a geologist on a mission to discover a new mineral. Then I ask the question What would you name it and what properties would it have?

2. Topic Introduction:

Minerals have played an essential role in human civilization for thousands of years, serving as fundamental resources for tools, construction, ornamentation, and technological advancements. These naturally occurring inorganic substances, with their unique chemical compositions and crystalline structus, have shaped the development of societies across the globe.

A well-balanced diet with diverse, nutrient-rich foods typically provides the required minerals to maintain good health. Minerals are essential nutrients that play a crucial role in maintaining the proper functioning of the human body. They are involved in numerous physiological processes that sustain health, growth, and overall well-being.

The minerals that support human beings for various applications are calcium, selenium, zinc, manganese, copper and magnesium. Calcium also helps prevent osteoporosis, a condition where bones become weak and brittle. Selenium, zinc, and manganese are involved in antioxidant enzymes that protect cells from damage caused by free radicals. Calcium is essential for the blood

clotting process, preventing excessive bleeding during injuries. Copper, zinc, and magnesium are important for enzyme systems that contribute to cell growth and repair.

2.1. General Objective:

Enable the students to understand minerals, their importance, deficiency diseases and dietary recommendations.

2.2. Specific Objectives:

Enable the students to:

- 1. identify the role of minerals.
- 2. describe the classification of minerals.
- 3. compare the need of different minerals and the effects of mineral deficiencies or excess on health.
- 4. summarize the applications of minerals.
- 5. give an outline of the dietary recommendations for mineral intake across different populations.

2.3: Taxonomy of objectives:

Taxonomy of Objectives							
Knowledge	The Cognitive	The Cognitive Process Dimension					
Dimension	Remember	Remember Understand Apply Analyze Evaluate Create					
A. Factual	1,2			1,2,5	4		
Knowledge							
B. Conceptual		1,3,4	3,4		2,34		
Knowledge							
C. Procedural				5			
Knowledge							
D. Meta Cognitive					5		
Knowledge							
_							

2.4: Key words:

Minerals, Mineral deficiencies, dietary recommendations for minerals

2.5: Key diagrams (if any):





Video link: <u>https://study.com/academy/lesson/video/minerals-in-our-food-what-theyre-for-where-to-find-them.html</u>

3. Discussion:

The students will be asked to do role play with foods containing minerals and their deficiency diseases.

4. Mind Map:



Mineral	Role in the Body	Food Sources
Calcium	Bone and teeth health	Dairy, leafy greens
Iron	Oxygen transport (hemoglobin)	Red meat, spinach
Potassium	Nerve signaling, muscle function	Bananas, potatoes
Magnesium	Enzyme activation, muscle relax.	Nuts, whole grains
Zinc	Immune support, wound healing	Shellfish, seeds

5. Summary:

Using Mind map, the essential nutrients required by the human body for various physiological processes is discussed. The students will get visual knowledge by using videos regarding the minerals that explains how minerals are crucial for growth, development and maintaining overall health.

Executing the acquired knowledge by asking questions like 'What mineral will essential for bone and teeth.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about creating an e-content on minerals
- Producing visual impact through videos.
- Providing PPT to ideas regarding the essential need of minerals.

7. FAQ's:

- 1. _____ is an important intracellular cation.
- a) Sodium b) Potassium c) Calcium d) Chromium Ans: b
- 2. _____ enzyme requires potassium for its maximal activity
 - a) Catalytic dehydrogenase b) lipase c) pyruvate kinase d) protease Ans: c
- 3. The best source of chromium is _____
 - a) Brewer's yeast b) milk c) butter d) chocolate Ans: a
- 4. Excess of ______ causes chalky white patches in teeth.
 - a) Sodium b) fluorine c) Calcium d) Chromium Ans: b
- 5. Diminished sensitivity of taste occurs due to deficiency of _____
- a) Sodium b) Potassium c) Calcium d) Zinc Ans: d

8. References: (Books/Periodicals/Journals)

- 1. Dulsy Fatima, Narayanan L.M, MeyyanPillai R.P, Nallasingam K, Prasanna Kumar S and Arumugam N. *Biochemistry*. Saras Publications, 2010.
- 2. Patricia trueman. Nutritional Biochemistry. MJP publisher, 2011.
- 3. Veerakumari L. Biochemistry. MJP Publishers, 2010.
- 4. Dr. Deb A.C. Concepts of Biochemistry. Kolkata: Central Book of Agency, 2001.
- 5. Powar C.B, Chatwal G. R. Biochemistry. Himalaya Publishing Ltd, 2002.
- 9. Verified by Subject Expert

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Course In-charge Dr. G.Amala Jothi Grace

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Approved by HOD



LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry
Semester	II
Course Title	Skill Enhancement Course II: Professional English for Chemistry II
Code	21UCHPE2
Hours	2
Total Hours	30
Credits	2
Max Marks	50
Unit & Title	Unit I: Nanotechnology and applications
Name of the Faculty	Dr.G. Amala Jothi Grace
T-L tools	Lecture method, Audio Visual aid: videos about applications of
	nanotechnology. Visual aid: Picture of nanoparticles and its applications
	and evaluated by oral questioning, presenting the report of group
	discussion.

Prerequisite Knowledge:

Knowledge about nano materials. Micro -planning



1. Topic for Learning through evocation

A **nanoparticle** is a particle that has at least one dimension in the nanometer range (typically 1 to 100 nanometers, or billionths of a meter). These particles have unique properties due to their small size and large surface area relative to their volume, which often makes them behave very differently from bulk materials.

The students will be asked to imagine a world where they could use a nano-sized robot to deliver medicine directly to cancer cells in your body, targeting only the unhealthy cells and leaving the healthy ones intact.By this imagination, they will realise the applications of nanotechnology. Visuals can evoke a sense of awe and interest. Them the images of products that have been enhanced by nanotechnology will be presented. For example, how nano-coatings are used to make surfaces water-resistant, or how nanoparticles improve solar panels' efficiency is presented

2. Topic Introduction:

Due to their small size, nanoparticles have a much higher surface area to volume ratio compared to larger particles. This increased surface area allows them to interact with other materials more efficiently, often enhancing their reactivity or strength. Nanotechnology is a multidisciplinary field that combines principles from physics, chemistry, biology, materials science, and engineering to create new materials, devices, and systems that have applications in diverse industries. Nanotechnology is still a rapidly developing field, with researchers constantly discovering new materials and techniques to harness its potential. As the technology continues to evolve, we can expect to see even more innovative applications that address global challenges in medicine, energy, the environment, and beyond.

2.1. General Objective:

Enable the students to realise the role of nanotechnology in different fields

2.2. Specific Objectives:

Enable the students to:

- 1. explore the role of nanotechnology in environmental protection, such as water purification, pollution control, and sustainable energy solutions through roleplay.
- 2. describe the the impact of nanotechnology on the development of smaller, faster, and more energy-efficient electronics and computing devices.
- 3. compare the ethical, environmental, regulatory challenges associated with the widespread use of nanotechnology..
- 4. summarize the the integration of nanotechnology into consumer goods like cosmetics, textiles, and food packaging.
- 5. give an outline of nanotechnology can improve energy storage and conversion technologies, such

as batteries, supercapacitors, solar cells.

2.3: Taxonomy of objectives:

Taxonomy of Objectives							
Knowledge	/ledge The Cognitive Process Dimension						
Dimension	Remember	Remember Understand Apply Analyze Evaluate Create					
A. Factual	1			1,2,3	4		
Knowledge							
B. Conceptual		1, 2,3,4	2,5		2,34		
Knowledge							
C. Procedural				2			
Knowledge							
D. Meta Cognitive					5		
Knowledge							
_							

2.4: Key words:

Nanoparticle, nano apllications, nano technology

2.5: Key diagrams (if any):



3. Discussion:

The students will be asked to do role play with the classification of vitamins. Quiz will be conducted regarding the deficiency diseases. Finally, students were asked to summarise the nano applications.

4. Mind Map:



5. Summary:

Using Mind map, students will understand the role of nanotechnology in different fields. Then the questions such as What are the primary fields of application for nanotechnology? How does the unique behavior of materials at the nanoscale differ from their bulk properties? will be asked to present as groups. Nanotechnology presents significant advancements, it also raises ethical, environmental, and health concerns. Potential risks include toxicity of nanoparticles, environmental impact, and the need for regulations to ensure safe usage. Long-term effects of nanomaterials on human health and ecosystems are still being researched. In conclusion, the applications of nanotechnology span across multiple industries, providing innovative solutions that improve efficiency, sustainability, and quality of life.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating the nano applications through chart work.
- Producing e-content.
- Providing PPT to get visual knowledge about nano materials.

7. FAQ's:

1. Which of the following is a potential application of nanotechnology in medicine?

A) **Drug delivery systems**

- B) DNA extraction
- C) Blood cell production
- D) Soil erosion prevention

2. In which industry is nanotechnology used for creating stronger, lighter, and more durable materials?

A) Automotive industry

- B) Fashion industry
- C) Agriculture industry
- D) Music industry

3. Which of the following nanomaterials is commonly used in solar cells to improve energy conversion efficiency?

- A) Gold nanoparticles
- B) Carbon nanotubes
- C) Silver nanowires
- D) Titanium dioxide nanoparticles

4. What is the role of nanotechnology in environmental applications?

A) Removing heavy metals from wastewater

- B) Reducing carbon emissions in cars
- C) Designing renewable energy sources
- D) Decreasing agricultural productivity

5. Which of the following is an example of nanotechnology used in consumer electronics?

- A) Quantum dots in displays
- B) Nanoparticles in clothing
- C) Nano-coatings on food packaging
- D) All of the above

8. References: (Books/Periodicals/Journals)

References:

1. https://www.nano.gov/you/nanotechnology-benefits

2. https://www.google.com/search?q=natural+and+artificial+dyes&rlz=1C1CHBD_enIN868IN8 68&oq=natural+and+artificial+dyes&aqs=chrome..69i57j0i22i30l3j0i390l2.1894j0j7&sourcei d=chrome&ie=UTF-8

- 3. https://en.wikipedia.org/wiki/Photosynthesis
- 4. https://en.wikipedia.org/wiki/Periodic_table
- 5. https://www.psd1.org/cms/lib/WA01001055/Centricity/Domain/30/The_Spirit_of_Chemical _Science.pdf
- 6. https://en.wikipedia.org/wiki/The_Alchemist_(novel)
- 7. https://www.livescience.com/60682-

polymers.html#:~:text=Polymers%20are%20materials%20made%20of,tough%2C%20like%20 epoxies%20and%20glass.

8. https://en.wikipedia.org/wiki/Pharmaceutical_industry

9. Verified by Subject Expert

Goluaghi

Course In-charge Dr. G.Amala Jothi Grace

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Approved by HOD

Head Department of Chemistry, SEMary's College (Autonomout), Thoothukudi-628001

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Physics					
Semester	II					
Subject Title	Allied Chemistry - II					
Code	21UCHA21					
Hours	4					
Total Hours	60					
Credits	3					
Max Marks	100					
Unit & Title	Unit: I - Metallurgy					
Name of the Faculty	Dr. B. Divya					
T-L tools	Lecture method, PPT					

Prerequisite Knowledge:

Knowledge Knowing about the importance of furnaces

Micro - planning



1. Topic for Learning through motivation

The food we get from nature are raw, to take as a nutrition what we do?. We just cook the food through processing. For this purpose we use the gas stove, cookers etc for preparation. In this way to process a metal we undergo many steps of processing, among that one of the thing which is utilized is furnace, the furnaces are of various types depending upon the nature of ore and heating.

2.Topic Introduction:

Metallurgy is defined as a process that is used for the <u>extraction of metals</u> in their pure form. The compounds of metals mixed with soil, limestone, sand, and rocks are known as minerals. Metals are commercially extracted from minerals at low cost and minimum effort. These minerals are known as ores. A substance which is added to the charge in the furnace to remove the gangue (impurities) is known as flux. Metallurgy deals with the process of purification of metals and the formation of alloys. Based on the method of generating heat, furnaces are broadly classified into two types namely combustion type (using fuels) and electric type. In case of combustion type furnace, depending upon the kind of combustion, it can be broadly classified as oil fired, coal fired or gas fired.

General Objective:

Enables the students to understand the the methods of purification of ores Know the types of furnaces.

Specific Objectives:

Enables the students to:

- 1. Describing the usage of furnances
- 2. Compare the types of furnace
- 3. Shows the importance of furnance in metallurgy
- 4. Distinguishing the various types of process

Taxonomy of Objectives							
Knowledge	The Cognitive Process Dimension						
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create	
A. Factual	1						
Knowledge							
B. Conceptual		1,2					
Knowledge							
C. Procedural				3,4			
Knowledge							
D. Meta Cognitive					2,3,4		
Knowledge							

Key words:

Metals, ores. furnace, refining

Key diagrams (if any):





Discussion:

The students will be asked questions regarding the types of furnaces. One of the students will be asked to explain the types of furnaces studied during the class.

Mind Map:



Summary:

Students will be asked to identify how heating takes place in the types of furnaces studied by using the mind

map.

Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental idea about creating an e-content of working of furnaces.
- Producing the e-content.
- Provided with different ores the students are asked to identify the nature of furnaces

FAQ's:

Find one among the following statements is true regarding calcination					
a) the ore is heated strongly in the absence of air b) the ore is heated with calcium					
c) the ore is heated with carbon d) the mineral is melted with lime stone					
Identify the process in which ore is heated in the presence of air below its melting point is called					
a) Leaching b) Roasting c) Smelting d) Calcination					
The furnace which is used to heat the ore directly with the fuel is furnace.					
a) blast b) Poling c) Van Arkel's process d) Zone refining					
Find the substance which is added to an ore in order to remove impurities during melting is called -					
a) Slag b) Flux c) Gangue d) catalyst					
Find thermite is a					
a) a mixture of the ore and Mg powder b) the molten metal obtained as end product					
c) a mixture of the ore and Al powder d) a mixture of the ore and Zn dust					

8.References

- 1. Puri B.R, Sharma L.R. and Kalia K.C .*Principles of Inorganic Chemistry*.Delhi: Milestone Publishers and Distributers, 2010.
- 2. Arun Bahl B.S. and Bahl, Tuli G.D. *Essentials of Physical Chemistry*. S.Chand & Company Ltd.New Delhi, 2008.

