

FIRST DEGREE PROGRAMME IN CHEMISTRY
TableI: Course structure, Scheme of Instruction and Evaluation

SEMESTER I									
Course Code	Study component	Instructional hrs/Week		Credit	Duration of Uty. Exam	Evaluation marks		Total Credit	
		T	P			CE	ESE		
								18	
EN1111	EnglishI	5		4	3hrs	20	80		
1111	Additional LanguageI	4		3	3hrs	20	80		
EN1121	FoundationCourse I	4		2	3hrs	20	80		
MM1131.2	Complementary CourseI	4		3	3hrs	20	80		
PY1131.2	Complementary CourseII	2		2	3hrs	20	80		
	Complementary Course Lab of PY1131.2		2	-	-	-	-		
CH1141	CoreCourseI	2		4	3hrs	20	80		
	CoreCourseLabIof CH1141		2	-	-	-	-		
SEMESTER II									
EN1211	EnglishII	4		3	3hrs	20	80	18	
EN1212	EnglishIII	5		4	3hrs	20	80		
1211	Additional LanguageII	4		3	3hrs	20	80		
CH1221	FoundationCourse II	2	2	3	3hrs	20	80		
MM1231.2	Complementary CourseIII	4		3	3hrs	20	80		
PY1231.2	Complementary CourseIV	2		2	3hrs	20	80		
	Complementary Course Lab of PY1231.2		2	-	-	-	-		
SEMESTER III									
EN1311	EnglishIV	5		4	3hrs	20	80	18	
1311	Additional LanguageIII	5		4	3hrs	20	80		
MM1331.2	Complementary CourseV	5		4	3hrs	20	80		
PY1331.2	Complementary CourseVI	3		3	3hrs	20	80		
	Complementary CourseLabof PY1331.2		2	-	-	-	-		
CH1341	CoreCourseII	3		3	3hrs	20	80		
	Core Course Lab I of CH1341		2	-	-	-	-		
SEMESTER IV									
EN1411	EnglishV	5		4	3hrs	20	80	24	
1411	Additional LanguageIV	5		4	3hrs	20	80		
MM1431.	Complementary	5		4	3hrs	20	80		

2								
	CourseVII							
PY1431.2	Complementary CourseVIII	3	2	3	3hrs	20	80	
	Complementary Course Lab of PY1131.2 PY1231.2 PY1331.2 & PY1331.2			4	3hrs	20	80	
CH1441	CoreCourseIII	3		3	3hrs	20	80	
CH1442	CoreCourseIV-Lab I ofCH1141		2	2	3hrs	20	80	
SEMESTER V								
CH1541	CoreCourseV	3		4	3hrs	20	80	19
CH1542	CoreCourseVI	4		4	3hrs	20	80	
CH1543	CoreCourseVII	4		4	3hrs	20	80	
CH1544	CoreCourse VIII Lab II		5	3	6hrs	20	80	
CH1545	CoreCourseIX Lab III		4	2		20	80	
1551	OpenCourse	3		2	3hrs	20	80	
	Project		2	-	-	-	-	
SEMESTER VI								
CH1641	CoreCourseX	3		4	3hrs	20	80	23
CH1642	CoreCourseXI	4		4	3hrs	20	80	
CH1643	CoreCourseXII	4		4	3hrs	20	80	
CH1644	CoreCourseXIII Lab IV			3	6hrs	20	80	
CH1645	CoreCourseXIV Lab V			2		20	80	
CH1661.1/ CH1661.2/ CH1661.3/ CH1661.4	Elective Course (Industry Based)	3		2	3hrs	20	80	
CH1646	Project and Factory Visit		3	4	Viva voce	-	100	

CE -Continuous Evaluation, ESE- End Semester Evaluation

Table I A.Total number of Courses offered in BSc programme

Sl No.	Courses	No. of courses	Credits semester wise
1	Language Courses	9	7+10+8+8=33
2	Foundation Courses	2	2+3=5
3	Complementary Courses	9	5+5+7+11=28
4	Core Courses	14	4+3+5+17+17=46
5	Open Course	1	2
6	Industry Based Elective Course	1	2
7	Project	1	4
Total number of Courses		37	
Total number of credits in all six semesters		18+18+18+24+19+23=120	120

Table II. Scheme of instruction of Core Courses, Foundation Course II, Open Course and Elective Course

Course No. Course code	Course Title	Sem I		Sem II		Sem III		Sem IV		Sem V		Sem VI		Total	
		Hrs L/P	C	Hrs L/P	C	Hrs L/P	C	Hrs L/P	C	Hrs L/P	C	Hrs L/P	C	Hrs	C
C.C.I CH1141	Inorganic Chemistry I	2/2	4											2	4
F.C.II CH1221	Chemistry-its Origin, Methodology and Impacts			2/2	3									4	3
C.C.II CH1341	Inorganic Chemistry II					3/--	3								3
C.C.III CH1441	Organic Chemistry I														3
C.C.IV CH1442	Lab I of CH1141,CH1341&CH1441 (Inorganic Qualitative Analysis)					--/2		--/2	2					6	2
C.C.V CH1541	Physical Chemistry I									3/--	4			3	4
C.C.VI CH1542	Inorganic Chemistry III									4/--	4			4	4
C.C.VII CH1543	Organic Chemistry II									4/--	4			4	4
C.C.VIII CH1544	Lab II of CH1541,CH1542&CH1543 (Inorganic Volumetric Analysis)									--/5	3			5	3
C.C.IX CH1545	Lab III of CH1541,CH1542&CH1543 (Physical Chemistry Experiments)									--/4	2			4	2
O.C CH1551	Open to other majors									3/--	2			3	2
C.C.X CH1641	Physical Chemistry II											3/--	4	3	4
C.CXI CH1642	Organic Chemistry III											4/--	4	4	4
C.CXII CH1643	Physical Chemistry III											4/--	4	4	4

