UNIVERSITY OF KERALA

First Degree Programme in Chemistry

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

CHEMISTRY COMPLEMENTAEY COURSES

SCHEME AND SYLLABI

2010 ADMISSION ONWARDS

Complementary Chemistry offered to Physics Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

B Sc Chemistry Complementary

Complementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .1		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .1		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .1		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .1 CH1432 .1		3×18 =54 2×18 = 36

GENERAL ASPECTS OF EVALUATION

MODE OF EVALUATION - COMMON TO CORE , ELECTIVE, COMPLEMENTARY AND FOUNDATION COURSES

Evaluation of each course shall involve Continuous Evaluation (CE) with a weightage of 25 % and End Semester evaluation (ESE) with a weightage of 75 % . A system of performance based direct grading will be used with Grades A-E and the Grade Points as shown below.

Performance	Grade	Grade Point	Grade Range
Excellent	A	4	3.50-4.00
Very Good	B	3	2.50-3.49
Good	C	2	1.50-2.49
Average	D	1	0.50-1.49
Below Average	E	0	0.00-0.49

I. 1. CONTINUOUS EVALUATION FOR LECTURE COURSES

The Continuous evaluation will have 25% percentage weightage and will be done continuously during the semester. CE components are

(i) Attendance for lecture and laboratory sessions (to be noted separately where both lecture and laboratory hours have been specified within a course);

(ii) assignment /seminar and

(iii) test

Grades A-E will be awarded for each component. There will be two class tests for which, the average of the two grades obtained will form part of CE. Seminar for each course to be organized by the course teacher and assessed along with a group of teachers in the Dept. The topic selection by the student for assignments/seminar will be with the approval of the course teacher. Total weightage is 4.

Components of CE For Lecture Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Assignment / Seminar	1	A-E
3	Test paper	2	A-E

I. 1. 1. EVALUATION OF THE ASSIGNMENTS AND SEMINAR

The assignment typed/written on A4 size paper should be 4-6 pages. The minimum duration of the seminar is fifteen minutes and the mode of delivery may use audio-visual aids if available. Both the assignment and the seminar will first be evaluated by awarding

grades A-E based for each of the four components below. The seminar is to be conducted within the contact hour allotted for the course.

Mode of Assignments / Seminar Evaluation		
No	*Main Component*	*Grades*
1	Adherence to overall structure & submission deadline	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Content & grasp of the topic	
3	Lucidity / Clarity of presentation	
4	References / Interaction/Overall effort	

The following guidelines are suggested as tentatively for the evaluation of each of the above main components. Thus, if all sub-components are present/satisfactory, then Grade A may be assigned to the main component.

Guidelines for Assignments / Seminar Evaluation		
No	*Main Component*	*Sub-Components*
1	Adherence to overall structure & submission deadline	i. Punctual submission ii. Adequate length/duration iii. Inclusion of Introduction, Discussion & Summary sections iv. Absence of errors/mistakes
2	Content & grasp of the topic	i. Coverage of topic ii. Understanding of topic iii. Logical organization iv. Originality (No copying from a source or plagiarism)
3	Lucidity / Clarity	i. Clarity ii. Effective presentation/delivery iii. Neatness of presentation iv. Inclusion of appropriate diagrams /equations /structures etc
4	References / Interaction/Overall effort	i. Listing of references ii. Use of more than one reference source/Use of Web resource iii. Correct Response to quiz /questions iv. Overall effort in preparing assignment/seminar

I. 1. 2. DETAILS OF THE CLASS TEST

1. The test has a duration of 1 hour.
2. Each question paper has four parts: A, B, C and D
3. Part A contains two questions. Each question contains four sub questions. Each question has a weight = 1. The questions may be in the forms - multiple choices, match the following, name the following or fill in the blanks or any one word- answer question (Objective).
4. Part B contains four questions. Out of these, the students have to answer two questions. Each answer should contain four points. Each question has a weight = 1(Short Answer).
5. Part C contains two questions of which the candidate has to answer one. Each question has a weight = 2. The answer must contain 8 points (Short Essay).
6. Part D contains two questions of which the candidate has to answer one. Each question has a weight = 4. Each answer must contain 16 points (Long Essay).
7. Total weightage for the entire questions to be answered is 10.

Question Paper Pattern for Test		
Question No	*Type of Question*	*Weightage*
Part A: I. 1-4; II. 4-8	2; Objective	1
Part B: 9-12	2 out of 4; Short Answer	1
Part C: 13,14	1 out of 2; Short Essay	2
Part D: 15,16	1 out of 2; Long Essay	4 Total = 10

I. 2. CONTINUOUS EVALUATION FOR LABORATORY COURSES

The Continuous evaluation will have 25% percentage weightage. For 5th semester, only CE evaluation will be done; the corresponding ESE will be in 6th semesters. Grades A-E will be awarded for each component. There will be two quizzes / tests for which, the average of the two grades obtained will form part of CE. The CE components are: (i) Attendance for laboratory sessions (ii) Experiment (Lab) Report on completion of each

set of experiments (iii) Laboratory Skill and (iv) Quiz / Test. These are summarized below. Total Weightage is 4.

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

The guidelines for evaluating the two main components 2-4 using sub-component are presented below.

I. 2. 1. EVALUATION OF THE EXPERIMENT (LAB) REPORT

On completion of each experiment, a report should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, tables of data collected, equations, calculations, graphs,other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

Mode of EXPERIMENT (LAB) Report Evaluation		
No	*Main Component*	*Grades*
1	Punctual submission and Neat presentation	All four sub-components: A Only three : B Only two : C Only one : D None : E
2	Inclusion of aim, materials, procedure etc.	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

I. 2. 2. EVALUATION OF THE LAB SKILL

Mode of Lab Skill Evaluation		
No	*Main Component*	*Grades*
1	Punctuality and experiment completion on time	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Lab skill & Neat arrangements of table and apparatus in lab	
3	Prompt and neat recording of observations in lab note book.	
4	Experimental Skill and attention to safety	

I. 2. 3. EVALUATION OF THE LAB QUIZ / TEST

The test for a lab course may be in the form of a quiz and two such tests are to be conducted. Based on the performance in answering the quiz, grades A-E may be awarded and the average grade earned in these two will be counted for CE. Two teachers, one of which is the course teacher, should conduct the quiz/test within the assigned lab contact hours.