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Head of the Department

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Approved by HOD

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Verified by Subject Expert (B.Divya)

LESSON PLAN SAMPLE FOR SCIENCE

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry				
Semester	II				
Subject Title	Allied Chemistry II				
Code	21UCH A22				
Hours	4				
Total Hours	60				
Credits	3				
Max Marks	100				
Unit & Title	Unit I: Metallurgy				
Name of the Faculty	Dr.A. Parveen Sulthana				
T-L tools	Lecture method, Audio Visual aid: videos about ores and their extraction				
	methods. Visual aid: Pictures of classification of ores, refining process,				
	extraction methods, multimedia approach and evaluated by oral				
	questioning, presenting the report of group discussion.				

Prerequisite Knowledge:

Knowledge about Classification of ores and Extraction methods.

Micro -planning: 60 minutes

Evocation – 3 minutes

Prerequisites – 2 minutes

General objective 1 – 10 minutes

Formative assessment 1 – 5 minutes

General objective 2 – 10 minutes

Formative assessment 2 – 5 minutes

General objective 3 – 10 minutes

Formative assessment 3 – 5 minutes

General objective 4 – 10 minutes

Formative assessment 3 – 5 minutes

Discussion – 5 minutes

Mind map – 3 minutes

Summary – 2 minutes



1. Topic for Learning through evocation

Minerals are naturally occurring substances containing the metal in the combined form.

Example: Clay (Alumino silicate). Ores are minerals from which the metal can be extracted easily and economically. Example: Rutile. Minerals and Ores differ in the following ways, Minerals have a low percentage of metals while ores contain a high percentage, Ores can be used to extract metals but minerals cannot, All minerals are not ores but all the ores are minerals.

2. Topic Introduction:

The scientific process of extracting metals in their pure form from naturally occurring minerals called ores, which usually contain impurities and then refining them to be used for various application. It is the method to get usable metals from the rocks they are found in. Metals are commercially extracted from minerals at low cost and minimum effort.

2.1. General Objective:

Enable the students to understand Ores, their classification and metals are extracted from minerals.

2.2. Specific Objectives:

Enable the students to:

- 1. Identify the different types of Ores.
- 2. Describe the Electrolytic refining process.
- 3. Compare calcination and roasting.
- 4. Summarize the extraction of Vanadium.
- 5. Give an outline of the extraction of Tungsten from Wolframite ore.

2.3: Taxonomy of objectives:

Taxonomy of Objectives							
Knowledge	nowledge The Cognitive Process Dimension						
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create	
A. Factual	1						
Knowledge							
B. Conceptual		1, 2, 3, 4	2,5				
Knowledge							
C. Procedural				2			
Knowledge							
D. Meta Cognitive					5		
Knowledge							
_							

2.4: Key words:

Mineral, Ore, Extraction, Refining.

2.5: Key diagrams:





3. Discussion:

The students will be asked to do present the classification of Ores. Quiz will be conducted regarding the extraction of ores.

4. Mind Map:



5. Summary:

Using Mind map, students will be asked to classify ores. The extracting methods of ores will be asked. Executing the acquired knowledge by asking questions like What are the steps involved in extraction of metals from ores.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about creating an e-content on Ores
- Producing the e-content.
- Providing PPT to create visual impact for Extraction of ores from their minerals.

7. FAQ's:

1.	. Heating the ore with carbon in the presence of air is known as						
	(a) Roasting	(b)Reduction	(c)Smelting	(d) Refining			
2.	Which of the f	following is aci	dic flux				
	(a) CaO	(b)MgO	(c)ZnO	(d) SiO ₂			
3.	Azurite is an o	ore of					
	(a) Cr	(b)Al	(c)Fe	(d) Cu			
4.	Iron ores are f	ound in					
	(a) Attock	(b)Tharparke	er (c)Chitral	(d) Dadu			
5.	FeCO ₃ is the f	formula of	•				
	(a) Magnetite	(b)Limonite	(c)Siderite	(d) Azurite			
Dafe	roncos						

8. References:

1. Arun Bahl and B.S. Bahl.. Advanced Organic Chemistry. S.Chand and Company Ltd., Reprint, 2005

2. Puri, B.R., Sharma, L.R. and K.C.Kalia, Principles of Inorganic Chemistry. Milestone Publishers and Distributers, Delhi, 2010.

3. Arun Bahl, B.S. and Bahl, G.D.Tuli. Essentials of Physical Chemistry. S.Chand & Company Ltd., New Delhi, 2008.

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Head of the Department

J. Tawen Sulfare Dr. A. Parveen Sulthana

Approved by HOD

Verified by Subject Expert

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc., Chemistry
Semester	Ι
Course Title	Ability Enhancement Course -Environmental Studies
Course Code	21UAEV21
Hours/Week	2
Total Hours	30
Credits	2
Unit & Title	Unit III Environmental Pollution / Global warming and Climate Change
Name of the Faculty	Dr. Irudaya Antonat Sophia
T-L tools	Lecture method, PPT

Prerequisite Knowledge: know the causes for global warming and its impact on the environment

Micro -planning:



1.Topic for Learning through evocation

Sea level has been measured regularly since the 19th century using systems of coastal tide gauges. Over the past 100 years, global average sea level has risen about 6 inches. Now, satellites are used to measure sea level very precisely. Sea level is rising more than twice as fast in recent decades than it did earlier in the 20th century. Satellite data collected since 1993 show that global sea level has risen about 3.8 inches in that time. Rising sea levels are due to two main factors. The first factor is the melting of land ice, that is, ice sheets and mountain glaciers. As the ice sheets and glaciers melt, they add liquid water to the oceans. The ice sheets on Greenland and West Antarctica are both melting at increasing rates and are pushing sea level higher. The second factor is that water expands as it gets warmer. Measurements show that this thermal expansion currently accounts for about 40 percent of observed sea level rise to date. Such changes are certain to continue. The oceans have absorbed a massive amount of the extra heat trapped by greenhouse gases in Earth's atmosphere. Greenhouse gas emissions today, the sea level would continue to rise. But it will rise faster the more quickly the world warms.

2. Topic Introduction:

Global warming, the phenomenon of increasing average air temperatures near the surface of Earth over the past one to two centuries. Climate scientists have since the mid-20th century gathered detailed observations of various weather phenomena (such as temperatures , precipitation , and storms) and of related influences on climate (such as ocean currents and the atmosphere's chemical composition). These data indicate that earth's climate has changed over almost every conceivable timescale since the beginning of geologic time and that human activities since at least the beginning of the industrial revolution have a growing influence over the pace and extent of present-day climate change. Climate change is one of the most pressing threats to coral reefs

globally. Rising ocean temperatures and increasing levels of carbon dioxide (CO₂) are driving

phenomena such as coral bleaching, ocean acidification, and sea level rise, all of which are rapidly

degrading coral ecosystems.

3.1. General Objective:

Enable the students to know about the causes of green house effect and its impact on climate change

3.2. Specific Objectives:

Enables the students to:

- 1. Know the effects of global warming
- 2. Categorise the causes leading to climate change
- 3. Enumerate easy ways to reduce global warming
- 4. Realising the role of individuals in this global warming and climate change

2.3 : Taxonomy of objectives:

Taxonomy of objectives:						
Knowledge	The Cognitive Proces	s Dimension				
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		2				
Knowledge						
C. Procedural			3	2,3		
Knowledge						
D. Meta Cognitive					3,4	
Knowledge						

2.4 : Key words: global warming, green house effect, sea level, climate change

2.5 : Key diagrams (if any):



Discussion: The students will be asked to list the causes and effects of global warming and find out ways to reduce

4.Mind Map:



5. Summary:

Students will be asked to identify the causes and effects of global warmingusing the mind map.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

• Asking the students to realise their role and preventive measures that can be taken in this regard
• creating an e-content

7. FAQ's:

1. CO₂ increases leads to _____. b) ozone depletion c) silicosis d) ecoterrorism a) global warming 2. Ozone layer is affected by excess release of _____ into the atmosphere. a) sulphur di oxide b) nitrogen c) chlorine d) chlorofluorocarbon 3. Release of more CO₂ in the atmosphere leads to _____ a) green house effect b) acid rain d) flood c) cancer 4. Burning of plastic causes _____. a) fever b) cancer c) skin disease d) ulcer Solingy 1.A.Sophia Dr. Irudaya Antonat Sophia Mrs. S. Rani Jeyamary

> Head Department of Chemistry, SE.Mary's College (Autonomous) Thoothukudi-525001

Verified by Subject Expert

Approved by HOD

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry
Semester	III
Subject Title	Core III Physical Chemistry-I
Code	21UCHC31
Hours	4
Total Hours	60
Credits	4
Max Marks	100
Unit & Title	Unit: I – Surface Chemistry
Name of the Faculty	Dr. B. Divya
T-L tools	Lecture method and powerpoint presentation

Prerequisite Knowledge: Knowledge on surfaces, solids, liquids and gases

Micro -planning : 60 minutes

Evocation – 3 minutes **Prerequisites** – 2 minutes **General objective 1** – 10 minutes **Formative assessment 1** – 5 minutes **General objective 2** – 10 minutes **Formative assessment 2** – 5 minutes **General objective 3** – 10 minutes **Formative assessment 3** – 5 minutes **General objective 4** – 10 minutes **Formative assessment 3** – 5 minutes **Discussion** – 5 minutes **Mind map** – 3 minutes **Summary** – 2 minutes



1. Topic for Learning through evocation

Surface Chemistry is the study of the chemical phenomena that occur at the surfaces, which can be solidliquid, solid-gas, solid-vacuum, liquid-gas, etc. Due to complete miscibility, there is no interface between the gases.

2. Topic Introduction:

When a solid surface is exposed to a gas or a liquid, molecules **accumulate on the surface**. This is called adsorption.

The phenomenon of concentration of molecules of a gas or liquid at a solid surface is called adsorption.

1.1. General Objective:

Enables the students to understand the concept of adsorption and its types

1.2. Specific Objectives:

Enables the students to:

- 1. describe the process of adsorption
- 2. compare adsorption and adsorption
- 3. know the characteristic features of adsorption
- 4. distinguish the various types adsorptions
- 5. apply the concept of adsorption in practical applications

2.3: Taxonomy of objectives:

Taxonomy of Objectives		
	The Cognitive Process Dimension	

Knowledge	Remember	Understand	Apply	Analyse	Evaluate	Create
Dimension						
A. Factual	1					
Knowledge						
B. Conceptual		1,2				
Knowledge						
C. Procedural			5	3,4		
Knowledge						
D. Meta Cognitive					4	
Knowledge						

2.4: Key words:

Adsorption, Absorption, Physisorption, Chemisorption **2.5: Key diagrams (if any):**



Discussion:

The students will be asked questions about the process of adsorption and absorption. One of the students will be asked to compare the process of physisorption and chemisorption.

4. Mind Map:



5. Summary:

Students will be asked to differentiate the process

Adsorption - Deposition on the surface, Absorption - Penetration into the body of the solid

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental idea about creating an e-content of the characteristic features of adsorption
- Producing the e-content.

7. FAQ's:

The substance of	n whose surface ad	sorption takes place	e is called	
a) adsorption	b) adsorbent	c) adsorbate	d)active substance	
Heat of adsorption	on is more in			
a)physisorption	b)chemisorption	c)desorption b)a	bsorption	
Adsorbent used	in decolouring suga	ar solution is		
a) Silica gel	b) Platinum	c) Animal charco	al d) Alumina	
Penetration of th	e substance into th	e body of the solid	is called	
a) adsorption	b) adsorbent	c) adsorbate	d)active substance	
Identify the reve	rsible process			
a)physisorption	b)chemisorption	c)desorption b)a	bsorption	

Absorption – Adsorption – Characteristic features – Types -

8. References

- 1. Puri B.R, Sharma L.R, Madan S. Pathania. *Principles of Physical Chemistry*. Vishal Publishing Co., 2008.
- Arun Bahl, Bahl B.S, Tuli G.D. Essentials of Physical Chemistry. New Delhi: S. Chand & Company Ltd., 2008.
- 3. Malligarjunan U.M. Principles of Physical Chemistry. SreeVinayaga Publications. First Edition, 2020.
- 4. Soni P.L, Dharmaha O.P. *Text Book of Physical Chemistry (A Modern Approach)*. Sultan Chand and Sons Publishers, Revised Edition 2010.

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Head Department of Chem trv. St.Mary's College (Autonon Thoothukudi-628001

(B. Divya)

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LESSON PLAN SAMPLE FOR SCIENCE

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry
Semester	III
Subject Title	Allied Chemistry I
Code	21UCH A31
Hours	4
Total Hours	60
Credits	3
Max Marks	100
Unit & Title	Unit IV: Biomolecules
Name of the Faculty	Dr.B.Divya
T-L tools	Lecture method, Audio Visual aid: videos about proteins and it's
	classification. Visual aid: Pictures of polypeptide linkage, amino
	acids, structure of proteins, multimedia approach and
	evaluated by oral questioning, presenting the report of
	group discussion.

Prerequisite Knowledge:

Knowledge about Prerequisite Knowledge:

Knowledge about Proteins and its classification.

Micro – planning : 60 minutes

Evocation – 3 minutes

Prerequisites – 2 minutes

General objective 1 – 10 minutes

Formative assessment 1 – 5 minutes

General objective 2 – 10 minutes

Formative assessment 2 – 5 minutes

General objective 3 – 10 minutes

Formative assessment 3 – 5 minutes

General objective 4 – 10 minutes

Formative assessment 3 – 5 minutes

Discussion – 5 minutes

Mind map – 3 minutes

Summary – 2 minutes



1. Topic for Learning through evocation

Proteins are defined as amino acid polymers. Since the amino acids are attached with each other through peptide linkage, they are otherwise known as polypeptides. Proteins are classified on the basis of their composition, solubility and other physical properties into Simple proteins, Conjugated proteins and Derived proteins. Proteins are primarily used for muscular activity, they are known as Building block of muscle. Then a question, If We eat high amounts of protein, will it make us bulk out? Will be asked.