C.C.XIII CH1644	Lab Course IV (Organic Chemistry Experiments)											--/5	3	5	3
C.C.XIV CH1645	Lab Course V (Gravimetric Experiments)											--/3	2	3	2
E.C (Industry Based) CH1661	Any one of the options											3/--	2	3	2
C.C.XV CH1646	Project									--/2		--/3	4	5	4
	Factory visit														
Credits/Semester		4	3	3	5	19	23								57

C.C-Core Course, F.C-Foundation Course, O.C-Open Course, E.C-Elective Course
L-Theory, P-Practical, C-Credit

B.Sc.Degree Programme in Chemistry
TableIII. Open Course offered to students of other disciplines
Semester V

Semester	No. of Hours/ Week		Credits	Course Code	Title of the Course	Instructional Hours
	L	P				
V	3	-	2	CH1551.1	Chemistry and its Application	54
				CH1551.2	Fundamentals of Chemistry & Its Application to Everyday Life	
				CH1551.3	Environmental Chemistry	

B.Sc.Degree Programme in Chemistry
TableIV. Elective Course (Industry Based) offered in
Semester VI

Semester	No. of Hours/		Credit s	Course Code	Title of the Course	Instruction al Hours
	L	P				
VI	3	-	2	CH1661.1	Industrial Aspects of Food Chemistry	54
				CH1661.2	Industrial Pollution and Environmental Management	
				CH1661.3	Introduction to Pharmaceuticals & Cosmetics	
				CH1661.4	Petrochemicals and Alternative Fuels	

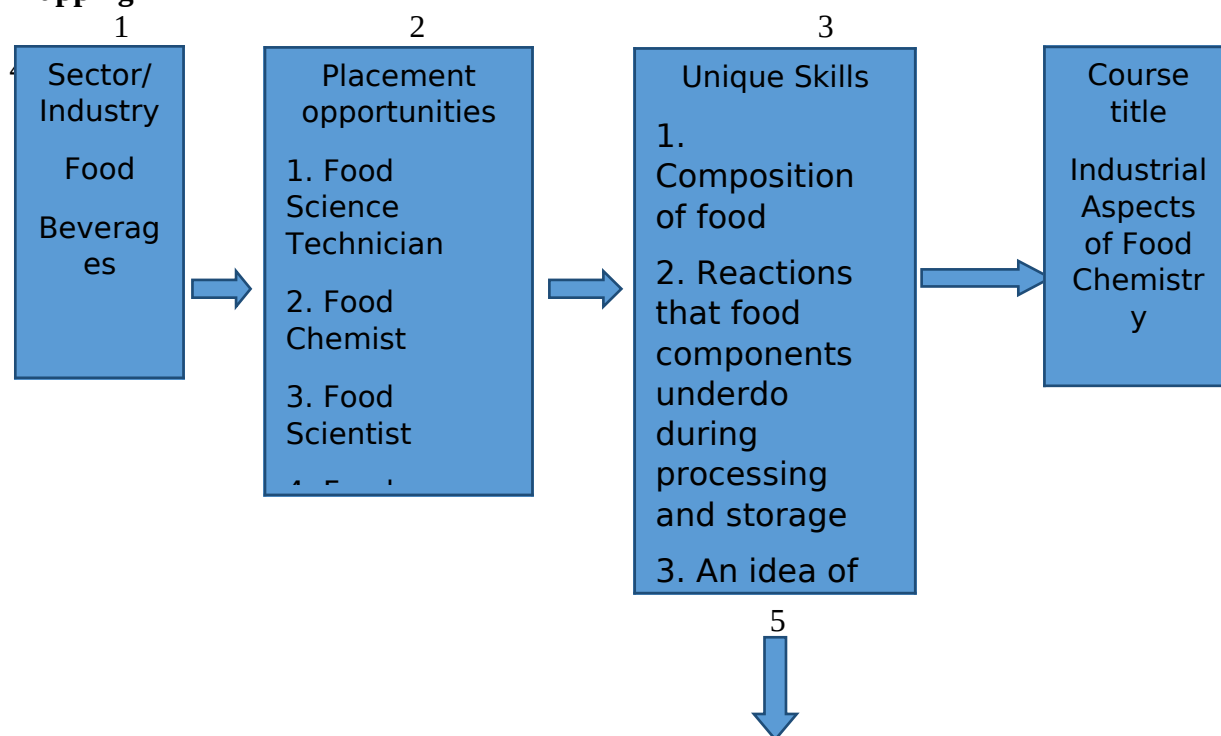
UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc.CHEMISTRY FIRST DEGREE PROGRAMME
2022 Admission Onwards
ELECTIVE COURSES

Semester	V1
Course	Elective Course
Course name	INDUSTRIAL ASPECTS OF FOOD CHEMISTRY
Course Code	CH1661.1
Credit	2
Hours	54 hours
Lecture-Tutorial-Lab	3-0-0

Course Title: Industrial Aspects of Food Chemistry

Course Code: CH1661.1

Mapping



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Course Outcomes

Upon completion of this course, the students

1. Explain the major components of food
2. Identify additives added to foods for various purposes
3. Describe the various chemical reactions of food components
4. Acquire knowledge of adulteration and toxicity of food
5. Understand the basic concepts of food processing and packaging.
6. Get knowledge of analysis of food components