II. 1. END SEMESTER EVALUATION FOR LECTURE COURSES

The end semester evaluation will be done by the University at the end of the semester and it will have a 75% percentage weightage. End of semester University theory examination will be of 3-hr duration. Grades A-E will be awarded as per Regulations and the general aspects of evaluation.

II. 1. 1. END SEMESTER QUESTION PAPER PATTERN

1. The theory examination has a duration of 3 hours
2. Each question paper has four parts: A, B , C and D
3. Part A contains four questions . Each question contains four sub questions. Each question has a weight = 1. The questions may be in the forms - multiple choices, match the following, name the following or fill in the blanks or any one word- answer question (Objective type).

4. Part B contains twelve questions. Out of these twelve questions, the students have to answer eight questions. Each answer should contain four points. Each question has a weight = 1 (Short Answer type).
5. Part C contains eight questions of which the candidate has to answer five. Each question has a weight = 2. The answer must contain 8 points (Short Essay type).
6. Part D contains three questions of which the candidate has to answer two. Each question has a weight = 4. Each answer must contain 16 points (Long Essay type).
7. The total weightage for the entire questions to be answered is 30.

SYLLABUS OF COMPLEMENTARY COURSE

(For students of Physics Majors)

I B.Sc Complementary CHEMISTRY

PRINCIPLES OF CHEMISTRY I

SEMESTER I Complementary Course N o. – 1 Course Code- CH1131 .1 Credit-2

TotalHour 36 L–T-P2-0-2

Module – 1: Atomic Structure

Atomic spectrum of Hydrogen – different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (no derivation mention only) concept of orbitals, the four quantum numbers and their significances. Orbital wise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, stability of filled and half filled orbitals 9 Hrs

Module II - Chemical bonding – Energetic of bond formation – Types of Chemical bonds – Energetics of ionic bond formation – Lattice energy – Born Haber Cycle – partial covalent nature of ionic bond – Fajan's rules , polarity of covalent bond its relation with electronegativity – electro negativity scales – Paulings and Mullikan's approaches, factors influencing polarity , dipole moment – its relation to geometry. Hydrogen bond – inter and intra molecular – its consequences on boiling point –volatility and solubility. Hybridisation and structure of molecules – SP, $SP^{2,}$ SP^3, dSP^2, dSP^3, SP^3d^2, and SP^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia VSEPR theory, geometry of molecules with bond pairs of electrons only, geometry of molecules containing bond pairs and lone pairs of electrons, limitations. A brief review of molecular orbital approach, LCAO method – bond order, bond distance and stability of O_2,O_2^{2+},O_2^{2-},NO,NO+,COandHF. 9hrs

Module III – Thermodynamics

First law of thermodynamics, mathematical form, intrinsic energy, enthalpy, reversible, process and maximum work, work of expansion of an ideal gas in reversible isothermal process. Heat capacity of gases at constant volume and constant pressure, derivation of $C_P - C_V = R$. Second law of thermodynamics, entropy and free energies,

significance of $\Delta G, \Delta H$ and available work – criteria of equilibrium, and spontaneity , on the basis of entropy and free energy. 9 Hrs

Module IV Thermochemistry Enthalpies of formation, combustion, neutralization, solution and hydration. Relation between heat of reaction at constant volume and constant pressure, variation of heat of reaction with temperature. Kirchoff's equation, Hess's law and application – bond dissociation energies and bond energies of different types of bonds, their calculation and enthalpies of reaction. 9 hrs

References

1. Atomic structure and chemical bonding with introduction to Molecular spectroscopy – Manas Chanda.
2. Concise Inorgantic Chemistry – J.D. Lee
3. Elements of Nuclear Chemistry – Arnikar
4. Environmental Chemistry – A.K. De
5. Principles of Physical Chemistry Puri, Sharma, Pathania.
6. Physical Chemistry - N. M. Kapoor.

Model Question . B.Sc complementary Chemistry - offered to physics majors Course Code - CH1131 .1 Semester I Course - I
Principles of Chemistry I
Time : Three Hours Total Weightage : 30
Section A, weightage 1 each (answer in one word \ sentence)
Answer all questions.

I. 1. The angular momentum of the electron according to the Bohr model is an integral multiple of ……
2. A subshell with n=6 and l=3 is designated as …….
3. For a reversible adiabatic process….is equal to zero
4. At constant temperature if $\Delta H = T\Delta S$,the process is said to be……

II. 5. A process in which temperature is kept constant is called……..
6. For a spontaneous process the change in Gibbs Free energy is…..
7. The state of hybridization of Boron in BCl3 is…….
8. The N-O bondorder in NO3- ion is…….

III. 9. For elementary substances in their standard state, enthalpy is equal to ……..
10. Thermochemical equations represent……..changes accompanying chemical reactions.
11. Deexcitation of electron from outer shell to the second shell produces _____ series of lines.
12. Give the relationship between heat of reaction at constant volume and at constant pressure.

IV. 13. The power of an atom to attract the shared pair of electron in covalent bond is called……..

14. The number of antibonding electrons in nitrogen molecule is…….

15. _____ principle deals with the distribution of electrons in various orbitals based on energy

16. Write Kirchoff's equation. **1×4 = 4**

Section B, weightage 1 each (short answer type).