2. Topic Introduction

Proteins are large molecules made up of amino acids that perform many functions in living organisms. They are large, complex molecules that play many critical roles in the body. They do most of the work in cells and are required for the structure, function and regulation of the body's tissues and organs.

2.1. General Objective:

Enable the students to understand proteins and their classification.

2.2. Specific Objectives:

Enable the students to:

- 1. Identify the different types of proteins.
- 2. Describe the peptide linkage.
- 3. Compare simple protein and conjugated protein.
- 4. Summarize the molecular structure and behaviour of protein.
- 5. Give an outline of the prosthetic group present in conjugated protein.

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cognitiv	e Process Dime	nsion			
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	1			1,2,3	4	
Knowledge						
B. Conceptual		1, 2, 3, 4	2,5		2,34	
Knowledge						
C. Procedural				2		
Knowledge						
D. Meta					5	
Cognitive						
Knowledge						

2.4: Key words:

Proteins, Polypeptide, Prosthetic group, Molecular structure.

2.5: Key diagrams:



3. Discussion:

The students will be asked to do role play with the structure of protein. Quiz will be conducted regarding the classification of proteins.

4. Mind Map:



5. Summary:

Using Mind map, students will be asked to classify proteins. The functions of proteins will be asked. Executing the acquired knowledge by asking questions like 'What proteins are involved in hair growth? Name the protein which is responsible for muscular activity.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about creating an e-content on Proteins
- Producing the e-content.
- Providing PPT to create visual impact for proteins and its classification.

7. FAQ's:

1.	The repeating units o	f proteins are			
	(a) Amino acids	(b)Glucose	(c)Fatty acid	(d) pe	ptides
2.	Amino acids are join	ed by			
	(a) Hydrogen bond	(b)Ionic bond	(c) Glycosidio	c bond	(d) Peptide bond
3.	Myoglobin is a				
	(a) Primary structure	(b)Tertiary s	tructure(c)Secondary	structu	re(d) All of these
4.	The 3-D structure of	protein can be	determined by		
	(a) Spectroscopy	(b)NMR	(c)Both a and b	(d) X-	ray crystallography
5.	Total numbers of ami	no acids are in	volved in protein synth	nesis in	plants
	(a) 20	(b)12	(c)25	(d) 28	

8. References:

1. Arun Bahl and B.S. Bahl.. Advanced Organic Chemistry. S.Chand and Company Ltd., Reprint, 2005

2. Puri, B.R., Sharma, L.R. and K.C.Kalia, Principles of Inorganic Chemistry. Milestone Publishers and Distributers, Delhi, 2010.

3. Arun Bahl, B.S. and Bahl, G.D.Tuli. Essentials of Physical Chemistry. S.Chand & Company Ltd., New Delhi, 2008.

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9. Verified by Subject Expert

Approved by HOD

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry				
Semester	III				
Course Title	Skill Based Elective : Agricultural Chemistry				
Code	21UCHS31				
Hours	2				
Total Hours	30				
Credits	2				
Max Marks	100				
Unit & Title	Unit: 1– Acid Soil				
Name of the Faculty	Dr. Irudaya Antonat Sophia				
T-L tools	Lecture method, Visual aid: PPT, Picture showing the formation of soil				
	acidity				

Prerequisite Knowledge:

Knowledge of characteristics of soil

Micro -planning



1. Topic for Learning through evocation

Students will be asked about the characteristic of soil and effect of soil characteristics on crop production

2. Topic Introduction:

Acid soil has a pH below 7, typically ranging between 4.5 and 6. The acidity is due to higher concentrations of hydrogen ions (H⁺). Parent material (acidic rocks), high rainfall, leaching of basic nutrients (calcium, magnesium). Overuse of nitrogen-based fertilizers, mining, industrial pollution. Poor in essential nutrients like calcium, potassium, and magnesium. Rich in aluminum and manganese, which can be toxic to plants at high levels. Favors certain plants, such as blueberries, azaleas, rhododendrons, and conifers. Reduced availability of key nutrients (e.g., phosphorus). Aluminum and manganese toxicity can damage roots and hinder plant growth. Lower microbial activity compared to neutral or alkaline soils.

Definition

- Acid soil is defined as a base unsaturated soil
- enough adsorbed exchangeable hydrogen ions
- pH is lower than 7.0.

Types of soil acidity

There are two types of soil acidity according to the presence of ions :

1. Active acidity : Free H⁺ ions are present in soil solution and produce limited acidity.

2. Potential acidity: Exchangeable hydrogen ions (H⁺) are adsorbed on the colloidal particles of the soil.

Formation of acid soil

1. Leaching : high rainfall (humid region)- lime and soluble basic salts of Ca, Mg, K, Na etc are leached away – leaving insoluble acidic reduces in the soil.

2. Microbial action: In coastal and marshy regions, organic residues -decomposed by micro-organisms -produce acids

3. Parent rock material : Some acid soils are developed from parent rock materials which are of acid nature (e.g. granite).

4. Vegetation cover: The foliage leaves of conifers lack alkali elements-leaf- litter on the ground-organic acids are released which make the soil acidic.

5. Crops: Some crops like sugarbeat absorb bases from the soil.

6. Fertilizers: Application of nitrogen fertilizers like ammonium sulphate, urea and ammonium nitrate causes acidity in the soil.

Reclamation methods

Addition of Liming material

- The soil solution becomes charged with Ca²⁺ ions.
- Cation exchange takes place between the Ca²⁺ ions of the solution and the H⁺ ions Liming materials
- i) Limestone (CaCO₃)
- ii) Quick lime (CaO)
- iii) Slaked lime (Ca(OH)₂)
- iv) Dolomite limestone (CaMg(CO₃)₂
- v) Blast furnace slag (CaSiO₃)

General Objective:

Enables the students to understand the effects soil acidity

Specific Objectives:

Enables the students to:

- 1. describe the sources of acidity of soil.
- 2. Reason for the formation of soil acidity
- 3. Effects of soil acidity
- 4. Methods of reclamation

Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cognitive	Process Dimens	ion			
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		1,2				
Knowledge						
C. Procedural			3	4		
Knowledge						
D. Meta Cognitive					3,4	
Knowledge						

Key words:

Acidity, liming, microbes, leaching

Key points with diagrams





Discussion:

The students will be asked questions regarding the sources of soil acidity. students will be asked to think about the reclamation methods.

Mind Map:



3. Summary:

Students will be asked to identify how acidity in soil is formed and how it can be reclaimed by using the mind map.

4. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating a new methodology to reclaim the acid soil
- Creating a video e-content.
- Provided with soil samples and assessing its acidity

5. FAQ's:

- 1. The pH of acid soil is_____. (Ans: 7)
- 2. _____ can be used in the reclamation of acid soils. (Ans: Limestone)
- 3. Microbial activity ______ (increases/ decreases) the acidity of soil. (Ans: increases)
- 4. Granite rock increases the acidity of the soil. (yes/no)
- 5. _____ plants absorbs the acidity in the soil.

6. References

1. Jayashree Ghosh. Text Book of Pharmaceutical Chemistry. NewDelhi:S. Chand and

company, 2003.

- 2. BagavathiSundari K . Applied Chemistry. MJP Publishers, 2008.
- 3. Sharma B. K. Industrial Chemistry. Goel Publishing House. Fifth Edition, 1993-94.
- 4. Sindhu P.S. Environmental Chemistry. New Age International Publishers, 2010.
- 5. Dr Joshi. S.R Biopesticides- A Biotechnological Approach. New Age International (P)

Ltd., Publishers, 2020.

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Head and Assistant Professor Department of Chemistry St. Mary's College (Autonomous) Thoothukudi

Approved by HOD

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LESSON PLAN SAMPLE FOR NME

Objective Oriented Learning Process RBT

Programme	II B.A./ B.Sc. / B.Com.
Semester	III
Course Title	Everyday Chemistry
Code	21UCHN31
Hours	2
Total Hours	30
Credits	2
Max Marks	75
Unit & Title	Unit I : Manufacture of Sugar
Name of the Faculty	Dr.A.Lakshmi
T-L tools	Lecture method, Audio Visual aid: videos about refining of petrochemicals. Visual aid: Pictures of knocking and cracking, refining of petroleum, fractional distillation, multimedia approach and evaluated by oral questioning, presenting the report of group discussion.

Prerequisite Knowledge:

Knowledge about industrial process.

Micro -planning



1. Topic for Learning through evocation

Students will be asked questions related to the color of sugar and sugarcane juice

2. Topic Introduction

Extraction of Juice

The sugarcane is passed through preparatory devices like knives for cutting the stalks into fine chips before being subjected to crushing in a milling tandem comprising 4 to 6 roller mills. In the best milling practice, more than 95% of the sugar of cane is extracted into the juice.

Clarification

The treated juice on boiling fed to continuous clarifier from which the clear juice is decanted while the settled impurities known as mud is sent to rotary drum vacuum filter for removal of unwanted stuff called filter cake. It is discarded or returned to the field as fertilizer.

Evaporation

The syrup will again have treated with sulphur dioxide before being send to the pan station for crystallization of sugar. Crystallization takes place in single-effect vacuum pans, where the syrup is evaporating until saturated with sugar. At this point "seed grain" is added to serve as a nucleus for the sugar crystals, and more syrup is add as water evaporates.

Centrifugation

The massecuite from crystallizer is drawn into revolving machines called centrifuges. The perforated lining retains the sugar crystals, which may be washed with water, if desired. The mother liquor "molasses" passes through the lining because of the centrifugal force exerted and after the sugar is "purged" it is cut down leaving the centrifuge ready for another charge of massecuite.

Gradation & Packing

The final product in the form of sugar crystal is dropped through pan section and this sugar is graded and picked in 50 kg bags. The grade of the sugar depends on the size of the crystal

viz. Small (S) and Medium

2.1. General Objective:

Enable the students to understand the manufacture of sugar

2.2. Specific Objectives:

Enable the students to:

- 1. Identify the best method to extract maximum juice from sugar cane.
- 2. Describe the methodology of extraction.
- 3. Summarize the steps involved in extraction.
- 4. Outline the flowchart

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cognitiv	e Process Dime	nsion			
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		1,2				
Knowledge						
C. Procedural			3	3,4		
Knowledge						
D. Meta					4	
Cognitive						
Knowledge						

2.4: Key words:

Sugar, extraction, clarification, centrifugation

2.5: Key diagrams (if any):



3. Discussion:

The students will be asked to summarize steps involved the manufacture of sugar

4. Mind Map:



5. Summary:

Using Mind map, students will be asked to summarize the steps involved in the manufacture of sugar.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about creating an e-content on manufacturing process
- Producing the e-content.
- Providing PPT to create harmful effects of bleaching.

7. FAQ's:

1. _____ percentage of sugar can be extracted from sugarcane using milling process

(Ans: 95%)

 2. Which of the following is used as table sugar? (a) Disaccharide of D-glucose (b) D-glucose (c) Monosaccharide (d) Disaccharide of D-glucose and D-fructose 	(Ans: d)
3. Sucrose on hydrolysis yields	
(a) two glucose molecules	
(b) glucose and fructose	
(c) glucose and lactose	
(d) glucose and galactose	(Ans: b)
4. What is the primary raw material used in the sugar industry?	
a) Wheat	
b) Rice	
c) Sugarcane	
d) Maize	(Ans: b)
5. which of the following state is the largest producer of sugar in the country.a) Haryanab) Tamil Naduc) Guiarat	
d) Uttar Pradesh	(Ans.d)
	(1113.0)

8. References: (Books/Periodicals/Journals)

1. Jayashree Ghosh. Fundamental concepts of Applied chemistry. Edition, New Delhi:S.

Chand & company Ltd., 2006.

2. Jain P.C and Monika Jain. *Engineering chemistry*.New Delhi:Dhanpat Rai & Sons, 2020.

3. Prakash Shetty.*Science and Technology of Printing materials*.Chennai: MJP Publishers, 2019.

4. Sharma B.K. Industrial Chemistry. Meerut: Goel Publishing House, 2003.

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Verified by Subject Expert

Approved by HOD

Head and Assistani Professor

Department of Chemistry St. Mary's College (Autonomous) Thoothukudi

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry		
Semester	III		
Course Title	Ability Enhancement Course: Women's Synergy		
Code	21UAWS31		
Hours	2		
Total Hours	30		
Credits	2		
Max Marks	50		
Unit & Title	Unit II: Factors determining psychological conditions of women		
Name of the Faculty	Dr.G. Amala Jothi Grace		
T-L tools	Lecture method, Audio Visual aid: videos about emotions,		
	Visual aid: Picture of emotions and evaluated by oral questioning,		
	presenting the report of group discussion.		

Prerequisite Knowledge:

Knowledge about environmental and external stressors, Psychological, biological and Socio cultural factors that relates mental well being.

Micro -planning



1. Topic for Learning through evocation

Psychological conditions for women, like for anyone, are shaped by a combination of biological, psychological, social, and cultural factors. However, women often face unique challenges due to gender-related experiences and societal influences.

Questions such as "What has been weighing on your mind recently?" or "How do you feel societal expectations impact your mental well-being?" are asked.

The girls are invited to share personal stories, allowing their experiences to unfold naturally and highlight underlying psychological patterns.

Journaling prompts such as "Describe a moment when you felt most empowered or most burdened" can evoke detailed reflections about mental health struggles and triumphs.

2. Topic Introduction:

Women often experience unique mental health challenges due to hormonal fluctuations, reproductive health concerns, societal expectations, and gender-based inequalities. Conditions such as anxiety, depression, and post-traumatic stress disorder (PTSD) tend to be more prevalent among women, influenced by experiences such as caregiving burdens, workplace discrimination, body image pressures, and exposure to trauma or abuse.

Understanding women's psychological conditions requires a nuanced approach that considers not only the biological differences but also the sociocultural contexts in which they live.