MODUL E	COURSE DESCRIPTION	Hrs	CO No.
1	Chemical composition of food	12	
1.1	Major components of food - Carbohydrate, Proteins and Amino Acids, Lipids and Fatty Acids, Minerals, Vitamins, Fibers- General classification with examples (<i>detailed study of structure and physical properties is not expected</i>), Sources and Functions	6	1
1.2	Moisture content in food and water activity	2	1
1.3	Sensory properties of amino acids, peptides and carbohydrates.	2	1
1.4	Physiology of nutrition.	2	1
2	Chemical reactions of food components	6	
2.1	Enzymatic and nonenzymatic browning reaction (Maillard reaction)	1	3
2.2	lipid oxidation, starch hydrolysis, formation of trans-fatty acids, cross-linking and denaturation of proteins	3	3
2.3	Texturization of proteins, gel formation, starch retrogradation, degradation of food.	2	3
3	Food additives	12	
3.1	Definition, Characteristics, Classification- based on origin-natural and synthetic, based on technological function Stabilizers of physical characteristics	3	2
3.2	Inhibitors of chemical and biological alterations, Modifiers of organoleptic characters	2	2
3.3	Improvers and correctors, based on types of food additives-Flavouring agents, Enzyme preparations,	2	2
3.4	Other additives including preservatives, colouring agents, Non-sugar sweeteners	2	2
3.5	Aroma substances, Functional role of food additives, toxicology , safety issues, Examples for flavour enhancers – monosodium glutamate (MSG), maltol and menthol.	3	2
4	Food analysis	6	
4.1	Compositional analysis of foods - moisture and total solid analysis, ash analysis.	2	6
4.2	Fat analysis, protein analysis, carbohydrate analysis, vitamin and mineral analysis.	4	6
5	Toxicity and Adulteration in food	12	
5.1	Natural toxins in food-commonly found natural toxins and their effects	2	4
5.2	Aquatic biotoxins, cyanogenic glycosides, furocoumarins, lectins, mycotoxins	3	4
5.3	Solanines, chaconine, poisonous mushrooms, pyrrolizidine alkaloids.	3	4
5.4	Adulteration in foods- Sources, health risks and detection	4	4

	methods, Prevention of food adulteration act (PFA), 1954.		
6	Food Processing and Packaging	6	
6.1	Food processing - definition, methods of food processing- traditional methods and modern methods	1	5
6.2	Heat treatment, fermentation, pickling, smoking, drying, curing, freezing, pasteurization, ultra-heat treatment, high pressure processing, modified atmosphere packaging.	2	5
6.3	Consequences of food processing, Healthy aspects.	1	7
6.4	Food packaging- Functions of packaging, packaging materials, Hazards and diseases, Future prospects of food packaging.	2	5,7

REFERENCES

1. Srilakshmi, Food Science, 7th edition, New Age Publishers, New Delhi, 2018
2. Shakuntala Manay, Foods: Facts & Principles, New Age Publishers, New Delhi, 2021
3. Shalini Sehgal, A Laboratory Manual of Food Analysis, I K International Publishing House; 0 edition, 2016.
4. H. D. Belitz, W. Grosch, P. Schieberle, Food Chemistry, 4th Edition, Springer, 2009
5. John M. deMan John W. Finley, W. Jeffrey Hurst, Chang Yong Lee, Principles of Food Chemistry, 4th Edition, Springer, 2018.
6. S. Suzanne Nielsen, Food Analysis, 4th Edition, Springer, 2017.

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Model Question Paper of BSc Chemistry Programme
2022 Admission onwards
SEMESTER VI - Course Code CH1661.1

ELECTIVE COURSE - Industrial Aspects of Food Chemistry

Time: 3 Hours

Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum of two sentences.

Each question carries 1 mark

1. Give an example for essential amino acid.
2. What are textured protein products?
3. What is MSG?
4. Give an example for a natural food additive.
5. What is Benedict's reagent?
6. What are mycotoxins?
7. When did PFA enacted?
8. What is Pasteurization?
9. Give any two traditional methods of food processing.
10. What are the 3 types of fibre?

(10x1=10 marks)

Section B

Short answer type. Answer any eight questions.

Each question carries 2 marks

11. Write any two components of food, their source and function.
12. Briefly describe Maillard reaction.
13. Write a note on starch hydrolysis.
14. Give the classification of food additives based on based on technological function.
15. What are Flavouring agents? Give any two examples.
16. How do you analyse ash content in food?
17. Briefly describe Aquatic biotoxins.
18. What are lectins?
19. Define food processing.
20. How are vitamins classified?
21. What is the significance of moisture content determination in food stuffs?
22. What is maltol used for?

(8x2=16 marks)

Section C

Answer any six questions

Each question carries 4 marks

23. What is menthol? Give its structure and effects.
24. Briefly describe fat analysis in foods.
25. Write a note on poisonous mushrooms.
26. What is food additive and explain their functions?
27. Describe starch retrogradation.
28. Write a note on minerals in food stuffs.
29. Briefly describe cross-linking and denaturation of proteins.
30. Write a note on modern method of food processing.
31. Explain the effects of solanines and chaconine.

(6x4=24 marks)

Section D

Answer any two from the following.

Each question carries 15 marks

32. Describe Adulteration in foods, sources, health risks and detection methods.
33. (a) Write a note on food packaging. ((7 marks)
(b) Explain the consequences of food processing and its healthy aspects. (8 marks)
34. (a) Describe sensory properties of amino acids and carbohydrates.(7 marks)
(b) Explain protein and carbohydrate analysis in food stuffs.(8 marks)
35. Describe the classification of food additives.

(2x15=30 marks)