Answer any 8 questions from the following. Each answer must contain 4 points

17. State and explain Pauli's exclusion principle.
18. Name two types of hydrogen bonding with example.
19. State and explain Fajan's rule.
20. Define(1) work function (2) Gibb's free energy function.
21. State and explain Hess's law.
22. Define standard enthalpy of formation of a compound.
23. Calculate the wavelength of radiation emitted when the electron in the hydrogen atom jumps from n=4 to n=2 level
24. Define the terms Cp and Cv of an ideal gas. How are they related.?
25. Define enthalpy of neutralization.
26. Give Schrodinger wave equation and explain the terms.
27. Explainm VSEPR theory with examples of regular and irregular geometry.
28. State the second law of thermodynamics. **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Distinguish between bond dissociation energy and bond energy.
30. Distinguish between diathermic work and adiabatic work.
31. Derive Kirchoff's equation. Calculate the heat of formation of ethane from the following data
    $C_2H_6(g)+31/2O_2(g)\ldots\ldots>2CO_2(g)+3H_2O(l)\ \Delta H=-1560KJ$
    $C+O_2(g)\ldots.>.CO_2(g)\ \Delta H=-393.5KJ$
    $H_2(g)+1/2O_2(g)\ldots\ldots>H_2O(l)\ \ \Delta H=-284.5KJ$
32. Explain Hund's rule of maximum multiplicity.
33. Explain dsp2 and dsp3 hybridisation with examples.
34. Write the postulates of Bohr theory.
35. Explain reversible process and maximum work.
36. Explain electronegativity scales of Pauling and Mulliken. **2× 5 = 10**

Section D, weightage 4 each (long essay).

Answer any two questions

37. What are the postulates of M.O.T. Compare bonding molecular orbital and antibonding molecular orbital.
38. Write briefly on the four quantum numbers and their significances.
39. Derive an expression for the work done in reversible isothermal expansion of an ideal gas. Calculate the work done when 5 moles of an ideal gas is expanded isothermally and reversibly from a pressure of 10 atm to 2 atm at 270 c. **4×2 = 8**

SYLLABUS OF COMPLEMENTARY COURSE

(For students of Physics majors)

PRINCIPLES OF CHEMISTRY II

SEMESTER II Complementary Course No.- 2 Course Code-CH1231 .1Credit – 2

Total Hours - 36 L-T-P 2-0-2

Module – I: Radio Activity

Radio active equilibrium (qualitative only) detection of radio activity by Wilson's cloud chamber and Geiger Muller Scintillation counter – units of radio activity – curie and rutherford – Radio Carbon dating , Rock dating, Neutron activation analysis Applications in agriculture and medicine. A brief study of the biological effects of radiation such as pathological and genetic damage, Dosimetry – Units – rad, gray and roentgen. Fricke dosimeter and ceric sulphate dosimeter. Nuclear Chemistry – stability of Nucleus – n/p ratio, artificial transmutation and radio activity, mass defect, binding energy, atomic fission and fusion. 9 Hrs

Module II Spectroscopy

Regions of electromagnetic spectrum – different units to represent energy such as erg, joule, calorie, cm^{-1}, Hz and eV, their interconversions – interaction of radiation with matter, different types of energy levels of molecules – rotation, vibration and electronic levels. Rotation spectroscopy Microwave spectrum of diatomic molecules – expressions for rotational energy, selection rule – frequency separation and determination of bond length – vibrational spectrum – harmonic oscillator, equation for frequency of vibration, expression for vibrational energy, selection rule, frequency separation, calculations of force constant, Electronic spectroscopy –types of transition and regions where they absorb.

Raman spectroscopy – stokes and anti stokes lines, quantum theory of Raman spectrum – advantages and disadvantages of Raman spectrum, rotational Raman spectrum, selection rules and frequency separation. Vibrational Raman spectrum – Complementary with IR spectrum, mutual exclusion principle, NMR spectroscopy, principle of NMR spectroscopy, nuclear spin, interaction with external magnet, energy spacing, transition between nuclear energy levels in hydrogen nucleus, low resolution

spectrum, chemical shift, spin – spin coupling – fine structure spectrum, application to simple molecule 9 Hrs

Module III Electro Chemistry

Transport number – definition, determination by Hittorfs method and moving boundary method, application of conductance measurements. Conductometric titrations involving strong acid – strong base, strong acid – weak base, weak acid – strong base and weak acid – weak base.

EMF – Galvanic cells, measurement of emf, cell and electrode potential, IUPAC sign convention, Reference electrodes, SHE and calomel electrode, standard electrode potential, Nernst equation, anion and cation reversible electrodes, redox electrode with examples, quinhydrone electrode, glass electrode concentration cell without transference, potentiometric titration, over voltage and passivity, corrosion of metals – prevention of corrosion, Fuel cells – H_2 – O_2 and hydrocarbon – O_2 type. 9 Hrs

Module IV Analytical Method

Analytical method in Chemistry – principles of volumetric analysis, primary standard, standard solution, normality and molarity, theory of acid - base titration, permanganometric and dichrometric titration, theory of acid – base and redox indicators.

Evaluation of analytical data – accuracy and precision, classification of errors. Detection and correction of determinate errors, standard deviation, variance and co-efficient of variation. 9 Hrs

References

1. Atomic structure and chemical bonding with introduction to Molecular spectroscopy – Manas Chanda.
2. Concise Inorgantic Chemistry – J.D. Lee
3. Elements of Nuclear Chemistry – Arnikar
4. Environmental Chemistry – A.K. De
5. Principles of Physical Chemistry Puri, Sharma, Pathania.
6. Physical Chemistry - N. M. Kapoor.

Model Question complementary Course - II to Physics majors

Semester II Course CodeCH1231 .1

Principles of Chemistry II

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)

Answer all questions .

I. 1. The energy needed for separating the nucleons from the nucleus is ……
2. The reciprocal of decay constant is called ……
3. Radiation of wavelength 600 nm falls in…….region.
4. Shift towards longer wavelength region is termed…….

II. 5. ……..is known as zero point energy.
6. Which among the molecules O2,H2and Hcl is microwave active.
7. Elastic collisions cause ……..
8. Which of the following will show Raman spectrum HCl,CS2,CCl4,Br2.