2.1. General Objective:

Enable the students to realise the biological, psychological and social factors that cause stress, anxiety, depression etc.

2.2. Specific Objectives:

Enable the students to:

- 1. identify the biological, psychological, and sociocultural factors influencing women's mental health.
- 2. describe the prevalence and patterns of common psychological conditions affecting women, such as depression, anxiety, PTSD, and eating disorders.
- 3. compare physical and psychological factors that causes mental well being.
- 4. summarize the the impact of gender-based violence, discrimination, and societal expectations on women's mental well-being.

5. assess the effectiveness of existing mental health services and interventions targeted at women.

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cognitive Process Dimension					
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	1			1,2,3	4	
Knowledge						
B. Conceptual		1, 2,3	2,4,5		2,34	
Knowledge						
C. Procedural				2		
Knowledge						
D. Meta Cognitive					5	
Knowledge						
_						

2.4: Key words:

Women's well being, Gender inequality, Emotional well being

2.5: Key diagrams (if any):





Video links:

https://www.webmd.com/depression/guide/detecting-depression#1 https://www.webmd.com/balance/stress-management/effects-of-stress-on-your-body https://www.webmd.com/anxiety-panic/guide/anxiety-disorders#1

3. Discussion:

The students will be asked to do role play with the situations that they can visualize in their daily life and asked to express the behavioural symptoms of psychologolical stress.

4. Mind Map:



4. Summary:

Addressing these issues necessitates fostering awareness, providing accessible mental health resources, and creating environments that promote equality and empowerment. By understanding the unique psychological conditions women face, we can better advocate for their well-being and contribute to building a more supportive and inclusive society.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating the emotional relief
- Producing the e-content.
- Providing PPT to create women empowerment.

7. FAQ's:

1. Which factor is most commonly associated with the higher prevalence of depression in women?

- A. Increased access to mental health care
- **B. Societal expectations and gender roles**
- C. Lower levels of education
- D. Reduced stress levels

2. What is postpartum depression primarily linked to?

- A. Financial instability during pregnancy
- **B.** Hormonal changes after childbirth
- C. Lack of prenatal care
- D. Genetic predisposition to anxiety

3. What is one key component of intersectionality in understanding women's mental health?

- A. Biological differences between men and women
- B. The unique experiences of women based on race, class, and identity
- C. The effectiveness of gender-neutral therapies
- D. The role of technology in improving access to care

4. Which of the following is a psychological condition disproportionately affecting women?

- A. Bipolar disorder
- B. Schizophrenia
- C. Anxiety disorders
- D. Substance use disorder

5. What is a major barrier to women seeking mental health care?

- A. A lack of mental health disorders among women
- **B.** Societal stigma and discrimination
- C. Overdiagnosis of psychological conditions
- D. Higher mental health care costs for men

8. References: (Books/Periodicals/Journals)

- 1. Susan G. Kornstein & Anita H. Clayton Women's Mental Health: A Comprehensive Textbook"
- 2. Margaret W. Matlin, "The Psychology of Women"
- 3. Janett Jones, Susan W. Barbour, & Helen L. Herrman "Understanding Women's Mental

Health"

- 4. Dr. Louann Brizendine "The Female Brain"
 - 0
- 5. Martie Haselton "Hormonal: The Hidden Intelligence of Hormones—How They Drive Desire, Shape Relationships, Influence Our Choices, and Make Us Wiser"

9. Verified by Subject Expert

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Course In-charge Dr. G.Amala Jothi Grace

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Approved by HOD

Head Department of Chemistry, St.Mary's College (Autonomout), Thoothukudi-621001

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry			
Semester	IV			
Subject Title	Core III Organic Chemistry-I			
Code	21UCHC41			
Hours	4			
Total Hours	60			
Credits	4			
Max Marks	100			
Unit & Title	Unit II: Reactive Methylene compounds and Conformational Analysis			
Name of the Faculty	Dr. B. Divya			
T-L tools	Lecture method and powerpoint presentation			

Prerequisite Knowledge: Knowledge on functional groups in organic chemistry

Micro -planning : 60 minutes
Evocation – 3 minutes
Prerequisites – 2 minutes
General objective 1 – 10 minutes
Formative assessment 1 – 5 minutes
General objective 2 – 10 minutes
Formative assessment 2 – 5 minutes
General objective 3 – 10 minutes
Formative assessment 3 – 5 minutes
General objective 4 – 10 minutes
Formative assessment 3 – 5 minutes
General objective 4 – 10 minutes
Formative assessment 3 – 5 minutes
General objective 4 – 10 minutes
Formative assessment 3 – 5 minutes
Guession – 5 minutes
Mind map – 3 minutes
Summary – 2 minutes



1. Topic for Learning through evocation

Configuration refers to the arrangement of atoms or groups in the disymmetric part of the molecule It cannot be interconverted into each other without breaking bonds. Cis -trans compounds, enantiomers and diastereomers cannot be converted simply by rotation. **Conformation** is used to indicate the momentary arrangement of atoms or groups in space which results from the rotation about the single bond. can be interconverted into each other without breaking bonds. Staggered form can be converted to eclipsed form by rotation

2. Topic Introduction:

Conformation analysis of ethane

Eclipsed, staggered and intermediate forms of ethane

Eclipsed - exactly parallel or opposite

Staggered - hydrogen atoms of one carbon lie exactly in the middle of the position occupied by the hydrogens of the other atom

Intermediate form - lie between these two extreme positions

Conformational analysis of dibromo ethane

Dipole moment for staggered or antiform is zero.

Gauche or skew form will have finite dipole moment.

Eclipsed or syn form will have maximum dipole moment.

Actual dipole moment of 1,2-dibromoethane is 1 Debye under normal conditions indicating that staggered and gauche conformations are in equilibrium

1.1. General Objective:

Enables the students to understand the confirmatonal analysis of ethane and substituted ethane molecules.

1.2. Specific Objectives:

Enables the students to:

- 1. describe the different types of conformations
- 2. compare the structure of ethane and its substituents
- 3. know the characteristic features of conformations
- 4. distinguish the various types conformations in ethane molecule
- 5. apply the concept of conformations in various organic compounds

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cognitive Process Dimension					
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1			J		
Knowledge						
B. Conceptual		1,2				
Knowledge						
C. Procedural			5	3,4		
Knowledge						
D. Meta Cognitive					4	
Knowledge						

2.4: Key words:

Adsorption, Absorption, Physisorption, Chemisorption **2.5: Key diagrams (if any):**







Discussion:

The students will be asked questions about the conformations of ethane molecule. One of the students will be asked to draw the different conformations of ethane and substituted ethanes.

4. Mind Map:

Conversion of staggered form to gauche form and conversion from gauche to eclipsed form and eclipsed form to staggered form.



5. Summary:

Students will be asked to draw the different conformations of ethane and substituted ethanes and explain the energy profile diagram of the conformers.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental idea about creating an e-content about the different conformations of ethane and substituted ethanes
- Producing the e-content.

7. FAQ's:

Find the repulsive interaction between the electron clouds of the C-H bonds of the neighbouring carbon atoms			
a)Torsional strain b) Steric strain c)Dipole-dipole interaction d) Vander Walls strain			
Name the isomers which are converted into each other by rotation around a single bond			
a) conformers b) enantiomers c) diastereomers d) position isomers			
Identify the dihedral angle for eclipsed conformation			
a) 0 b) 60 c) 120 c) 180			
Find the compounds that have an infinite number of conformations by rotation around carbon- carbon			
single bonds.			
a) alkanes b) alkenes c) alkynes d) ethane			
Find the dipolemoment for the staggered form of 1,2 dibromo ethane			
a) 0 b) 2.6 c) 1.4 d)5.2			

8. References

1. Ernest l. Eliel. Stereochemistry of Organic compounds.New Delhi: Tata McGRAW-

Hill Publication company Ltd., 1975.

- 2.Nasipuri D. Stereochemistry of Organic Compounds Principles and Applications. New Age International Publishers, 1994.
- 3. Kalsi S. *Stereochemistry-Conformation and Mechanism*. New Age International Publishers, 2008.
- 4. Anup Pathak, Anupa Saha, *Organic Chemistry*. Kolkata: Books and Allied Pvt Limited, Volume I, 2015.

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(B. Divya) Verified by Subject Expert

Solonijeyon

(Mrs. S. Rani Jeyamary)

Head Department of Chemistry, St.Mary's College (Autonomeum), Thoothukudi-628001

Approved by HOD

LESSON PLAN SAMPLE FOR SCIENCE

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry		
Semester	IV		
Subject Title	Allied Chemistry II		
Code	21UCH A41		
Hours	4		
Total Hours	60		
Credits	3		
Max Marks	100		
Unit & Title	Unit I: Metallurgy		
Name of the Faculty	Dr.B.Divya		
T-L tools	Lecture method, Audio Visual aid: videos about ores and their extraction		
	methods. Visual aid: Pictures of classification of ores, refining process,		
	extraction methods, multimedia approach and evaluated by oral		
	questioning, presenting the report of group discussion.		

Prerequisite Knowledge:

Knowledge about Classification of ores and Extraction methods.

Micro -planning: 60 minutes

Evocation – 3 minutes

Prerequisites – 2 minutes

General objective 1 – 10 minutes

Formative assessment 1 – 5 minutes

General objective 2 – 10 minutes

Formative assessment 2 – 5 minutes

General objective 3 – 10 minutes

Formative assessment 3 – 5 minutes

General objective 4 – 10 minutes

Formative assessment 3 – 5 minutes

Discussion – 5 minutes

Mind map – 3 minutes

Summary – 2 minutes



1. Topic for Learning through evocation

Minerals are naturally occurring substances containing the metal in the combined form.

Example: Clay (Alumino silicate). Ores are minerals from which the metal can be extracted easily and economically. Example: Rutile. Minerals and Ores differ in the following ways, Minerals have a low percentage of metals while ores contain a high percentage, Ores can be used to extract metals but minerals cannot, All minerals are not ores but all the ores are minerals.

2. Topic Introduction:

The scientific process of extracting metals in their pure form from naturally occurring minerals called ores, which usually contain impurities and then refining them to be used for various application. It is the method to get usable metals from the rocks they are found in. Metals are commercially extracted from minerals at low cost and minimum effort.
2.1. General Objective:

Enable the students to understand Ores, their classification and metals are extracted from minerals.

2.2. Specific Objectives:

Enable the students to:

- 1. Identify the different types of Ores.
- 2. Describe the Electrolytic refining process.
- 3. Compare calcination and roasting.
- 4. Summarize the extraction of Vanadium.
- 5. Give an outline of the extraction of Tungsten from Wolframite ore.

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	Knowledge The Cognitive Process Dimension					
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		1, 2,3,4	2,5			
Knowledge						
C. Procedural				2		
Knowledge						
D. Meta Cognitive					5	
Knowledge						
_						

2.4: Key words:

Mineral, Ore, Extraction, Refining.

2.5: Key diagrams:





3. Discussion:

The students will be asked to do present the classification of Ores. Quiz will be conducted regarding the extraction of ores.

4. Mind Map:



5. Summary:

Using Mind map, students will be asked to classify ores. The extracting methods of ores will be asked. Executing the acquired knowledge by asking questions like What are the steps involved in extraction of metals from ores.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about creating an e-content on Ores
- Producing the e-content.
- Providing PPT to create visual impact for Extraction of ores from their minerals.

7. FAQ's:

1.	Heating the or	e with carbon i	n the presence of air is	known as
	(a) Roasting	(b)Reduction	(c)Smelting	(d) Refining
2.	Which of the f	following is aci	dic flux	
	(a) CaO	(b)MgO	(c)ZnO	(d) SiO ₂
3.	Azurite is an o	ore of		
	(a) Cr	(b)Al	(c)Fe	(d) Cu
4.	Iron ores are f	ound in		
	(a) Attock	(b)Tharparke	er (c)Chitral	(d) Dadu
5.	FeCO ₃ is the f	ormula of	·	
	(a) Magnetite	(b)Limonite	(c)Siderite	(d) Azurite
Dof	nonoog			

8. References:

1. Arun Bahl and B.S. Bahl.. Advanced Organic Chemistry. S.Chand and Company Ltd., Reprint, 2005

2. Puri, B.R., Sharma, L.R. and K.C.Kalia, Principles of Inorganic Chemistry. Milestone Publishers and Distributers, Delhi, 2010.

3. Arun Bahl, B.S. and Bahl, G.D.Tuli. Essentials of Physical Chemistry. S.Chand & Company Ltd., New Delhi, 2008.

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry
Semester	IV
Subject Title	Medicinal Chemistry
Code	21UCHS41
Hours	2
Total Hours	30
Credits	2
Max Marks	50
Unit & Title	Unit: IV Blood pressure and cardio vascular drugs
Name of the Faculty	Mrs. S. Rani Jeyamary
T-L tools	Lecture method, PPT

Prerequisite Knowledge:

Knowledge Knowing about the importance of metabolism taking place in our body





1. Topic for Learning through motivation

The student are asked the questions like i) What happens when a person is more stressed? ii)Why the changes in the body happens when we get angry? iii)The flow of water increases when we supply water to flow why?. This is due to more pressure exertion.The same process takes place in our metabolism and explained the topic hypertension.

2.Topic Introduction:

High blood pressure is when the force of blood pushing against your artery walls is consistently too high. This damages your <u>arteries</u> over time and can lead to serious complications like <u>heart attack</u> and <u>stroke</u>. "Hypertension" is another word for this common condition.

Blood pressure (BP) is the measurement of the pressure or force of blood pushing against blood vessel walls. Your BP reading has two numbers:

- The top number is the systolic blood pressure, which measures the pressure on your artery walls when your <u>heart</u> beats or contracts.
- The bottom number is the diastolic blood pressure. This measures the pressure on your artery walls between beats when your heart is relaxing.

Healthcare providers measure blood pressure in millimeters of mercury (mmHg).

Things that increase the risk of having high blood pressure include:

- older age.
- genetics.
- being overweight or obese.
- not being physically active.
- high-salt diet.
- drinking too much alcohol.