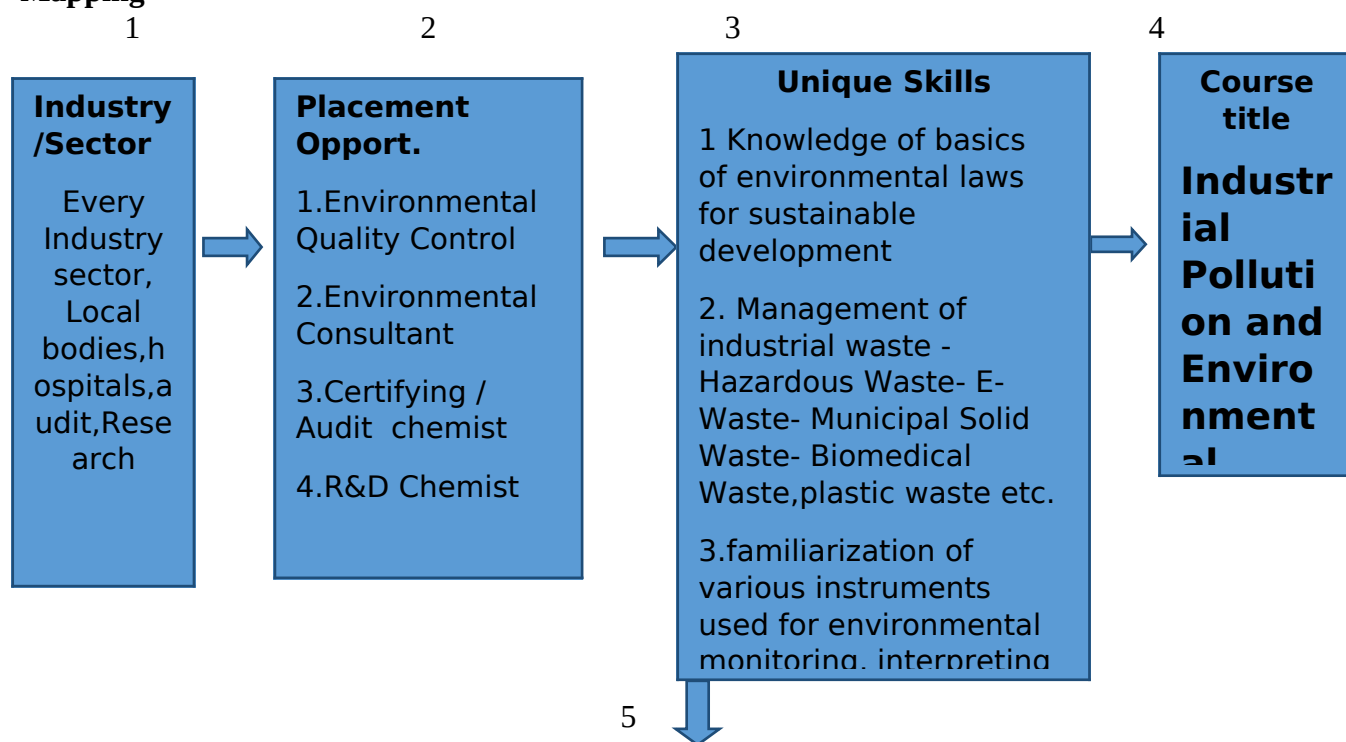
2022 Admission onwards

Semester	V1
Course	Industry Based Elective Course
Course name	Industrial Pollution and Environmental Management
Course Code	CH1661.2
Credit	2
Hours	54 hours
Lecture-Tutorial-Lab	3-0-0

Course Title: Industrial Pollution and Environmental Management

Course Code : CH 1661.2

Mapping



Course Outcomes

Upon completion of this course, the students

1. Explain the material cycle in ecosystem.
2. Awareness on biodiversity conservation
3. Get awareness of Sustainable Development and Environment Management
4. Understand the various process of control of potential threat to the environment from human activities
in general and industrial activities in particular.
5. Familiarize with the instruments used for environmental monitoring & interpreting environmental data
6. Aware the fundamental environment laws.

	biosphere and Lithosphere.		
1.2	Ecosystem- components of ecosystem	2	1
1.3	Productivity and energy flow – food chain and food webs	2	1
1.4	Material cycle in ecosystem – elemental cycle: carbon cycle, oxygen cycle and nitrogen cycle – Introduction to biodiversity & needs for biodiversity conservation. Eco sensitive zones.	3	1,2
2	Fundamentals of Environmental Laws	9	
2.1	Major Indian Environment laws – Aim and objectives of: The Environment Protection Act, The Municipal Solid Wastes (Management & Handling) rules	3	6
2.2	The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, The Plastic Waste (Management and Handling) Rules, The E-Waste (Management and Handling) Rules	3	6
2.3	The Air (Prevention and Control of Pollution) Act, The Water (Prevention and Control of Pollution) Act, The Factories Act.	3	6
3	Environmental Impact Assessment	9	
3.1	Environmental Monitoring –Indoor & Outdoor Air Pollution- Ambient Air Quality Monitoring (AAQM)	2	3,4
3.2	Water Quality Monitoring –Water quality standards-WHO & Indian standards. Data Interpretation and Quality Assurance	2	3,4
3.3	Concept and process of Environmental Impact Assessment and Environmental Audit.	3	3,4
3.4	Online Monitoring of Industrial Emission & Effluent-Pollution Control Boards.	2	3,4
4	Industrial Waste management	9	
4.1	Management of Wastes- Hazardous Waste- E-Waste	2	4
4.2	Municipal Solid Waste- Biomedical Waste	2	4
4.3	Plastic Wastes - Battery waste	2	4
4.2	Four R's principle – bioremediation - Sustainable development- Introduction to Green chemistry – 12 principles(elementary ideas only)	3	3,4
5	Analytical techniques	9	
5.1	Instrumental Analytical Techniques - Principles and applications of AAS, ICP-OES, XRF	3	5
5.2	GC-MS, ATD-GC, HPLC	3	5
5.3	IC, EC/ OC and TOC	3	5
6	Industrial Safety Management	9	
6.1	Concept of Industrial Safety- Applicable areas-Occupational health and safety	3	7
6.2	Disaster management - Fire Safety - Combustion - Flashpoint - Fire point - Ignition temperature and spontaneous combustion.	3	7
6.3	Classification of Fire and types of extinguishers - method of operation - First Aid.	3	7

References:-

1. R.K. Trivedy, N.S. Raman; Industrial Pollution and Environmental Management, Scientific Publishers, 2002
2. ArvindKumar; Industrial Pollution & Management; Aph Publishing Corporation, 2004.
3. S C Bhatia, Managing Industrial Pollution, Laxmi Publications, 2003.
4. B.K. Sharma, Industrial Chemistry, GOEL Publishing House, 2000
5. B.K. Sharma, Instrumental methods of chemical analysis, Goel publishing House, 2000
6. Skoog, Holler and Nieman: Principles of Instrumental Analysis, Harcourt Acta, 2001.