III. 9. Conductance of unit volume of conductor is called……..
10. Equivalent conductance…….with dilution.
11. Ionic product of water is equal to……
12. The standard electrode potential of Zn and Ag are -0.80v and -0.76v respectively. The standard EMF of the cell is ……..

IV. 13. A saltbridge eliminates the …….
14. The tendency of an electrode to gain electrons is called its……..
15. Phenolphthalein is not suitable for titration of strong acid against…….
16. A solution of accurately known concentration is known as a……solution.

1×4 = 4

Section B, weightage 1 each (short answer type)

Answer any 8 questions from the following. Each answer must contain 4 points

17. What is meant by artificial transmutation ?
18. Define(1) Chromophore (2) Auxochrome (3) hyperchromic effect (4) Hypochromic effect.
19. What are the different types of electronic transitions?
20. What is Raman effect?
21. Explain the rule of mutual exclusion.
22. Define transport number of an ion
23. The equivalent conductance of 0.05N solution of acetic acid is106ohm-1cm2 eq-1.Calculate the degree of dissociation of acetic acid at this concentration, given that the ionic conductance of H +and CH_3COO- are 349.5 and 40 ohm-1cm2eq-1.
24. What are redox titrations?
25. Calculate the normality of 10 percent solution of NaOH
26. Whatiselectromagneticspectrum?
27. What is a primary standard?
28. What are the units of radioactivity? Explain. **1×8 = 8**

Section C, weightage 2 each . (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Sketch and explain the low resolution and high resolution spectra of ethanol
30. How will you determine the transport number by moving boundary method?
31. Write a note on Rotational Raman spectrum.
32. How are errors classified ?
33. Write briefly on over voltage.
34. Explain carbon dating.
35. In weak base- strong acid titration methyl orange is used while in strong base-weak acid titration phenolphthalein is used . Why ?
36. Explain mass defect and binding energy. **2×5 = 10**

Section D, weightage 4 each (long essay)

Answer any two questions .

37. Briefly explain the working of H2-O2 and hydrocarbon –O2 fuel cell.
38. Write a note on conductometric titrations.
39. Write notes on (1) Neutron activation analysis.(2)Fricke Dosimeter. **4×2 = 8**

SYLLABUS OF COMPLEMENTARY COUSRSE

(For students of Physics Majors)

PHYSICAL AND INORGANIC CHEMISTRY I

SEMESTER III Course-3 Credit-3Course Code – CH1331 .1

L-T-P 3-0-2 54 Hrs

Module 1: Gaseous State

Maxwell's distribution of molecular velocities (No derivation) average, most probable and rms velocities, collision number and collision frequency, mean free path, deviation of gases from ideal behaviour – Boyle temperature, derivation of vander waals constants and critical constants – Law of corresponding states – reduced equation of state, Joule Thomson effect, liquefaction of gases – Linde's and claude's processes 9 Hrs

Module II – Crystalline State

Isotropy and anisotropy – symmetry elements in crystals – the seven crystal systems. Miller indices, Bravais lattices, primitive, bcc and hcc lattices of cubic crystals. Bragg equation, diffraction of Xrays by crystals – single crystal and powder method. Detailed study of structures of NaCI and KCI crystals. Liquid crystals – mesomorphic state, types of liquid crystals applications and examples. .9 Hrs

Module III –Chemical Equilibrium

Reversible reactions – K_P, K_C, and K_X and their inter relationships – Free energy change and chemical equilibrium – Van't Hoff reaction, isotherm and isochore - influence of pressure and temperature on the following reactions.

(i) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (ii) $PCl5 \rightleftharpoons PCl_3 + Cl_2$ (iii) $2SO2 + O_2 \rightleftharpoons 2\ SO_3$

Le Chatelier's principle and the discussion of the above reactions on its basis. 9 Hrs

Module IV – Ionic Equilibrium

Concepts of Acids and Bases, ionization of weak electrolytes. pH and its determination of potentiometric method. Buffer solutions and calculations of their pH. Henderson equation. Hydrolysis of salt – degree of hydrolysis and hydrolytic constant, derivation of relation between Kw and Kh for salts of strong acid – weak base, weak acid – strong base and weal acid – weak base. 9 Hrs

Module V - Metallurgy

General principles of occurrence and extraction of metals – purification, roasting, calcination and smelting, reduction to metal, different method with examples, refining of metals- electrolytic and zone refining. Van – Arkel method. Metallurgy of titanium, cobalt, nickel, thorium and uranium. 9 Hrs

Module VI : Chemistry of Nano Materials

Evolution of Nano science – Historical aspects – preparations containing nano gold in traditional medicine, Lycurgus cup – Faraday's divided metal etc.

Nanosystems in nature.

Preparation of Nano particles – Top – down approach and bottom – top approach, sol – gel synthesis, colloidal precipitations, Co- precipitation, combustion technique. Properties of nano particles: optical, magnetic and mechanical properties.

Tools for measuring nano structure – XRD, Atomic force Microscopy (AFM), Scanning Tunneling Microscopy (STM), and Scanning Electron Microscopy (SEM) Transmission Electron Microscopy (TEM) . Applications of nano materials in electronics, robotics, computers, sensors, mobile electronic devices, Vehiles Medical applications (use Au, Ag, ZnO and ZnO_2 as examples. 9 hrs

References

1. Concise Inorganic Chemistry – J. D. Lee.
2. Physical Chemistry – Rakshit.
3. Principles of Physical Chemistry – Puri, Sharma, Pathania.
4. Nano – 'The Essentials'. T. Pradeep Mc. Graw Hill
5. Modern Inorganic Chemistry – R.D. Madan.
6. Co – ordination chemistry – Basolo and Johnson.