General Objective:

Enables the students to understand the types of hypertension

Specific Objectives:

Enables the students to:

- 1. Describing the types of hypertension
- 2. Comparing the nature of hypertension
- 3. Shows the importance of healthy life
- 4. Distinguishing the various types to prevent hypertension.

Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	KnowledgeThe Cognitive Process DimensionDimensionRememberUnderstandApplyAnalyseEvaluateCreate					
Dimension						
A. Factual	1					
Knowledge						
B. Conceptual		1,2				
Knowledge						
C. Procedural				3,4		
Knowledge						
D. Meta Cognitive					2,3,4	
Knowledge						

Key words:

Hypertension, hypotension, diastolic, systolic

Key diagrams (if any):



Discussion:

The students will be asked questions regarding the types of hypertension One of the students will be asked to explain the reading range od diastolic and systolic pressure studied during the class.

Mind Map:



Summary:

Students will be asked to identify how evolution takes place in the types of stele studied by using the mind

map..

Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental idea about creating an e-content of working of metabolism
- Producing the e-content.
- Provided with different reading and asked to identify the type of hypertension

FAQ's:

Any agent whic	Any agent which reduces blood pressure is known as drugs					
a)hypotensive	b)antiarrh	ythmic	c)anti anginal agents	d)anaesthetic agents		
The normal ble	ood pressu	re systoli	c in a young adult is	mm (Hg)		
a) 120 b) 80	c) 150	d) 180			
The normal blo	ood pressu	re diasto	ic in a young adult is	mm (Hg)		
a) 120 b	a) 120 b) 80 c) 150 d) 180					
The drug whic	The drug which reduces the blood pressure is called drug					
a) antiarrhythmic b) antihypertensive c) anaesthetic d) antihypoglycemic						
Clonidine finds use in the treatment of						
a) hypertensio	n b) diabet	es c) care	liac diseases d) anaesth	netics		

8.References

1. Jayashree Ghosh. Text Book of Pharmaceutical Chemistry. New Delhi: S. Chand and

company, 2003.

2. BhagavathiSundari. Applied Chemistry. MJP Publishers, 2008.

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Head of the Department

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Verified by Subject Expert (S.Rani Jeyamary)

Approved by HOD

LESSON PLAN SAMPLE FOR NME

Objective Oriented Learning Process RBT

Programme	II B.A./ B.Sc. / B.Com.
Semester	IV
Course Title	Industrial Chemistry
Code	21UCHN41
Hours	2
Total Hours	30
Credits	2
Max Marks	75
Unit & Title	Unit I : Petro Chemicals
Name of the Faculty	Dr.A.Lakshmi
T-L tools	Lecture method, Audio Visual aid: videos about refining of
	petrochemicals. Visual aid: Pictures of knocking and cracking, refining of
	petroleum, fractional distillation, multimedia approach and evaluated by
	oral questioning, presenting the report of group discussion.

Prerequisite Knowledge:

Knowledge about Refining of Petroleum.

Micro -planning



1. Topic for Learning through evocation

Petroleum or crude oil burns with a sooty flame and has an unpleasant odour. Thus, it is unsuitable for direct use as motor fuel. The process of removing objectionable impurities (eg. sulphur compounds which cause unpleasant smell) from petroleum and separating it into various useful fractions is called refining of petroleum. It involves the following steps: separation of water, removal of sulphur compounds, fractional distillation. Then a question, Which technique is used for refining of petroleum? will be asked.

2. Topic Introduction

Petroleum occurs as a dark viscous liquid underneath the earth. It is also known as rock oil (petra = rock ; oleum = oil) . It is brought up to the surface through bore wells. The petroleum thus obtained is essentially a mixture of hydrocarbons with a few organic compounds containing O, S and N. the United States of America and Middle East Countries (Abu Dhabi, Bahrain, Iran, Iraq, Kuwait and Saudi Arabia) are the major oil producing countries.

2.1. General Objective:

Enable the students to understand petroleum and their refining methods.

2.2. Specific Objectives:

Enable the students to:

- 1. Identify the types of chemical processing of petroleum fractions.
- 2. Describe the knocking methods.
- 3. Compare thermal cracking and catalytic cracking.
- 4. Summarize the Cetane number.

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	Knowledge The Cognitive Process Dimension					
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		1,2				
Knowledge						
C. Procedural			3	3,4		
Knowledge						
D. Meta					4	
Cognitive						
Knowledge						

2.4: Key words:

Petroleum, Knocking, Cracking, Cetane number.

2.5: Key diagrams (if any):





3. Discussion:

The students will be asked to do present the refining of petroleum.

4. Mind Map:



5. Summary:

Using Mind map, students will be asked to classify the refining of petroleum. The types of chemical processing will be asked. Executing the acquired knowledge by asking questions like 'Which fuel has highest cetane number?

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about creating an e-content on Refining process
- Producing the e-content.
- Providing PPT to create visual impact for knocking and cracking method.

7. FAQ's:

1.	Water gas is a m	ixture of					
	a)CO+H ₂	b) CO ₂ +N ₂	c) C+N ₂	d) CO ₂ +O ₂			
2.	The octane num	ber of iso-octane	is				
	a)0	b) 50	c) 100	d) 10			
3.	The cetane number of a-methyl naphthalene is						
	a) 0	b) 100	c)10	d) 50			
4.	Synthetic petrol	is obtained by the	e catalytic hydrog	enation of			

a)CO₂ b)CO c) O₂ d)H₂

5. A sharp metallic sound due to pressure rise in IC engine is known as _____

a) Knocking b)oxidation c) reduction d) combustion

8. References: (Books/Periodicals/Journals)

1. Siva Sankar B. *Food processing and preservation*.New Delhi:Prentice — Hall of India Pvt.Ltd., 2002.

2. BagavathiSundari K. *Applied Chemistry*.Chennai:MJP Publishers, TamilNadu Book House, 2006.

3. Agarwal. *Natural Products Volume II (Organic)*. Meerut: Krishna Prakashan Media P. Ltd 2015.

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Verified by Subject Expert

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Head and Assistani Professor Department of Chemistry St. Mary's College (Autonomous) Thoothukudi

Approved by HOD

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry
Semester	IV
Subject Title	Ability Enhancement Course: Yoga and Meditation
Code	21UAYM41
Hours	2
Total Hours	30
Credits	2
Max Marks	50
Unit & Title	Unit I: Benefits of Yoga and Meditation
Name of the Faculty	Dr.G. Amala Jothi Grace
T-L tools	Lecture method, Audio Visual aid: videos about meditation benefits.
	Visual aid: Picture of yoga benefits and evaluated by oral questioning,
	presenting the report of group discussion.

Prerequisite Knowledge:

Knowledge about the benefits of yoga and meditation.

Micro -planning



1. Topic for Learning through evocation

After a yoga session, students can reflect on questions such as:

- "How do I feel emotionally after this practice?"
- "What changes do I notice in my body?"
- "How has my mindset shifted since starting yoga?

The students are encouraged to do journaling exercise. The students are asked to share their personal experiences of yoga in a safe group setting, evoking collective insights about physical, emotional and spiritual impacts.

2. Topic Introduction:

Yoga, an ancient practice with roots in Indian philosophy, has gained worldwide recognition for its ability to harmonize the mind, body, and spirit. Far beyond a physical exercise, yoga integrates breathing techniques, mindfulness, and meditation to promote overall well-being. Its adaptability makes it accessible to people of all ages and fitness levels, offering a wide range of benefits that cater to physical, mental, and emotional health.

Physically, yoga enhances flexibility, strength, and balance while helping to alleviate chronic pain and improve posture. Mentally, it is a powerful tool for reducing stress, improving focus, and fostering a sense of inner calm. Emotionally, yoga encourages self-awareness, self-compassion, and resilience, making it a valuable practice in managing anxiety and depression.

In today's fast-paced world, yoga serves as a sanctuary, allowing individuals to slow down, reconnect with themselves, and achieve greater harmony. Whether practiced in a studio, at home, or outdoors, yoga offers a transformative experience that nurtures both the body and soul.

2.1. General Objective:

Enable the students to realise how yoga contributes to the overall well-being of the body, mind,

and spirit by fostering balance and harmony

2.2. Specific Objectives:

Enable the students to:

- 1. identify how can be a therapeutic approach for health issues.
- 2. describe how yoga builds core strength.
- 3. compare mental and emotional benefits.
- 4. To investigate how yoga encourages self-reflection and promotes positive self-acceptance and self-compassion.

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge The Cognitive Process Dimension						
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	1			1,2	4	
Knowledge						
B. Conceptual		1, 2,3,4	2,4		2,34	
Knowledge						
C. Procedural				2,4		
Knowledge						
D. Meta Cognitive					4	
Knowledge						

2.4: Key words:

Yoga, Physical benefits, Psychological benefits

2.5: Key diagrams (if any):





Video link:

https://www.youtube.com/watch?v=cvQn6Pzxnto

https://www.youtube.com/watch?v=5YyEV6eb7ll

3. Discussion:

The students were encouraged to reconnect themselves. Physically, yoga enhances flexibility, strength, and balance while helping to alleviate chronic pain and improve posture. Mentally, it is a powerful tool for reducing stress, improving focus, and fostering a sense of inner calm. Emotionally, yoga encourages self-awareness, self-compassion, and resilience, making it a valuable practice in managing anxiety and depression.

4. Mind Map:



5. Summary:

Yoga offers a wide array of benefits that extend across physical, mental, emotional, and spiritual domains, making it a holistic practice for overall well-being. Physically, yoga enhances flexibility, builds strength, and improves balance, helping individuals achieve better posture and reduce the risk of injury. It also alleviates chronic pain, such as back and joint pain, and promotes better breathing and lung capacity through pranayama techniques. Mentally, yoga is an effective tool for stress reduction, promoting relaxation by lowering cortisol levels and calming the mind. It enhances focus and mental clarity, fostering mindfulness and cognitive function. Emotionally, yoga encourages self-awareness and self-compassion, leading to a more positive outlook on life, improved emotional regulation, and increased resilience. On a spiritual level, yoga deepens the connection between the mind and body, cultivating inner peace and facilitating personal growth. Then the students were asked to create their own mind map about the benefits of meditation.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mindmap.
- Producing e-content.
- Providing PPT to create how yoga promotes physical, psychological and spiritual health.

7. FAQ's:

1. Which of the following is a primary physical benefit of yoga?

- A. Weight loss without exercise
- B. Increased flexibility and strength
- C. Decreased energy levels
- D. Increased joint inflammation

2. How does yoga contribute to stress reduction?

- A. By promoting intense physical exertion
- B. By activating the sympathetic nervous system

C. Through mindfulness and relaxation techniques

D. By focusing only on physical poses

3. What emotional benefit is commonly associated with regular yoga practice?

- A. Increased stress and anxiety
- **B.** Improved emotional regulation and resilience
- C. Reduced self-awareness
- D. Greater feelings of frustration and anger

4. In what way does yoga help with mental clarity and focus?

- A. By increasing physical strength
- **B.** Through mindfulness practices and meditation
- C. By encouraging fast movements and multitasking
- D. By isolating the practitioner from their emotions

5. Which of the following is a long-term benefit of consistent yoga practice?

- A. Increased risk of chronic illness
- B. Reduced sleep quality
- C. Enhanced chronic illness prevention and better sleep
- D. Decreased lung capacity

8. References: (Books/Periodicals/Journals)

- 1) Thamburaj Francis. Meditation and Yoga for Holistic Wellbeing. Trichy:Grace Publication 2019.
- 2) Osho. Meditation the Only Way. New Delhi: Full Circle Publication, 2009.
- 3) Thamburaj Francis. Journey from Excellence to Godliness: Zen Meditation for Transformation. Grace Publication, Trichy, 2017.
- 4) Osho. Awareness: The Key to Living in Balance. New York: St.Martin's Griffin Publication, 2001.
- 5) Tolle Eckart. The Power of Now: A Guide to Spiritual enlightenment. New World Library, 2004.

9. Verified by Subject Expert

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Course In-charge Dr. G.Amala Jothi Grace

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Approved by HOD



LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry
Semester	V
Course Title	Common Core : Material Science
Code	21UPCC51
Hours	6
Total Hours	90
Credits	5
Max Marks	100
Unit & Title	Unit: 2- Shape Memory Alloys
Name of the Faculty	Dr.A.Lakshmi
T-L tools	Lecture method, Visual aid: PPT, Picture showing the phase
	transformation

Prerequisite Knowledge:

Knowledge of alloys and its characteristics

Micro -planning



1. Topic for Learning through evocation

Students will asked about the designing of a biomedical device, such as a stent and how the safety and effectiveness is ensured for such biomedical device

2. Topic Introduction:

Definition

A group of metallic alloys which shows the ability to return to their original shape or size (i.e., alloy appears to have memory) when they are subjected to heating or cooling are called shape memory alloys.

Phases of shape memory alloys

Martensite and Austenite are two solid phases in SMA as shown in the fig.



i) Martensite is relatively soft. It is easily deformable phase which exists at low temperature (monoclinic) ii) Austenite is a phase that occurs at high temperature having a crystal structure and high degree of symmetry (cubic)



Fig. 6.5 Martensite and austenite phases

CHARACTERISTICS OF SMAS

Shape memory effect

The change in shape of a material at low temperature by loading and regaining of original shape by heating it, is known as shape memory effect.

The shape memory effect occurs in alloys due to the change in their crystalline structure with the change in temperature and stress.

- While loading, twinned martensite becomes deformed martensite at low temperature.
- On heating, deformed martensite becomes austenite (shape recovery) and upon cooling it gets transformed to twinned martensite



SMAs exhibit changes in electrical resistance, volume and length during the transformation with temperature.

The mechanism involved in SMA is reversible (austenite to martensite and vice versa.)

Stress and temperature have a great influence on martensite transformation.

Pseudo elasticity

Pseudo elasticity occurs in shape memory alloys when it is completely in austenite phase. Unlike the shape memory effect, pseudo elasticity occurs due to stress induced phase transformation without a change in temperature. The load on the shape memory alloy changes austenite phase into martensite.