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Model Question Paper of B.Sc. Chemistry Programme
2022 Admissions onwards

Elective Course : CH 1661.2 : Industrial Pollution and Environmental Management

Time: 3 Hrs

Total marks: 80

SECTION A

Answer all the questions. Each question carries 1 mark

1. What is material cycle?
2. Which zone separate Troposphere from stratosphere?
3. Write the full form of ATD-GC.
4. Who notifies eco sensitive zones in India?
5. The uppermost layer of the atmosphere is called-----
- 6 What is fire point?
7. Define combustion.
8. Give an example of a hazardous waste.
9. What is biosphere?
10. Write one application of GC-MS.

(10 x 1 = 10 marks)

SECTION B

Each question carries 2 marks (Short answer). Answer any 8 questions

11. What is the difference of outdoor and indoor air pollution?
12. What are the features of eco sensitive zones?
13. What are the types of industrial safety?
14. Explain the term bioremediation.
15. What is called energy flow?
16. Why do we need to conserve biodiversity ?
17. How do plastic wastes affect our environment?
18. How do you dispose of battery waste?
19. What are the different components of ecosystem?
20. What is online TOC analyzer?
21. Write the different steps in Oxygen cycle?

22. What is Ambient Air Quality Monitoring System.

(8×2 = 16 Marks)

SECTION C

Each question carry 4 marks (Short essay) Answer any 6 questions

23. What are the composition and the structure of the atmosphere?

24. What are objectives of “The Environment Protection Act”

25. What is the difference between food chains and food webs?.

26. Briefly discuss Online Monitoring of Industrial Emission & Effluents

27. Write are the different water quality standards?

28. Explain 4R principle in waste management.

29. What is environmental monitoring and impact assessment?

30. Write any two applications of XRF

31. Differentiate between flash point and ignition temperature.

(6 x 4 = 24 marks)

SECTION D

Answer any two questions. Each question carries 15 marks

32. a) What are the salient features of water Prevention and Control Act 1974?

b) Write notes on Central Pollution control board

33. Write notes on (a) Occupational health and safety (b) Sustainable development

(c) Environmental Audit

34. a) Write the 12 principles of Green chemistry

b) Write notes on the working of different types of fire extinguishers

35. Write the principle and any four applications of (a) AAS (b) HPLC

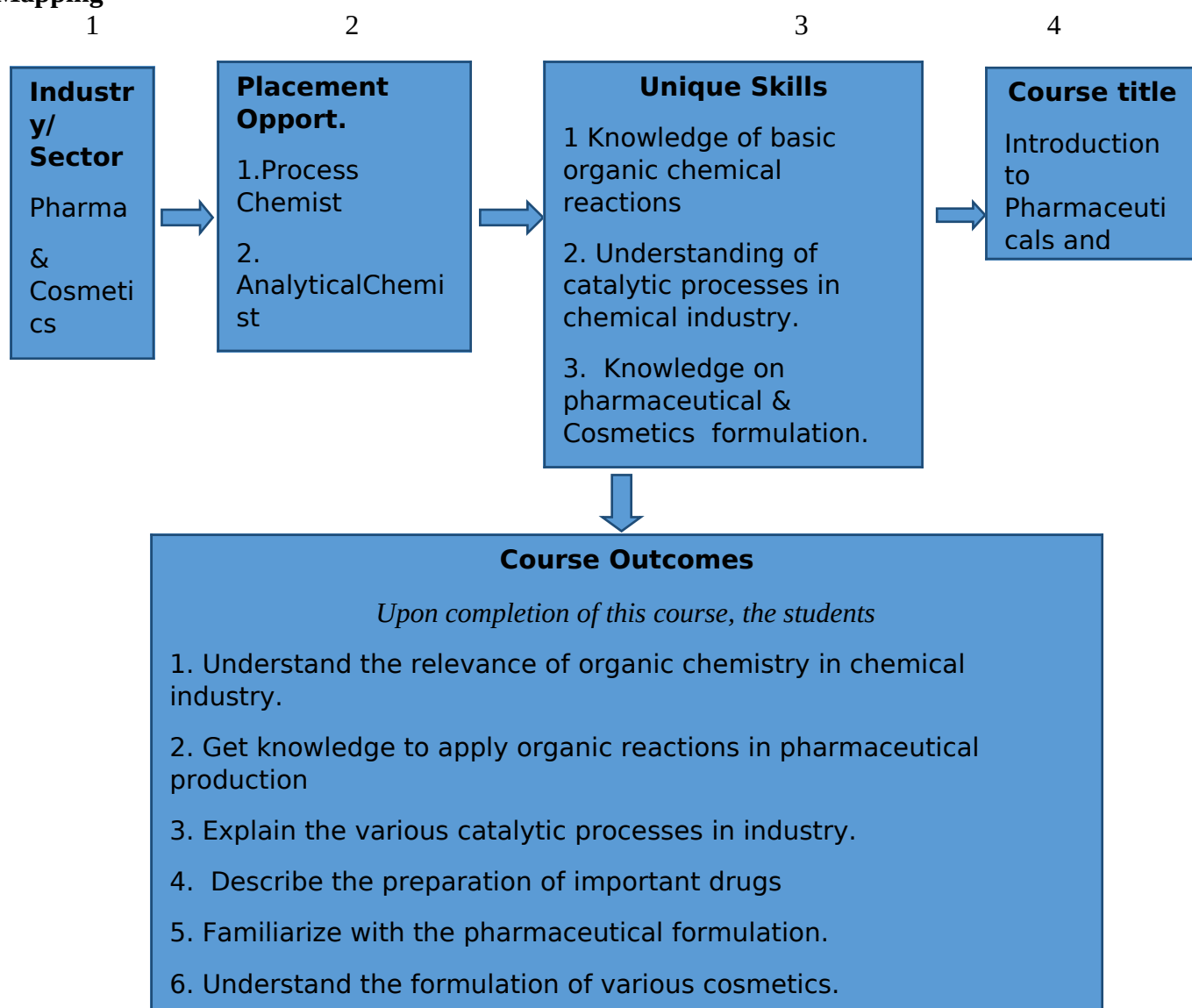
(2x15=30marks)