7. Physical Chemistry – N. M. Kapoor.

MODEL QUESTIONS Third Semester Complementary Chemistry for Physics Majors
Course - III Course Code CH1331 .1
Physical and Inorganic Chemistry I
Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)
Answer all questions

I. 1. The gas which obeys all gas laws under all conditions of temperature and pressure is_____.
2. Mathematical expression of Joule Thomson Coefficient is _____
3. _____ is a process for the liquefaction of gases.
4. van der Waals gas equation is _____

II. 5. What is the coordination number of b c c lattice.
6. Name a nanosensor.
7. Name a liquid crystal.
8. What is Bragg's equation?

III. 9. The relation between kp and kc is _____
10. van't Hoff reaction isotherm is _____
11. According to _____ concept acids are proton donors.
12. The relation connecting hydrolysis constant and dissociation constant of weak acid is ----------

IV. 13. During roasting ore undergoes _____ .
14. What is the expansion of SEM ?
15. During isothermal process _____ is kept constant.
16. What is AFM. **1×4 = 4**

Section B, weightage 1 each (short answer type)
Answer any eight questions from the following. Each answer must contain 4 points.

17. Define Boyle temperature.
18. State reduced equation of state .
19. What is mesomorphic state ?
20. Define Miller indices.
21. What is free energy change ?
22. What is an isochoric process ?
23. Define pH.
24. Write Henderson equation.
25. Explain zone refining.
26. What is calcination ?
27. Explain co-precipitation.
28. What is TEM. **1× 8 = 8**

Section C, weightage 2 each (short essay)
Answer any five questions from the following . Each answer must contain 8 points.

29. What is law of corresponding state ?
30. Define the terms, collision number and collision frequency.

31. What are the applications of liquid crystals ?
32. Explain symmetry elements in crystals.
33. Explain the effect of temperature and pressure on the equilibrium N2 + 3H2↔ NH3
34. Derive Henderson equation for the hydrolysis of a salt of weak base and strong acid.
35. Explain the metallurgy of Cobalt.
36. Explain the applications of nano materials in electronics and robotics. **2×5 = 10**

Section D , weightage 4 each (long essay)

Answer any two questions

37. Explain Linde's and Claude's processes for the liquefaction of gases.
38. Explain diffraction of X-rays by crystals .
39. Explain the preparation of nano particles in detail. **4×2 = 8**

SYLLABUS OF COMPLEMENTARY COUSRSE

(For students of Physics Majors)

Physical and Inorganic Chemistry II

SEMESTER IV Course-4 Credit-3Course Code – CH1431 .1

L-T-P 3-0-2 **Total 54hrs**

Module – 1: Chemical Kinetics

Rates of reaction, various factors influencing rates of reactions – order and molecularity – Zero, first, second and third order reaction, derivation of integrated rate equation, fractional life time, units of rate constants, influence of temperature on reaction rates. Arrhenius equation, calculation of Arrhenius parameters – collision theory of reaction rates. 9 Hrs

Module II – Catalysis and Photo Chemistry

General Characteristics of catalytic reactions. Different types of catalysis – examples – theories of catalysis (Outline of intermediate compound formation theory and adsorption theory).

Photo Chemistry**:** - Laws of Photo Chemistry, Grothus – Drapter law, Beer Lambert's law, Einstein's laws, quantum yield, H_2 – Cl_2 reaction, H_2 – Br_2 reaction photo sensitization, chemiluminescence. 9 Hrs

Module III – Phase Equilibria

Phase rule - Explanation of terms, the relationship F = C – P+2, application of phase rule to one component systems. Phase diagram of water and sulphur. General discussion of simple eutectic, lead – silver systems, Pattinson's process. Construction of

phase diagram by cooling curve method, salt – water systems and freezing mixture (KI – water, $FeCl_3$ -, H_2O only). 9 hrs

Module IV – Binary Liquid systems

Completely miscible liquid pairs vapour pressure composition and temperature – composition curves of ideal and non ideal systems, azeotropes, fractional distillation. Partially miscible systems, critical solution temperature, phenol – water system. Immiscible liquid pairs, steam distillation, determination of molecular mass. Distribution law: Explanation, principle of solvent extraction. 9 hrs

Module V Coordination Chemistry

Types of ligands, Werner's coordination theory, Valence bond theory of bonding in octahedral and tetrahedral complexes, Drawbacks of valence bond theory crystal field theory of octahedral and tetrahedral complexes, examples – high and low spin complexes, magnetic properties ,application in qualitative and quantitative analysis. 9 hrs

Module VI Colloidal State

Kinetic, optical and electrical properties of colloids – ultra microscope – determination of avogandro number by Brownian movement – Electrical double layer and zeta potential. Gels – inhibition and syneresis. Miscelles, critical miscelle concentration, sedimentation and streaming potentials, Application of colloids Cottrell precipitator – purification of water, coagulation, reverse osmosis, electro dialysis. 9 Hrs

References

1. Concise Inorganic Chemistry – J. D. Lee.
2. Physical Chemistry – Rakshit.
3. Principles of Physical Chemistry – Puri, Sharma, Pathania.
4. Nano – 'The Essentials'. T. Pradeep Mc. Graw Hill
5. Modern Inorganic Chemistry – R.D. Madan.
6. Co – ordination chemistry – Basolo and Johnson.
7. Physical Chemistry – N. M. Kapoor.

MODEL QUESTION Fourth Semester CH1431 .1 Complementary Chemistry for Physics Majors

Course –IV Physical and Inorganic Chemistry II

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)

Answer all questions

I 1. Arrhenius equation is _____
2. Half life period of a first order reaction is _____
3. Unit of second order rate constant is ____
4. Name the optical property of colloids.

II. 5. Name the two types of catalysis.
6. Give an example of a low spin comlex.
7. What is the quantum yield of H2- Cl2 reaction ?
8. Write an example of chemiluminascence.