As soon as the loading decreases the martensite begins to transform to austenite results in shape recovery.

This phenomenon of deformation of a SMA on application of large stress and regaining of original shape on removal of the load is known as pseudo elasticity. This pseudo elasticity is also known as super elasticity.

Hysteresis

The temperature range for the martensite to austenite transformation which takes place upon heating is somewhat higher than that for the reverse transformation upon cooling.

The difference between transition temperature upon heating and cooling is called hysteresis. The difference of temperature is found to be 20 - 30 °C.

General Objective:

Enables the students to understand the phase transformation in Shape memory alloys and its characteristics

Specific Objectives:

Enables the students to:

- 1. describe the phase transformation
- 2. Reason for the stability of the phases
- 3. Effects of temperature on the phase transformation
- 4. Evaluation of characteristics

Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	Knowledge The Cognitive Process Dimension					
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		1,2				
Knowledge						
C. Procedural			3	3,4		
Knowledge						
D. Meta Cognitive					4	
Knowledge						

Key words:

austenite, martensite, shape memory, hysteresis,

Key points with diagrams



The Phase Transformation Process for SMAs

Discussion:

The students will be asked questions regarding the transformation of phases and temperature dependence of phase transformation

Mind Map:



3. Summary:

Students will be asked to summarize the characteristics of shape memory alloys and its phase transformation

4. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Model making about the working of stents
- Creating a video e-content.
- List some combination of metals which has the same shape memory characteristics

5. FAQ's:

- 1. _____are used to make toys and ornamental goods because of its response topulses of electricity
- a) metallic glasses b) shape memory alloys c) biomaterials d) ceramics (Ans:b)
- 2. Which among the following is the major disadvantage of shape memory alloy
- a) poor fatigue properties b)low energy efficiency c) expensive d) all the above (Ans: d)
- 3. _____ phase is stable at high temperature (Ans: Austenite)

4. Shape memory effect is _____ (reversible/irreversible)

5. ______is relatively soft. It is easily deformable phase which exists at low temperature (Ans: Martensite)

6. References

1. Arumugam M. Material Science. Anuradha Publication, 2008.

2. Sri Vasta C M & Srinivasan C. Science of Engineering materials. New Age International

(P) Ltd, Second Edition, 1999.

3. Palanisamy P. K. Solid state Physics Copyright (2003). Chennai: Scitech Publication

(India) Pvt Ltd, 3rd reprint 2008.

4. Mureghesan R, Kiruthiga Sivaprasath. Modern Physics. S.Chand& Co Ltd. 17th Edition,

2013.

5. Dr.Mani. P. A Text Book of Engineering Physics. Chennai: Dhanam Publications. Revised Edition, 2008.

6. Marikani A. Materials Science. Delhi: PHI Learning Pvt. Ltd. Eastern Economy Edition,

2017.

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Head of the Department

Dr. Inudaya Antonai Sophia Heae and Assistam Professor Department of Chemistry St. Mary's College (Autonomous) Thoothukudi

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry				
Semester	V				
Subject Title	Core VI Inorganic Chemistry I				
Code	Core VI 21UCHC51				
Hours	4				
Total Hours	60				
Credits	4				
Max Marks	100				
Unit & Title	UNIT I – NON AQUEOUS SOLVENTS				
Name of the Faculty	Dr. B. Divya				
T-L tools	Lecture method and powerpoint presentation				

Prerequisite Knowledge: Knowledge on solvents, polar solvents, universal solvents.
Micro -planning : 60 minutes

Evocation - 3 minutes **Prerequisites** - 2 minutes **General objective** 1 - 10 minutes **Formative assessment** 1 - 5 minutes **General objective** 2 - 10 minutes **Formative assessment** 2 - 5 minutes **General objective** 3 - 10 minutes **Formative assessment** 3 - 5 minutes **General objective** 4 - 10 minutes **Formative assessment** 3 - 5 minutes **Discussion** - 5 minutes **Mind map** - 3 minutes **Summary** - 2 minutes



1. Topic for Learning through evocation

A solvent is defined as a substance which has the power of dissolving other substances. Examples: water, benzene, ethanol, ether, etc.

2. Topic Introduction:

1. Non-ionising solvents (Non-polar solvents) :

These solvents are also called aprotic solvents (or non-protonic or non-protic solvents). These solvents have no hydrogen in their structure. Examples are C_6H_6 , CCl_4 , etc.

These solvents have very little dielectric constant. They dissolve non-polar substances.

2. Ionising solvents (Polar solvents)

Because of their polar nature, these solvents have associated structures. Ionic and covalent polar substances dissolve in them. The dissolution of ionic substances is due to their greater solvation energy than the lattice energy of the salts. Several covalent substances dissolve forming H-bonds.

Examples: H₂SO₄, CH₃COOH, H₂O, liq. NH₃, liq. SO₂, pyridine, BrF₃, HgBr, CH₃OH, etc Non. polar substances do not dissolve in these solvents because of the squeezing effect produced by their associated structure.

1.1. General Objective:

Enables the students to understand the nature of different types of solvents and its characteristic features.

1.2. Specific Objectives:

Enables the students to:

- 1. describe the nature of solvents and universal solvent
- 2. compare polar and non polar solvents
- 3. know the characteristic features of solvents
- 4. distinguish the various types of solvents based on solubility
- 5. apply the concept of solvation of various solvents in chemical reactions

2.3: Taxonomy of objectives:

Taxonomy of Objectives							
Knowledge	The Cognitive Process Dimension						
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create	
A. Factual	1						
Knowledge							
B. Conceptual		1,2					
Knowledge							
C. Procedural			5	3,4			
Knowledge							
D. Meta Cognitive					4		
Knowledge							

2.4: Key words:

Solvents, universal solvent, polar solvent, non polar solvents

2.5: Key diagrams:



Discussion:

The students will be asked questions about the nature of solvents. One of the students will be asked to compare the properties of polar and non polar solvents.

4. Mind Map:

Solvents have been classified in a number of ways, depending on the properties of the solvents.



5. Summary:

Students will be asked to classify the different types of solvents like polar and non polar solvents.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental idea about creating an e-content of the different types of solvents.
- Producing the e-content.

7. FAQ's:

1. The aprotic solvent is

	(a) H ₂ O	(b) C ₆ H ₆	(c) HF	(d) NH ₃	Ans: (c)
2.	The basic solv	ent among the following	ng is		
	(a) HF	(b) NH ₃	(c) H ₂ O	(d) None of them	Ans: (b)
3.	The polar solv	ent among the following	ng is		
	(a) CCl ₄	(b) C ₆ H ₆	(c) H ₂ O	(d)None	Ans: (c)
4.	Benzene is	solvent			
	(a) Polar (b) Protonic	(c) Non-Prote	onic (d) Acidic	Ans: (c)
5.	A best solvent	has a liquid r	ange		
	(a) Narrow	(b) Wide	(c) Average	(d) No	Ans: (b)

4. References

- 1. Puri B.R, Sharma L.R, Kalia K.C. *Principles of Inorganic Chemistry*.Delhi:Milestone publishers and distributors, 2019 2020.
- 2. Sathya Prakash and Madan R.D. Advance Inorganic Chemistry. S Chand and Co, 2019.
- Wahid U Malik, Tuli G.D, Madan R.D. Selected Topics in Inorganic Chemistry, S. Chand& Co. Ltd., 2018.
- 4. Albert Cotton F, Geoffrey Wilkinson, Carlos A. Murillo, Manfred Bochmann.
- 5. Advanced Inorganic Chemistry, John Wiley & Sons. sixth edition, 2016.

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry			
Semester	Ш			
Subject Title	Major Core: Organic Chemistry-II			
Code	21UCHC52			
Hours	5			
Total Hours	75			
Credits	5			
Max Marks	100			
Unit & Title	Unit: III – Photochemistry			
Name of the Faculty	Dr.J.Martin rathi			
T-L tools	Lecture method, Visual aid: PPT, Picture showing the evolution of			
	dyes			

Prerequisite Knowledge:

Knowledge of Jablonski diagram and its application.

Micro -planning



1. Topic for Learning through evocation

I will ask the students to say some examples of naturally light emitters ? How will you find the path in highways during night travel? Photochemistry is the study of chemical reactions that occur due to the absorption of light. Learning through evocation in photochemistry means recalling and reinforcing fundamental concepts by connecting them to real-world applications and experimental observations. Absorption of light and electronic transitions, Jablonski diagram and excited states, Fluorescence, phosphorescence, and photochemical reactions.

2.Topic Introduction:

The **Jablonski diagram** is a graphical representation of the electronic states of a molecule and the transitions between these states due to absorption and emission of light. It helps explain photophysical and photochemical processes such as fluorescence, phosphorescence, and intersystem crossing.

1. Electronic States

- \circ Ground State (S₀): The lowest energy state of a molecule.
- Excited Singlet States (S₁, S₂, etc.): Higher energy states achieved after light absorption.
- Excited Triplet State (T₁): A lower-energy state where electrons have parallel spins.

2. Absorption of Light

- \circ When a molecule absorbs a photon, it gets excited from the ground state (S₀) to a higher singlet state (S₁, S₂, etc.).
- This transition is fast ($\sim 10^{-15}$ s) and follows the **Franck-Condon principle**.

3. Non-Radiative Relaxation

- Internal Conversion (IC): A non-radiative process where energy is dissipated as heat, causing transitions between electronic states of the same spin (e.g., $S_2 \rightarrow S_1 \rightarrow S_0$).
- **Intersystem Crossing (ISC):** A spin-forbidden transition where the molecule moves from an excited singlet state (S_1) to an excited triplet state (T_1) .

4. Radiative Processes (Emission of Light)

- **Fluorescence:** Emission of light from an excited singlet state ($S_1 \rightarrow S_0$). It occurs quickly (~10⁻⁹ to 10^{-12} s).
- **Phosphorescence:** Emission from the triplet state ($T_1 \rightarrow S_0$), which occurs more slowly (~10⁻³ to several seconds) due to spin-forbidden transitions.

Importance of the Jablonski Diagram

- Explains the behavior of molecules under light exposure.
- Helps understand photophysical and photochemical reactions.
- Used in applications like fluorescence spectroscopy, photodynamic therapy, and organic photovoltaics.

3.1. General Objective:

Enables the students to understand the Jablonski diagram.

3.2. Specific Objectives:

- Enables the students to:
- 1. describe the non-radiative relaxation.
- 2. compare the Fluorescence and Phosphorescence.
- 3. describe the electronic transition.
- 4. importance of Jablonski diagram.

3.3 Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cognitive Process Dimension					
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
onceptual		1,2				
Knowledge						
C. Procedural			4			
Knowledge						
D. Meta Cognitive					2,3,4	
Knowledge						




Discussion:

The students will be asked questions regarding the Jablonski diagram. One of the students will be asked to draw electronic states studied during the class.

2. Mind Map:



3. Summary:

The **Jablonski Diagram** is a graphical representation of the electronic states of a molecule and the transitions between them. It explains how a molecule absorbs and emits light, including radiative and non-radiative processes.

4. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental idea about creating an e-content of Jablonski diagram
- Producing the e-content.

5. FAQ's:

1. What does the Jablonski diagram represent?

a) Electron transport chain **b**) Energy states of molecules and transitions between them

c) Chemical bonding d) Crystal lattice structure

2. Which of the following transitions in the Jablonski diagram occurs without radiation?

a) Fluorescence b) Phosphorescence c) Internal conversion d) Absorption

3. What is the primary difference between fluorescence and phosphorescence?

a) Fluorescence is a radiative transition, while phosphorescence is non-radiative

b) Fluorescence occurs from the singlet excited state, whereas phosphorescence occurs from the triplet excited state

c) Phosphorescence is faster than fluorescence

d) Fluorescence requires an external energy source, while phosphorescence does not

4. What type of molecular transitions are depicted in the Jablonski diagram?

a) Vibrational transitions only

b) Rotational transitions only c) Electronic transitions with vibrational and rotational energy levels

d) Nuclear transitions

6. References

1.Tewari K.S, Vishnoi N.K. A Text Book of Organic Chemistry.Vishal Publishing.2nd Revised Editions 2017.

2. Arun Bahl and B. S. Bahl. Advanced Organic chemistry. S. Chand and Company Ltd., Reprint, 2017.

1. A.Sophia

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Approved by HOD

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc., Chemistry
Semester	V
Subject Title	Physical Chemistry II
Code	21UCHC53
Hours	5
Total Hours	75
Credits	5
Unit & Title	Unit V Electrochemistry II/ Electroplating
Name of the Faculty	Dr. Irudaya Antonat Sophia
T-L tools	Lecture method, Visual aid: PPT

Prerequisite Knowledge: Basics of electrolysis and electrochemical cells

Micro -planning:



1.Topic for Learning through evocation

The principle of electroplating is based on the principle of electrolysis (ie) oxidation takes place at the anode and reduction takes place at the cathode. The anode is nothing but the coating metal itself. The cathode is the base metal or article to be electroplated. During electrolysis, the concentration of the electrolytic solution (plating bath) remains constant. This is due to the loss of metal ions in the solution which go to cathode for plating are reproduced continuously by the reaction of free anions with the anode metal.

Example: For the electroplating of copper, copper sulphate is used as an electrolytic (plating bath) solution . Pure copper metal acts as the anode. The cathode is the base metal or article to be electroplated.

Students were asked to recall the basic terms like electrolysis, corrosion, anode, cathode and oxidation.