Semester	V1
Course	Industry Based Elective Course
Course name	Introduction to Pharmaceuticals & Cosmetics
Course Code	CH1661.3
Credit	2
Hours	54 hours
Lecture-Tutorial-Lab	3-0-0

Course Title: Introduction to Pharmaceuticals & Cosmetics

Course Code : CH 1661.3

Mapping



MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	Processes in Organic Chemical Industry	9	
1.1	Nitration-Nitrating agents -fuming HNO ₃ , mixed acid nitric acid in organic solvents, acyl nitrates in organic solvents	3	2

1.2	Halogenation - Free radical halogenation- Addition of halogens to alkenes and alkynes-Halogenation of aromatic compounds- Kinetics of halogenation	2	2
1.3	Oxidation using H ₂ O ₂ , sodium hypochlorite, Lead tetraacetate, Cerium Ammonium Nitrate.	2	2
1.4	Esterification by organic acids - esterification of carboxylic acid derivatives – hydrolysis - kinetics and mechanism.	2	2
2	Catalytic processes in chemical industry	9	
2.1	Industrially important catalysts and processes: Raney Nickel, Palladium, Platinum, Chromium, Vanadium	4	3
2.2	Hydrogen transfer reactions, Metal hydrides	2	3
2.3	Case study on industrial reduction process - Phase Transfer Catalysis, Introduction to green catalysis.	3	3
3	Raw materials and process of manufacture of bulk drugs	9	
3.1	Sulpha drugs (sulphaguanidine, sulphamethoxazole)	2	4
3.2	Analgesic-anti-inflammatory (salicylic acid and its derivatives, ibuprofen)	2	4
3.3	Antihistamines (chloropheneramine maleate), Antibiotics– history of their origin and examples	3	4
3.4	Synthesis of Chloramphenicol, Cardiovascular drug- Sorbitrate, Beta blockers-Propranolol, Barbiturates- phenobarbitol.	4	4
4	Pharmaceutical Formulations	9	
4.1	Introduction to various type of formulations and routes of administration. Aseptic conditions, need for sterilization, various methods of sterilization.	3	5
4.2	Various methods of pharmaceutical excipients- their chemistry, process of manufacture and quality, specifications, glidants, lubricants, diluents, preservatives, antioxidants, emulsifying agents, coating agents, binders,	4	5
4.3	Colouring agents, flavouring agents and other additives, sorbitol, mannitol, viscosity builders.	2	5
5	Introduction to Cosmetics	9	
5.1	Classification of cosmetic and cosmeceutical products- Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives.	3	6
5.2	Principles of formulation and building blocks of Soap, Face wash, Moisturizing cream, Shampoo, Toothpaste, Mouthwash, Hair oils, face powder.	3	6
5.3	Role of herbs in cosmetics: Aloe, turmeric, henna, amla, neem, clove.	1	6
5.3	Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics.	2	6
6	Fundamentals of Intellectual Property Rights	9	
6.1	Introduction and the need for intellectual property right (IPR)	2	7
6.2	Nature of Intellectual Property: Patents, Designs, Trade and Copyright.	3	7
6.3	Process of Patenting and Development: technological research, innovation, patenting, development.	4	7

References:

1. Unit processes in organic synthesis, P H Groggins, McGraw Hill Education; 5th Ed (28 May 2001)
2. Industrial Chemistry, B.K.Sharma, Krishan Prakashan; 17/e edition (1 January 2014)
3. Clayden, J., Greeves, N and Warren, S. "Organic Chemistry", OUP, 2001.
4. P.P.Sharma, Cosmetics - Formulation, Manufacture and Quality control, 5th Edition, 2014
5. Poucher's Perfumes Cosmetics and Soaps, 10th Edition, 2000
6. Janodia, M. D. "Basic Concepts of Intellectual Property Rights" Manipal University Press, 2015.
7. B M Mithal, A Textbook of Pharmaceutical Formulation, Vallabh Prakashan, 1997
8. Sarfaraz K. Niazi, Handbook of Pharmaceutical Manufacturing Formulations: Sterile Products, CRC Press; 1st edition,2004.

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Model Question Paper of B.Sc. Chemistry Programme
2022 Admissions onwards

Elective Course : CH 1661.3 : Introduction to Pharmaceuticals & Cosmetics

Time: 3 hours

Maximum marks: 80

Section A

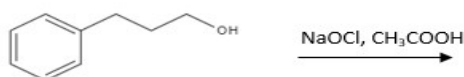
Answer all questions (Each answer carries 1 mark)

- 1 ----- is the active species involved in aromatic nitration
- 2 Name any two metal hydrides used in organic reduction process.
- 3 Write the use of cerium ammonium nitrate?
- 4 Write the structure of sulphamethoxazole.
- 5 What are beta blockers?
- 6 Give an example for flavoring agent.
- 7 Give the importance of surfactants in cosmetics
- 8 What are the main components in face powder?
- 9 What are cosmeceuticals?
- 10 What is innovation? (10X 1 = 10marks)

Section B

(Answer any 8 questions, Each answer carries 2 mark)

- 11 Toluene is more reactive towards electrophilic nitration than benzene. Why?
- 12 Enumerate the use of lead tetra acetate in organic synthesis.
- 13 Discuss the role of Chromium in industrial catalysis.
- 14 What is green catalysis?
- 15 Distinguish between sterility testing and pyrogenic testing.
- 16 What are the different methods of sterilization?
- 17 What is antihistamine? Give two examples
- 18 Predict the product of the reaction:



- 19 Give an example for the use of Raney Ni
- 20 What are pharmaceutical excipients? Give examples
- 21 Draw the structures of sorbitol and mannitol
- 22 What are the major active components of clove and turmeric? (8 X 2 = 16marks)

Section C

Answer any 6 questions. Each question carries 4marks.