III. 9. Phase rule expression is F= _____
10. Water is a _____ component system.
11. An example of a completely miscible liquid pair is _____
12. Coordination theory was proposed by _____

IV 13. Write an example of a gel.
14. What is the common magnetic property of high spin complexes ?
15. What type of a system is lead-silver system?
16. Name one law of photochemistry. **1×4 = 4**

Section B , weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Define a zero order reaction.
18. What are the factors influencing the rate of the reactions ?
19. What is intermediate compound formation theory of catalysis.
20. Explain H2 – Br2 photochemical reaction.
21. What is Pattinson's process of desilverisation of lead ?
22. Apply phase rule expression to sulphur system.
23. What are ideal and non ideal solutions ?
24. What is the principle of solvent extraction ?
25. What is Werner's coordination theory ?
26. What are the drawbacks of Valence Bond Theory ?
27. What is Brownian movement ?
28. Define streaming potential ? **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any five questions from the following. Each answer must contain 8 points.

29. What is the collision theory of reaction rate ?
30. Derive an expression for the first order rate constant ?
31. Define quantum yield and photosensitisation .
32. Explain adsorption theory of catalysis.
33. Draw the phase diagram of FeCl3 – water system.
34. Explain critical solution temoerature and fractional distillation.
35. Demonstrate how crystal field theory is applied to octahedral complexes.

36. What are the application of colloids. **2× 5 = 10**

Section D, weightage 4 each (long essay)

Answer any two questions

37. (a) What are the general characteristics of catalysts?
    (b) Explain the influence of temperature on reaction rates.
38. (a) How will you construct the phase diagram by cooling curve method ?
    (b) Explain steam distillation .
39. (a) What are MISCELLES ?
    (b) What are inhibition and syneresis ? **4×2 =8**

SYLLABUS FOR LABORATORY COURSES FOR B.Sc COMPLEMENTARY CHEMISTRY

Course V Course CodeCH1432 .1 Credit 2 For Physics & Geology Majors

Semesters 1, 2, 3 & 4

Reactions and identification of cations : Hg^{+}, Pb^{2+}, Ag^{+}, Hg^{2+}, Bi^{3+}, Cd^{2+}, As^{3+}, Sb^{3+}, Sn^{2+}, Sn^{4+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Mn^{2+}, Zn^{2+}, Ni^{2+}, Cd^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+} and NH_4^{+}

The cations must be provided in solutions. A student must analyse at least ten mixtures containing two cations each.

Volumetric analysis

A. Acidimetry and Alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

B. Permanganometry

a. Standardisation of $KMnO_4$ by oxalic acid sodium oxalate and Mohr's salt

b. Estimation of oxalic acid / sodium oxalate

c. Estimation of Mohr's Salt.

d. Estimation of calcium.

C. Dichrometry

e. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

f. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodometry and Iodimetry

g. Standardization of sodium thiosulphate using std. potassium dichromate.

h. Estimation of copper in a solution

i. Estimation of iodine

E. **Complexometric titrations**

j. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution

k. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Gravimetric Analysis

1. Estimation of water of hydration in barium chloride crystals.
2. Estimation of barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st} ,2^{nd} , 3^{rd} and 4^{th} semesters

COURSE OFFERING AND CREDITS

Semester IV; credits: Two

COURSE OBJECTIVES

To equip the students with skill in qualitative and quantitative chemical analysis of inorganic materials.

After the course completion, the student will have the necessary training required for laboratory based wet chemical analysis.

COURSE TRANSACTION FORMAT

Lecture-Tutorial-Lab: 0-0-2 hours per week; eighteen 5-day weeks per semester.

Contact hours per semester: 36 hrs lab instruction.

MODE OF EVALUATION

Continuous Evaluation: The Continuous evaluation will have 25% percentage weightage. Grades A-E will be awarded for each component. There will be two quizzes / tests for which, the average of the two grades obtained will form part of CE. The CE components are: (i) Attendance for laboratory sessions (ii) Experiment (Lab) Report on completion of each set of experiments (iii) Laboratory Skill and (iv) Quiz / Test. These are summarized below. Total Weightage is 4.

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

Evaluation of the Experiment (Lab) report and Lab Skill: On completion of each experiment, an "experiment (lab) report" should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, tables of data collected, equations,

calculations, graphs, other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

Mode of Experiment (Lab) Report Evaluation		
No	*Main Component*	*Grades*
1	Punctual submission and Neat presentation	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Inclusion of aim, materials, procedure etc.	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

Mode of Lab Skill Evaluation		
No	*Main Component*	*Grades*
1	Punctuality and experiment completion on time	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Lab skill & Neat arrangements of table and apparatus in lab	
3	Prompt and neat recording of observations in lab note book.	
4	Experimental Skill and attention to safety	

Details of the Lab Quiz / Test: The test for a lab course may be in the form of a quiz and two such tests are to be conducted. Based on the performance in answering the quiz, grades A-E may be awarded and the average grade earned in these two will be counted for CE. Two teachers, one of which is the course teacher, should conduct the quiz/test within the assigned lab contact hours.

End Semester Evaluation: 75% percentage weightage. Total Weightage is 30. The ESE of the qualitative experiment(analysis of the mixture of two cations for the physics\geology majors and organic compound analysis for the zoology, botany, biochemistry and homescience majors) and quantitative volumetric analysis of Course CH1432 will be on the 4th semester. The Examination will be of 3- hr duration.

The main components of the ESE for the Course CH1432 will be (i) Principle and Procedure, (ii) Experiment Report & Lab Skill, (iii) Calculations & Result and (iv) Lab Course Record and each of these components should be assessed as part of the ESE of lab courses based on the sub-components as given below.

Main Components of ESE For Lab Courses			
No	*Main Components in General*	*Weightage*	*Grades*
1	Principle and Procedure	4	A-E
2	Experiment Report & Lab Skill	8	A-E
3	Calculations & Result	12	A-E
4	Lab Course Record	6	A-E

If necessary this table may be modified by the Board of Examiners

The subdivisions in the case of (i) Inorganic Qualitative Analysis and (ii) Quantitative Volumetric Analysis are given below.