2. Topic Introduction:

The process of electroplating is carried out using the following procedures.

i) metal or article to be electroplated is first cleaned with organic solvent (tetrachloro ethane) to remove oils, greases, etc.

ii) Then the article is cleaned with dilute HCl or H,SO, to remove surface scales, rust (oxide layer), etc.

iii) The cleaned article is placed on the bucket type container which acts as cathode (Figure.4) iv) The anode is made up of pure coating metal.

v) The electrolytic solution or plating bath is a solution of a soluble salt of the coating metal. vi) In addition, various substances (additives) are introduced in the plating bath solution to improve the throwing power (i.e.) to obtain the smooth and uniform deposit over the entire article.

vii) The anode and cathode are dipped in the electrolytic solution as shown in the figure 4. viii) The direct current of 8-12Vat an operating current density of 10 to 400mA cm is usually required. When the direct current is passed through the electrodes, the coating metal ions in the plating bath move to the cathode and get deposited on the article.

ix) Most of the electroplating processes are carried out at moderate temperature. Hence heating coil (Figure 4) is used to heat the electrolytic solution.

x) The low temperature, high current density and low metal ion concentration are the some of the favourable conditions used for brighter and uniform plating on the article.

3.1. General Objective:

Enables the students to understand the chemistry behind the process of electroplating

3.2. Specific Objectives:

Enables the students to:

1. Know the stepwise process in electroplating of Cu, Ni and Cd

- 2. Understand the favourable conditions used for Cu, Ni and Cd metallic coating
- 3. Tabulate the plating bath composition for Cu, Ni and Cd metallic coating
- 4. Compare the current density, temperature, current efficiency, throwing power, additives, anode and applications of electroplating of Cu, Ni and Cd

2.3 : Taxonomy of objectives:

Taxonomy	of objectives:					
Knowledge	The Cognitive Proce	ess Dimension				
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		2				
Knowledge						
C. Procedural				2,3		
Knowledge						
D. Meta Cognitive					3,4	
Knowledge						

2.4 : Key words: electrolysis, corrosion, anode, cathode, electrolye ,oxidation.

2.5 : Key diagrams (if any):



Discussion: The students will be asked to draw the diagram for electroplating, recollect the types of plating bath

4.Mind Map:



5. Summary:

Students will be asked to identify the stepwise process involved in electroplating using the mind map.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

• Asking the students to comparing the efficiency of process involved in electroplating in different plating bath solution.

• creating an e-content

• Discussing about the impact of chemicals coming out of these industries

7. FAQ's:

1. What is the main principle of electroplating?

a) Hydrolysis b) Neutralization c) Esterification d) Saturation

2. Which of the following is not an application of electroplating?

a) Decorative purposes b) Coating of metal c) Metal protection d) Corrosion prevention

3. The process of modifying a metal's properties is called _____

a) Electrolysis b) Electro deposition c) Electro less plating d) Electroplating

4. Saucepans can be prepared through electrolysis of _____

a) Nickel b) Galvanized zinc c) Chromium d) Copper

5. Electroplating of chromium helps in preparing of _____

a) Car bumpers b) Saucepans c) Cutlery d) Watches

8. References

 ArunBahl, Bahl B.S, Tuli G.D. *Essentials of Physical Chemistry*.New Delhi:S.Chand and Company Ltd.,Revised edition 2008.
 Puri B.R, Sharma L.R, Madan Pathania S. *Principles of Physical Chemistry*. Vishal Publishing Co. 2008.

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry
Semester	III
Subject Title	CBSC – Computer for digital era and soft skills
Code	21UCSB51
Hours	2
Total Hours	30
Credits	2
Max Marks	60
Unit & Title	Unit: I – Fundamentals of Computers
Name of the Faculty	Dr. B. Divya
T-L tools	Lecture method and powerpoint presentation

Prerequisite Knowledge: Knowledge on surfaces, solids, liquids and gases

Micro -planning : 60 minutes

Evocation -3 minutes **Prerequisites** -2 minutes **General objective 1** -10 minutes **Formative assessment 1** -5 minutes **General objective 2** -10 minutes **Formative assessment 2** -5 minutes **General objective 3** -10 minutes **Formative assessment 3** -5 minutes **General objective 4** -10 minutes **Formative assessment 3** -5 minutes **Discussion** -5 minutes **Mind map** -3 minutes **Summary** -2 minutes

1. Topic for Learning through evocation

A **computer** is a machine that can be programmed to automatically carry out sequences of arithmetic or logical operations (computation). A computer is an electronic device, operating under the control of instructions stored in its own memory that can accept data (input), process the data, produce information (output) and store the information for future use.

2. Topic Introduction:

Any digital computer carries out four functions

• Takes Data as input.

- Stores the data or instruction in its memory
- Processes the data and converts it into useful
- Generates the output.

Computer hardware is the collection of physical elements that constitutes a computer system.

Computer hardware refers to the physical parts or components of a computer such as the monitor, mouse, keyboard, computer data storage, hard drive disk (HDD), system unit

Software is a generic term for organized collection of instructions that enables a user to interact with the computer.

1.1. General Objective:

Enables the students to understand the basics of computer

1.2. Specific Objectives:

Enables the students to:

- 1. describe the components of computer
- 2. compare hardware and software
- 3. know the functions of computers
- 4. distinguish the various types computers
- 5. understand the difference between input and output devices

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cognitive Process Dimension					
Dimension	Domonton	The dometors d	A	Amalana	Evolueto	Create
	Kemember	Understand	Арріу	Analyse	Evaluate	Create
A. Factual	1, 3					
Knowledge						
B. Conceptual		2, 5				
Knowledge						
C. Procedural			4, 5	4		
Knowledge						
D. Meta Cognitive					4	
Knowledge						

2.4: Key words:

Computers, input devices, output devices

2.5: Key diagrams:

and use them when required. information.



Discussion:

The students will be asked questions about the types of computer and it components. They will be asked about the different types of input and output devices and the functions of the computer.

4. Mind Map:



5. Summary:

Students will be asked to recite the different components of computer and the functions of the computer.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental idea about creating an e-content with the basics concepts about the functions of the computer and its functions.
- Producing the e-content.

7. FAQ's:

Label the brain of the computer

a)Monitor b)Hard disk c)Central processing unit d)Keyboard Name the fundamental building block of CPU used to perform arithmetic and logic operations

a)Arithmetic - logic unit b)Control unit c)Registers d)Drivers
Find the temporary storage place for instruction or data.
a)CPU b)Monitor c) Hard disk d)Registers
Identify the name of physical elements that constitutes a computer system
a)hardware b)software c)system software d)operating system
Label the digital circuit used to perform arithmetic and logic operations
a)Arithmetic - logic unit b)Control unit c)Registers d)Drivers

8. References

1. Peter Norton, Introduction to Computers 6th Edition

2. Charles P Pfleeger, Shari Lawrence Pfleeger, Security in Computing, I Edition, Pearson Education, 2003.

3. E.Balagurusamy, Fundamentals of Computers ,McGraw Hill

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry
Semester	VI
Subject Title	Inorganic Chemistry - II
Code	Core IX 21UCHC61
Hours	4
Total Hours	60
Credits	4
Max Marks	100
Unit & Title	Unit II: Co-ordination Compounds II
Name of the Faculty	Dr. B. Divya
T-L tools	Lecture method and powerpoint presentation

Prerequisite Knowledge: Knowledge on metal ions, nature of bonding and types of bonds. **Micro-planning** : 60 minutes

Evocation – 3 minutes **Prerequisites** – 2 minutes **General objective 1** – 10 minutes **Formative assessment 1** – 5 minutes **General objective 2** – 10 minutes **Formative assessment 2** – 5 minutes **General objective 3** – 10 minutes **Formative assessment 3** – 5 minutes **General objective 4** – 10 minutes **Formative assessment 3** – 5 minutes **Discussion** – 5 minutes **Mind map** – 3 minutes **Summary** – 2 minutes



1. Topic for Learning through evocation

Coordination entity A coordination entity constitutes a central metal atom or ion bonded to a fixed number of ions or molecules. For example, $[CoCl_3(NH_3)_3]$ is a coordination entity in which the cobalt ion is surrounded by three ammonia molecules and three chloride ions.

A major feature of transition metals is their tendency to form complexes. A complex may be considered as consisting of a central metal atom or ion surrounded by a number of ligands. The interaction between these ligands with the central metal atom or ion is subject to crystal field theory.

2. Topic Introduction:

Crystal field theory was established in 1929 and treats the interaction of metal ion and ligand as a purely electrostatic phenomenon where the ligands are considered as point charges in the vicinity of the atomic orbitals of the central atom. Development and extension of crystal field theory taken into account the partly covalent nature of bonds between the ligand and metal atom mainly through the application of molecular orbital theory. Crystal field theory is often termed ligand field theory.

General Objective:

Enables the students to understand the splitting of d –orbitals in octahedral, tetrahedral and square planar fields.

Specific Objectives:

Enables the students to:

- 1. describe the nature of d orbitals
- 2. compare splitting in octahedral and tetrahedral field

- 3. know the characteristic features of d- orbitals in various fields
- 4. distinguish the types of splitting in different fields
- 5. apply the concept of crystal field splitting in coordination complexes.

2.3: Taxonomy of objectives:

Taxonomy of Objectives					
The Cognitive Process Dimension					
Domomhon	Indonatond	Annly	Analyza	Evoluoto	Create
Keineinder	Understand	Арріу	Analyse	Evaluate	Create
1					
	1,2				
		5	3,4		
				4	
	The Cognitive Remember 1	Taxonomy The Cognitive Process Dimense Remember Understand 1 1,2	Taxonomy of Objectives The Cognitive Process Dimension Remember Understand Apply 1 1 1 1 1,2 5 5 5 5	Taxonomy of Objectives The Cognitive Process Dimension Remember Understand Apply Analyse 1 1 1 1 1 1 1,2 1 1 1 5 3,4 1 1 1	Taxonomy of Objectives The Cognitive Process Dimension Analyse Evaluate 1 Inderstand Apply Analyse Evaluate 1 Inderstand Inderstand Inderstand Inderstand 1 Inderstand Inderstand Inderstand Inderstand Inderstand 1 Inderstand Inderstand Inderstand Inderstand Inderstand Inderstand 1 Inderstand Inderstand Inderstand Inderstand Inderstand Inderstand Inderstand 1 Inderstand Indersta

2.4: Key words:

Crystal field theory, d-orbitals, splitting

2.5: Key diagrams:



Shapes of eg orbitals or axial orbitals



Discussion:

The students will be asked questions about the types of d- orbitals. One of the students will be asked to compare the splitting in octahedral and tetrahedral fields.

4. Mind Map:



5. Summary:

Students will be asked to classify the splitting in octahedral, tetrahedral and square planar fields.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental idea about creating an e-content of the different types of splitting of d- orbitals.
- Producing the e-content.
- 7. FAQ's:

1.	Identify the para	magnetic complex from the	e following		
	a) [Co(NH ₃) ₆] ³⁺	b) $K_4[Fe(CN)_6]$	c) $[Co(CN)_6]^3$	- d) $[CoF_6]^{3-}$	
					Ans : d)
2.	The magnitude of	of Δ_0 value will depend on			
	a) charge on the co	entral metal ion	b) nature of the ligand	1	
	c) principal quantu	um no. of the d-electron	d) all the abov	e.	
					Ans : d)
3.	The CFSE for a	high spin octahedral compl	lex of d ⁶ ion is		
	a) $-1.8\Delta_0$	b) $-0.6\Delta_0$	c) 1.2Δ ₀	d) $-0.4\Delta_0$	
					Ans : d)
4.	The ligands can	stabilize metals in low oxid	dation state among the fol	lowing is	
	a) F ⁻	b) NH3	c) Co	d) S ²⁻	
					Ans:c)
5.	The relation betw	ween Δ_t and Δ_0 for the same	e metal ligand system is		
	a) $\Delta_0 = \frac{4}{2} \Delta_t$	b) 9 $\Delta_t = 5 \Delta_0$	c) $4 \Delta_0 = 9 \Delta_t$	d) $\Delta_{0} \approx \Delta_{t}$	
	2				Ans: c)
	4 D C				

4. References

- 1. Puri B.R, Sharma L.R, Kalia K.C. *Principles of Inorganic Chemistry*. Delhi: Milestone publishers and distributors, 2019 2020.
- 2. Sathya Prakash and Madan R.D. Advance Inorganic Chemistry. S Chand and Co, 2019.
- Wahid U Malik, Tuli G.D, Madan R.D. Selected Topics in Inorganic Chemistry, S. Chand& Co. Ltd., 2018.
- 4. Gopalan R, Ramalingam V.*Concise co-ordination Chemistry*. Vikas Publishing House Pvt Ltd, 2008.

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Mrs. S. Rani Jeyamary

I F: Sophics Dr. Irudaya Antonat Sophia Head Department of Chemistry, St.Mary's College (Autonomous), Thoothukudi-628001

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry			
Semester	III			
Subject Title	Major Core: OrganicChemistry-III			
Code	21UCHC62			
Hours	5			
Total Hours	75			
Credits	5			
Max Marks	100			
Unit & Title	Unit: 1I – Dyes			
Name of the Faculty	Dr.J.Martin rathi			
T-L tools	Lecture method, Visual aid: PPT, Picture showing the evolution of			
	dyes			

Prerequisite Knowledge:

Knowledge of classification of dyes and its application.

Micro -planning



1. Topic for Learning through evocation

I will ask the students to think of how clothes, paintings, or even hair is colourful? Can you name some common dyes used in textiles or food? Have you ever noticed why some dyes fade while others last longer? yes have transformed industries by providing vibrant, long-lasting colors. With ongoing research, eco-friendly dyes are being developed to reduce environmental impact while maintaining color quality! $\mathcal{B} \odot$ Dyes are colored substances that can chemically or physically bind to materials to impart color. They are widely used in textiles, food, cosmetics, medicine, and even in biological staining. Unlike pigments, which are insoluble, dyes dissolve in a liquid medium, allowing them to penetrate the material being dyed.

2.Topic Introduction:

Dyes are **coloring substances** that impart color to various materials, including textiles, paper, leather, food, and even biological specimens. They work by **absorbing specific wavelengths of light** while reflecting others, giving the material a distinct color. Unlike pigments, which remain on the surface, dyes penetrate and bond with the material, providing a more durable and even coloration. The use of dyes dates back thousands of years, with ancient civilizations such as the Egyptians, Indians, and Chinese using natural sources like:

Plants (Indigo, Madder, Turmeric)

Animals (Cochineal, Tyrian purple from sea snails)

Minerals (Ochre, Malachite)

Based on Application

- Acid Dyes Used for protein fibers like wool and silk.
- **Basic Dyes** Used for acrylic and some synthetic fibers.
- **Direct Dyes** Suitable for cotton without a mordant.
- **Reactive Dyes** Chemically bond with fibers, ensuring long-lasting color.
- Vat Dyes Insoluble dyes (like Indigo) that require reduction before dyeing.
- **Disperse Dyes** Used for synthetic fibers like polyester.