- 23 Discuss the mechanism for chlorination of methane.
- 24 Describe the process of phase transfer catalysis
- 25 Discuss the synthesis of phenobarbitol
- 26 Differentiate the terms: lubricants and glidants
- 27 Explain the various rheology modifiers in cosmetics.
- 28 Comment on the statement: 'Mouthwash is classified both as a cosmetic and therapeutic product'.
- 29 With suitable examples, discuss the use of H₂O₂ as an oxidizing agent
- 30 Discuss the applications of Cerium ammonium nitrate in oxidation reactions
- 31 What are the various types of cosmetic excipients? Give suitable examples.

(6 X 4 = 24 marks)

Section D

Answer any 2 questions. Each question carries 15 marks.

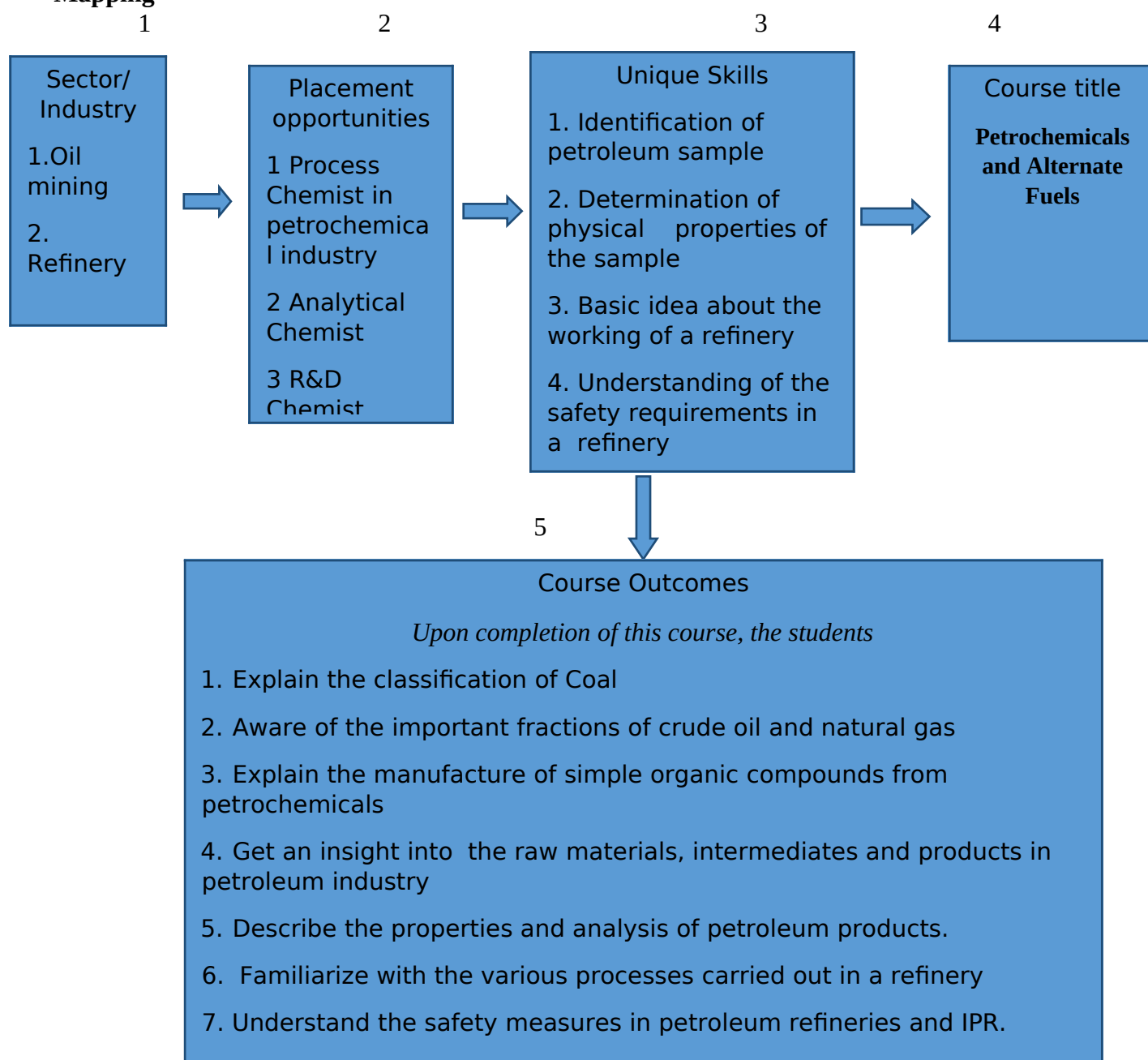
- 32 a. With the help of suitable examples, explain the use of mixed acid method of nitration. (5 marks)
- b. What is halogenation? Write the mechanism of aromatic halogenation. (4 marks)
- c. What is ester hydrolysis? Explain the mechanism of ester hydrolysis using acid (6marks)
- 33 a. What is antibiotic? Briefly explain the synthesis of chloramphenicol with necessary equations. (5marks)
- b. What are sulpha drugs? Write its uses. How sulphamethoxazole is prepared (5marks)
- c. Write notes on flavouring agents and coloring agents in pharmaceutical formulations. (5 marks)
- 34 a. Discuss the cosmetic formulation of (i) Soap (ii) Shampoo (iii) Moisturizing creams (9 marks)
- b. Discuss the role of herbs in cosmetics (6 marks)
- 35 Discuss the four major types of IPR in detail. What are the major steps involved in obtaining a patent? **(2 X 15 = 30 marks)**

Semester	V1
Course	Industry Based Elective Course
Course name	Petrochemicals and Alternative Fuels
Course Code	CH1661.4
Credit	2
Hours	54 hours
Lecture-Tutorial-Lab	3-0-0