Semester IV Course Code CH1432 .1 1.Inorganic Qualitative Analysis

Analysis of a mixture of two cations. For Physics\Geology majors

Examination in 4th semester with 3- hrs duration. Total weightage for ESE is 30 and for CE is 4.

Sub-Components for End Sem Evaluation of Inorganic Qualitative Analysis				
No	*Main Component*	*Weightage*	*Sub-Components*	*Grades*
1	Principle and Procedure	2	i. Principle of the experiment stated ii. Aim of the experiment stated iii. Separation Scheme stated iv. Materials & apparatus specified.	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
2	Experiment Report &Lab Skill	4	i. Preliminary experiments done ii. Preliminary reports correct iii Satisfactory skill in experimentation iv. Neatness of data and result presentation	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
3	Calculations & Result	6	i. 4 correct tests for the two ions ii. 3 tests correctly for the ions iii.2 correct tests iv.1 correct test v. 0 correct test	A B C D E
4	Lab Course Record Book	3	i. Required No: of Experiments done ii. Data and experimental details sufficient iii. Correctness of results reported iv. Neatness of presentation and absence of errors/mistakes in the Record Book	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E

If necessary this table may be modified by the Board of Examiners

2. Inorganic Quantitative Analysis(Volumetric Analysis)

Estimation of ion or salt in Volumetric Analysis .

To all complementary Courses

Sub-Components for End Sem Evaluation of Quantitative Volumetric Analysis				
No	*Main Component*	*Weightage*	*Sub-Components*	*Grades*
1	Principle and Procedure	2	i. Principle of the experiment stated & correct ii. Aim of the experiment stated & correct iii. Procedure stated & correct iv. Materials & apparatus specified	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
2	Experiment Report &Lab Skill	4	i. Standardization Calculation Correct ii. Estimation Calculation correct iii Unknown Weight Calculation correct iv. Neatness of data and result presentation	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
3	Calculations & Result	6	i. ≤1% ii. >1- ≤ 1.4 iii.> 1.4 - ≤ 1.8 iv.> 1.8 - ≤ 2.2 v. > 2.2	A B C D E
4	Lab Course Record Book	3	i. Required No: of Experiments done ii. Data and experimental details sufficient iii. Correctness of results reported iv. Neatness of presentation and absence of errors/mistakes in the Record Book	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E

If necessary this table may be modified by the Board of Examiners

CE for each half practical course(volumetric , cations, organic)

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

If necessary this table may be modified by the Board of Examiners

UNIVERSITY OF KERALA

FIRST DEGREE PROGRAMME IN CHEMISTRY

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

SCHEME AND SYLLABI

2010 ADMISSION ONWARDS

Complementary Chemistry offered to Geology Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry Complementary

Complementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .2		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .2		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .2		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .2 CH1432 .2		3×18 =54 2×18 = 36

GENERAL ASPECTS OF EVALUATION

MODE OF EVALUATION - COMMON TO CORE , ELECTIVE, COMPLEMENTARY AND FOUNDATION COURSES

Evaluation of each course shall involve Continuous Evaluation (CE) with a weightage of 25 % and End Semester evaluation (ESE) with a weightage of 75 % . A system of performance based direct grading will be used with Grades A-E and the Grade Points as shown below.

Performance	Grade	Grade Point	Grade Range
Excellent	A	4	3.50-4.00
Very Good	B	3	2.50-3.49
Good	C	2	1.50-2.49
Average	D	1	0.50-1.49
Below Average	E	0	0.00-0.49

I. 1. CONTINUOUS EVALUATION FOR LECTURE COURSES

The Continuous evaluation will have 25% percentage weightage and will be done continuously during the semester. CE components are

(i) Attendance for lecture and laboratory sessions (to be noted separately where both lecture and laboratory hours have been specified within a course);

(ii) assignment /seminar and

(iii) test

Grades A-E will be awarded for each component. There will be two class tests for which, the average of the two grades obtained will form part of CE. Seminar for each course to be organized by the course teacher and assessed along with a group of teachers in the Dept. The topic selection by the student for assignments/seminar will be with the approval of the course teacher. Total weightage is 4.

Components of CE For Lecture Courses

No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Assignment / Seminar	1	A-E
3	Test paper	2	A-E

I. 1. 1. EVALUATION OF THE ASSIGNMENTS AND SEMINAR

The assignment typed/written on A4 size paper should be 4-6 pages. The minimum duration of the seminar is fifteen minutes and the mode of delivery may use audio-visual aids if available. Both the assignment and the seminar will first be evaluated by awarding grades A-E based for each of the four components below. The seminar is to be conducted within the contact hour allotted for the course.

Mode of Assignments / Seminar Evaluation		
No	*Main Component*	*Grades*
1	Adherence to overall structure & submission deadline	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Content & grasp of the topic	
3	Lucidity / Clarity of presentation	
4	References / Interaction/Overall effort	

The following guidelines are suggested as tentatively for the evaluation of each of the above main components. Thus, if all sub-components are present/satisfactory, then Grade A may be assigned to the main component.

Guidelines for Assignments / Seminar Evaluation		
No	*Main Component*	*Sub-Components*
1	Adherence to overall structure & submission deadline	i. Punctual submission ii. Adequate length/duration iii. Inclusion of Introduction, Discussion & Summary sections iv. Absence of errors/mistakes
2	Content & grasp of the topic	i. Coverage of topic ii. Understanding of topic iii. Logical organization iv. Originality (No copying from a source or plagiarism)
3	Lucidity / Clarity	i. Clarity ii. Effective presentation/delivery iii. Neatness of presentation iv. Inclusion of appropriate diagrams /equations /structures etc
4	References / Interaction/Overall effort	i. Listing of references ii. Use of more than one reference source/Use of Web resource iii. Correct Response to quiz /questions iv. Overall effort in preparing assignment/seminar

I. 1. 2. DETAILS OF THE CLASS TEST

1. The test has a duration of 1 hour.
2. Each question paper has four parts: A, B, C and D
3. Part A contains two questions. Each question contains four sub questions. Each question has a weight = 1. The questions may be in the forms - multiple choices, match the following, name the following or fill in the blanks or any one word- answer question (Objective).
4. Part B contains four questions. Out of these, the students have to answer two questions. Each answer should contain four points. Each question has a weight = 1(Short Answer).
5. Part C contains two questions of which the candidate has to answer one. Each question has a weight = 2. The answer must contain 8 points (Short Essay).
6. Part D contains two questions of which the candidate has to answer one. Each question has a weight = 4. Each answer must contain 16 points (Long Essay).
7. Total weightage for the entire questions to be answered is 10.