Based on Chemical Structure

1. Azo Dyes

- Contain one or more azo (-N=N-) groups.
- Most common class of dyes.
- Examples: Methyl orange, Congo red, Direct Red 23.
- Used in textiles, food, and cosmetics.

2. Anthraquinone Dyes

- Based on the anthraquinone structure.
- Known for excellent lightfastness and bright shades.
- Examples: Alizarin, Disperse Red 9.
- Used in synthetic fibers, cosmetics, and lacquers.

3. Phthalocyanine Dyes

- Contain a phthalocyanine (Pc) ring system with a metal ion (Cu, Ni).
- High stability, intense blue and green colors.
- Example: Copper Phthalocyanine (C.I. Pigment Blue 15).
- Used in inks, plastics, and coatings.

4. Xanthene Dyes

- Derived from xanthene (oxygen-containing) rings.
- Bright fluorescent colors.
- Examples: Fluorescein, Eosin, Rhodamine B.
- Used in biological stains, lasers, and cosmetics.

5. Triarylmethane Dyes

- Based on a triarylmethane (C-Ar₃) structure.
- Bright, often green or violet shades.
- Examples: Crystal Violet, Malachite Green, Fuchsine.
- Used in textiles, inks, and biological staining.

6. Indigoid Dyes

- Derived from indigo structure (heterocyclic).
- Example: Indigo, Tyrian Purple.
- Used mainly in denim dyeing.

7. Nitro and Nitroso Dyes

- Contain nitro (-NO₂) or nitroso (-NO) groups.
- Example: Nitroso Green, Martius Yellow.
- Used in leather and paper industries.

3.1 General Objective:

Enables the students to understand the evolution of classification of dyes.

3.2 Specific Objectives:

Enables the students to:

- 1. describe the term dyes.
- 2. compare the classification of dyes.
- 3. show the application of dyes distinguish the various types of dyes
- 4. distinguish the various types of dyes.

3.3. Taxonomy of Objectives

Taxonomy of Objectives						
Knowledge	The Cognitive	Process Dimensi	on			
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		1,2				
Knowledge						
C. Procedural				3,4		
Knowledge						
D. Meta Cognitive					2,3,4	
Knowledge						

3.3: Key words:

Nitro dyes, Nitroso dyes, Azo Dye , Anthraquinone Dyes , Acid dyes, Basic dyes, Vat Dyes, Disperse Dyes, Direct dyes,

3.4: Key diagrams (if any):





Discussion:

The students will be asked questions regarding the types of dyes. One of the students will be asked to sketch any type of dyes studied during the class.

4.Mind Map:



5.Summary:

Students will be asked to identify how evolution takes place in the types of dyes studied by using the mind map.

6.Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental idea about creating an e-content of applications of dyes.
- Producing the e-content.
- Provided with dye samples with different types of dyes and asked to identify using taking sections.

7.FAQ's:

1. Find the Martius yellow is an example of
a) Nitro dye b) azo dye c) trimethyl phenyl d) xanthene dye
2.What is the main feature of vat dyes?
a) They are water-soluble b) They require reduction before application
c)They are used for protein fibers only (d) They are fluorescent in nature
3. Which dye class is known for its excellent fluorescence?
a) Xanthene dyes b) Azo dyes c) Nitro dyes d) Indigoid dyes
4. Which class of dyes contains the $-N=N-$ (azo) functional group?
a) Indigoid dyes b) Azo dyes c) Phthalocyanine dyes d) Xanthene dyes

8.Reference

- 5. Tewari K.S, Vishnoi N.K.A Text Book of Organic Chemistry. Vishal Publishing 2nd Revised Editions, 2017
- 6. Arun Bahl and Bahl B. S. Advanced Organic chemistry. S. Chand and Company Ltd, Reprint, 2017.

J. Martin Rith

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc., Chemistry
Semester	VI
CourseTitle	Physical Chemistry III
Code	21UCHC63
Hours/Week	5
Total Hours	75
Credits	5
Unit & Title	Unit III Photochemistry/ Jablonski diagrams-explanation of
	fluorescence and phosphorescence
Name of the Faculty	Dr. Irudaya Antonat Sophia
T-L tools	Lecture method, Visual aid: PPT

Prerequisite Knowledge: Basics of chemical reactions under light

Micro -planning:



1.Topic for Learning through evocation

Ordinary reactions occur by absorption of heat energy from outside. The reacting molecules are energised and molecular collisions become effective. These bring about the reaction. The reactions which are caused by heat and in absence of light are called thermal or dark reactions. On the other hand, some reactions proceed by absorption of light radiations. These belong to the visible and ultraviolet regions of the electromagnetic spectrum (2000 to 8000 Å). The reactant molecules absorbs photons of light and get excited. These excited molecules then produce the reactions.

2. Topic Introduction:

In many photochemical reactions the reactant molecule does not absorb the radiation required for the reaction. Hence the reaction is not possible. In such cases the reaction may still occur if a foreign species such as mercury vapour is present. The mercury atom absorbs the incident radiation and subsequently transfers its energy to the reactant molecule which is activated. Thus the reaction occurs. A species which can both absorb and transfer radiant energy for activation of the reactant molecule, is called a photosensitizer. The reaction so caused is called a photosensitized reaction. If the absorbed radiation is not used to cause a chemical change, it is re-emitted as light of longer wavelength. The three such photophysical processes which can occur are :(a) Fluorescence (b) Phosphorescence (c) Chemiluminescence

3.1. General Objective:

Enables the students to explore the chemistry behind photophysical process

3.2. Specific Objectives:

Enables the students to:

- 1. Identify different radiative transitions and non radiative transitions
- 2. Differentiate fluorescence and phosphorescence
- 3. Outline the principle behind fluorescence and phosphorescence and the substances which exhibit these properties

- 4. Sketch Jablonski diagram and explains various photophysical process
- 5. Compare 2.3 : Taxonomy of objectives:

Taxonomy of objectives:						
	1					<u> </u>
Knowledge	The Cognitive Process Dimension					
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		2,3				
Knowledge						
C. Procedural				2,3		
Knowledge						
D. Meta Cognitive					3,4	
Knowledge						

2.4 : Key words: fluorescence, phosphorescence, internal conversion, intersystem crossing, radiative transition, nonradiative transition

2.5 : Key diagrams (if any):



 S_0 - singlet ground state S_1, S_2, S_3 are singlet excited states



Discussion: The students will be asked to draw the Jablonski diagram and explain in detail





5. Summary:

1. Students will be asked to identify the various photophysical process using the mind map.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Asking the students to compare fluorescence and phosphorescence
- creating an e-content
- Discussing about the impact of light on chemical substances
- 7. FAQ's:
 - 1. is used in traffic signals .
 - a) **Fluorescent dyes** b) organic dyes
 - b) a paste of radium with zinc sulphide d)inorganic dyes
 - 2. The photosensitiser used in photosynthesis is ------.

a) Lightb) CO2c) H2Od) Chlorophyll3. The reverse of photochemical reaction is -----

a) Bioluminescence b) Chemilumescence c) Fluorescence d) Photosensitization

4. The rate of the photochemical reaction depends on the ------.

a) Concentration b) Pressure c) **Intensity of light** d) Temperature

8. References

 ArunBahl, Bahl B.S, Tuli G.D. *Essentials of Physical Chemistry*.New Delhi:S.Chand and Company Ltd.,Revised edition 2008.
 Puri B.R, Sharma L.R, Madan Pathania S. *Principles of Physical Chemistry*. Vishal Publishing Co. 2008.

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Chemistry		
Semester	VI		
Course Title	Elective : Polymer Chemistry		
Code	21UCHE61		
Hours	4		
Total Hours	60		
Credits	4		
Max Marks	100		
Unit & Title	Unit:1- Conducting Polymers		
Name of the Faculty	Dr.A.Lakshmi		
T-L tools	Lecture method, Visual aid: PPT, Picture showing the preparation of		
	conducting polymers		

Prerequisite Knowledge:

Knowledge of alloys and its characteristics

Micro - planning



1. Topic for Learning through evocation

Students will be asked about the designing of chips and the polymers which has the tendency to conduct electric current.

2. Topic Introduction:

Conductive polymers are polyconjugated organic polymers that conduct electricity because of their conjugated π -bonds. Such compounds can have either metallic conductivity or can be semiconductors. The biggest advantage of conductive polymers is their processability, mainly by dispersion. Conductive polymers are generally not thermoplastics, i.e., they are not thermoformable. But, like insulating polymers, they are organic materials. They can offer high electrical conductivity but do not show similar mechanical properties to other commercially available polymers. The electrical properties can be fine-tuned using the methods of organic synthesis and by advanced dispersion techniques. In pure form (undoped or pristine state), conducting polymers have low electrical conductivity and behaves like an insulator or as a semiconductor. These polymers can be converted to polymer salts having electrical conductivities comparable to that of metals by treating with suitable oxidizing or reducing agents. These types of doped polymers having high electrical conductivities are called as synthetic metals. The electrical conductivities of undoped conjugated polymers have the range in the order of 10⁻¹⁰ S/cm from those of the typical insulators and in the range of 10⁻⁵ S/cm from those of the semiconductors.

TYPES OF CONDUCTING POLYMERS



	Polymer		(S/cm)
1.	Polyacetylene		10 ³ - 1.7x10 ⁵
2.	Polyphenylene vinylene		$3 - 5 \times 10^3$
3.	Polyaniline (X = NH/N) Polyphenelene sulfide (X = S)	$\begin{bmatrix} x \\ x \\ (X = NH/N, S) \end{bmatrix}_{n}$	30 - 200
4.	Polypyrrole (X = NH) , Polythiophene (X = S)	(X = NH, S)	$10^2 - 7.5 \times 10^3$

Synthesis

The scientist, Shirakawa, prepared poly(acetylene) by passing acetylene gas over the ZeiglerNatta catalyst. Zeigler-Natta catalyst is the coordination complex of tetra butoxy titanium, [Ti(OBu)4], an organo metallic compound and triethyl aluminium, [Et3A1].

$$_{nHC=CH} \xrightarrow{Ti(OC_{4}H_{9})_{4}/Al(C_{2}H_{3})_{3}} -[-CH=CH_{-}]_{xc}$$

The reaction forms copper coloured cis-poly(acetylene), having conductivity in the range 10-8 - 10-7 S/cm, at low temperature (-780C). At higher temperatures (1500C), more stable silver coloured trans-poly(acetylene), having conductivity in the range 10-3 -10-2 S/cm is formed. Cispoly(acetylene) can be converted to trans-poly(acetylene) by heating it at 1500C for few minutes.

APPLICATIONS OF CONDUCTING POLYMERS

• They have promise in antistatic materials and they have been incorporated into commercial displays and batteries, but there have had limitations due to the manufacturing costs, material inconsistencies, toxicity, poor solubility in solvents, and inability to directly melt process.

• Literature suggests they are also promising in organic solar cells, printing electronic circuits, organic light-emitting diodes, actuators, electrochromism, supercapacitors, chemical sensors and biosensors, flexible transparent displays, electromagnetic shielding and possibly replacement for the popular transparent conductor indium tin oxide.

* It is used for microwave-absorbent coatings, particularly radar-absorptive coatings on stealth aircraft.

General Objective:

Enables the students to understand the condition of a polymer to be conductive and their application in electronics.

Specific Objectives:

Enables the students to:

- 1. describe the condition for conductivity
- 2. classify conducting polymers
- 3. Synthesis a conducting polymer
- 4. Evaluation of characteristics of polymer.

Taxonomy of objectives:

Taxonomy of Objectives							
Knowledge	The Cognitive Process Dimension						
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create	
A. Factual	1,2						
Knowledge							
B. Conceptual		2					
Knowledge							
C. Procedural			3	3,4			
Knowledge							
D. Meta Cognitive					4		
Knowledge							

Key words:

Polyacetylene, conducting polymers, pi electrons, doping **Key points with diagrams**



Discussion:

The students will be asked questions regarding the pi electrons and their influence on the conductance of polymer

Mind Map:



3. Summary:

Students will be asked to summarize the characteristics of conducting polymer.

4. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Model making about the fabrication of electronic chips
- Creating a video e-content.
- List some organic conducting polymers.

5. FAQ's:

1. Find the condition of polymer to be conductive.

a) pi- electron b) sigma electron

c) conjugated pi electron d) odd electron

2. Find the oxidizing agent that can be used in the synthesis polyaniline.

a) KOH b) KCl c) $K_2S_2O_8$ d) KBr (Ans:c)

(Ans: c)

3. Find an example of conducting polymer in the following.

a)HDPE b) teflon c) polyacetylene d) PVC (Ans: c)
4. These doped polymers having high electrical conductivities are called as ____(Ans: Synthetic Metals)
5. The scientist, Shirakawa, prepared poly(acetylene) by passing acetylene gas over the _____catalyst. (Ans: Zeigler Natta)

6. References

Text book:

1. Bagavathi Sundari K. Applied Chemistry. Chennai: MJP Publishers, Tamilnadu Book

House, 2008.

2. Young R.J and Lovell P.A . Introduction to polymers. Replika press Pvt.Ltd.India.II

Edition, 2011

3. Arora M.G, Singh M. Polymer chemistry. New Delhi: Anmol publications Pvt.Ltd.

- 4374/4B, Ansari Road, Daryaganj, 2003.
- 4. Gowarikar V.R, Viswanathan N. V and Streedhar J. Polymer science. 4th edition, 2021.
- 5. Jain P.C. and Monika Jain. Engineering chemistry. Delhi: DhanpatRai & Sons. Eleventh

Edition, 2012.

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Verified by Subject Expert

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