Course Title: Petrochemicals and Alternative Fuels

Course Code : CH 1661.4

Mapping



MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	Crude oil and Natural Gas	9	

1.1	Coal: classification based on carbon content- Carbonisation of coal	3	1
1.2	Introduction to crude oil, exploratory methods - constitution and distillation, composition and uses of important fractions	3	2
1.3	Gasoline- Diesel -Natural Gas-CNG, LNG, LPG	3	2
2	Petrochemicals C1, C2, C3 C4 and aromatics	9	
2.1	List of Chemicals from C1 – Manufacture of Methanol and formaldehyde (reaction only)	2	3,4
2.2	List of Chemicals from C2 – manufacture of ethanol (reaction only)	1	3,4
2.3	List of Chemicals from C3 and C4 – manufacture of acetaldehyde (reaction only) – oxo process for conversion of olefins and synthesis gas to aldehydes and alcohols	4	3,4
2.4	List of chemicals from aromatics- Production and separation of benzene, toluene and xylene.	2	3,4
3	Properties and Analysis of Petroleum products	9	
3.1	Properties of petroleum products - Octane number, cetane number, flash point, fire point, aniline point, pour point, cloud point, drop point, calorific value, carbon residue	3	5
3.2	Measurement of properties of - Gasoline , ASTM distillation set up, specific gravity- Kerosene, flash and fire point, smoke point, aniline point.	3	5
3.3	Diesel , cloud and pour point, aniline point, flash point, viscosity – wax, drop point.	3	5
4	Petroleum Refining processes	9	
4.1	Cracking –Thermal Cracking	3	6
4.2	Catalytic Cracking -Reforming	3	6
4.3	Hydrogenation-Alkylation- Esterification and hydration- waste water treatment in refineries	3	6
5	Safety in Petroleum Refineries and IPR	9	
5.1	Hazards in refinery units	1	7
5.2	Safety Programs and Regulations	2	7
5.3	Accidents and Loss prevention measures	2	7
5.4	Fire and Explosions-Hazard Analysis- Safe operation systems.	2	7
5.5	Basic Concepts in IPR- Patent, Copyright, Trademark, Geographical Index	2	7
6	Alternative Fuel Sources	9	
6.1	Usage and depletion of petroleum products	2	8
6.2	Need for alternative fuel and Green Chemistry approaches for sustainable development: Renewable fuels	3	8
6.3	Biofuel – ethanol, Biodiesel	4	8

References

1. Mohamed A. Fahim, Taher A. Al-Sahhaf, Amal Elkilani , Fundamentals of Petroleum Refining, Elsevier 1st Edition, 2009.
2. B K Sharma, H. Gaur, Industrial chemistry, Goel Publishing House, New Delhi, 2002
3. B. K. Bhaskararao, A text on Petrochemicals, Khanna Publishers, New Delhi, 2004.
4. Neeraj Pandey, Khushdeep Dharni, Intellectual Property Rights, PHI Learning Pvt Limited, Delhi, 1st Edition, 2014
5. For Petrochemicals overview: <https://nptel.ac.in/content/storage2/courses/103103029/pdf/mod3.pdf>
6. Vogel's text book of quantitative analysis
7. Ramadhas, A S, Alternative Fuels for Transportation, CRC Press, 2012.
8. Tetsuo Soga, Nanostructured Materials for Solar Energy Conversion, Elsevier, 1st edition, 2006.
9. Amit Sarin, Biodiesel-Production and Properties, RSC Publishing, 2012.
10. Anju Dhahiya, Bioenergy: Biomass to Biofuels, Academic Press, 1st Edition, 2014.
11. E.M. Goodger, Alternative Fuels-Chemical Energy Resources, McMillan Press Ltd., 1980.

University of Kerala
B.Sc Chemistry Programme
Model Question Paper
Semester VI
Elective Course **CH1661.4: Petrochemicals and Alternative Fuels**
2022 admission onwards

Time: 3 hours

Maximum marks: 80

Section A.

Answer all questions (Each question carries 1 mark)

1. What are the major components of crude oil?
2. What are cool fuels?
3. Define Cracking.
4. What is CNG?
5. Name the various types of Coal
6. Give the test that indicates the aromatic content of an oil.
7. What is the main constituent of natural gas?
8. Define Patent.
9. Give an example of a trademark
10. What are renewable fuels?

(10 X 1 = 10marks)

Section B.

Answer any 8 questions (Each question carries 2 marks)

11. What are photovoltaic cells? What are their advantages?
12. Explain Octane and Cetane number
13. What are the petrochemicals obtained from methane
14. What is syn gas?
15. Explain the preparation of biodiesel.
16. What are biofuels?
17. Define flash point and fire point
18. What are the catalytic processes involved in petroleum refining?
19. What are asphaltanes?
20. What is API Gravity?
21. Compare isomerisation and reforming
22. What do you mean by IPR ? (8 X 2 =16marks)

Section C.

Answer any 6 questions (Each question carries 4 marks)

23. Differentiate between ASTM distillation and TBP distillation
24. Explain Oxo Process.
25. List the petrochemicals obtained from C1 fraction
26. Explain the manufacture of acetaldehyde from acetylene.
27. Discuss on the safety measures in refinery
28. Explain the various parameters that determine the quality of gasoline and their measurement.
29. Give a short note on the waste-water treatment in refineries
30. Explain the need for alternative fuels/
31. How are the nano-structures solar cells superior to conventional solar cells?

(6 X 4 = 24 marks)

Section C.

Answer any 2 questions (Each question carries 15 marks)

32. What is coal? How is it classified ? Explain carbonisation of coal.
33. Explain the various fragments obtained from the distillation of crude oil ? Explain the uses of each fraction,
34. Discuss the various parameters by which the quality of crude oil can be assessed.
35. Write short notes on the following
 - i) Solar energy harvesting
 - ii) Alkylation
 - iii) Hazards in refinery units

(2 X 15 = 30 marks)