Question Paper Pattern for Test		
Question No	*Type of Question*	*Weightage*
Part A: I. 1-4; II. 4-8	2; Objective	1
Part B: 9-12	2 out of 4; Short Answer	1
Part C: 13,14	1 out of 2; Short Essay	2
Part D: 15,16	1 out of 2; Long Essay	4 Total = 10

I. 2. CONTINUOUS EVALUATION FOR LABORATORY COURSES

The Continuous evaluation will have 25% percentage weightage. For 5th semester, only CE evaluation will be done; the corresponding ESE will be in 6th semesters. Grades A-E will be awarded for each component. There will be two quizzes / tests for which, the average of the two grades obtained will form part of CE. The CE components are: (i) Attendance for laboratory sessions (ii) Experiment (Lab) Report on completion of each set of experiments (iii) Laboratory Skill and (iv) Quiz / Test. These are summarized below. Total Weightage is 4.

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	2	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	2	A-E
3	Laboratory Skill	2	A-E
4	Quiz / Test	4	A-E

The guidelines for evaluating the two main components 2-4 using sub-component are presented below.

I. 2. 1. EVALUATION OF THE EXPERIMENT (LAB) REPORT

On completion of each experiment, a report should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, tables of data collected, equations, calculations, graphs,other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

Mode of EXPERIMENT (LAB) Report Evaluation		
No	*Main Component*	*Grades*
1	Punctual submission and Neat presentation	All four sub-components: A Only three : B Only two : C Only one : D None : E
2	Inclusion of aim, materials, procedure etc.	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

I. 2. 2. EVALUATION OF THE LAB SKILL

Mode of Lab Skill Evaluation		
No	*Main Component*	*Grades*
1	Punctuality and experiment completion on time	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Lab skill & Neat arrangements of table and apparatus in lab	
3	Prompt and neat recording of observations in lab note book.	
4	Experimental Skill and attention to safety	

I. 2. 3. EVALUATION OF THE LAB QUIZ / TEST

The test for a lab course may be in the form of a quiz and two such tests are to be conducted. Based on the performance in answering the quiz, grades A-E may be awarded and the average grade earned in these two will be counted for CE. Two teachers, one of which is the course teacher, should conduct the quiz/test within the assigned lab contact hours.

II. 1. END SEMESTER EVALUATION FOR LECTURE COURSES

The end semester evaluation will be done by the University at the end of the semester and it will have a 75% percentage weightage. End of semester University theory examination will be of 3-hr duration. Grades A-E will be awarded as per Regulations and the general aspects of evaluation.

II. 1. 1. END SEMESTER QUESTION PAPER PATTERN

1. The theory examination has a duration of 3 hours
2. Each question paper has four parts: A, B , C and D
3. Part A contains four questions . Each question contains four sub questions. Each question has a weight = 1. The questions may be in the forms - multiple choices, match the following, name the following or fill in the blanks or any one word- answer question (Objective type).

4. Part B contains twelve questions. Out of these twelve questions, the students have to answer eight questions. Each answer should contain four points. Each question has a weight = 1 (Short Answer type).
5. Part C contains eight questions of which the candidate has to answer five. Each question has a weight = 2. The answer must contain 8 points (Short Essay type).
6. Part D contains three questions of which the candidate has to answer two. Each question has a weight = 4. Each answer must contain 16 points (Long Essay type).
7. The total weightage for the entire questions to be answered is 30.

SYLLABUS OF COMPLEMENTARY COURSE

(For students of Geology Majors)

PRINCIPLES OF CHEMISTRY I

SEMESTER I Complementary Course N o. – 1 Course Code- CH1131 .2 Credit-2

TotalHours36L–T-P2-0-2

Module – 1: Atomic Structure

Atomic spectrum of Hydrogen – different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (no derivation mention only) concept of orbitals, the four quantum numbers and their significances. Orbital wise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, stability of filled and half filled orbitals 9 Hrs

Module II - Chemical bonding – Energetic of bond formation – Types of Chemical bonds – Energetics of ionic bond formation – Lattice energy – Born Haber Cycle – partial covalent nature of ionic bond – Fajan's rules , polarity of covalent bond its relation with electronegativity – electro negativity scales – Paulings and Mullikan's approaches, factors influencing polarity , dipole moment – its relation to geometry. Hydrogen bond – inter and intra molecular – its consequences on boiling point –volatility and solubility. Hybridisation and structure of molecules – SP, $SP^{2,}$ SP^3, dSP^2, dSP^3, SP^3d^2, and SP^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia VSEPR theory, geometry of molecules with bond pairs of electrons only, geometry of molecules containing bond pairs and lone pairs of electrons, limitations. A brief review of molecular orbital approach, LCAO method – bond order, bond distance and stability of O_2,O_2^{2+},O_2^{2-},NO,NO+,COandHF. 9hrs

Module III – Thermodynamics

First law of thermodynamics, mathematical form, intrinsic energy, enthalpy, reversible, process and maximum work, work of expansion of an ideal gas in reversible isothermal process. Heat capacity of gases at constant volume and constant pressure, derivation of $C_P - C_V = R$. Second law of thermodynamics, entropy and free energies, significance of $\Delta G, \Delta H$ and available work – criteria of equilibrium, and spontaneity , on the basis of entropy and free energy. 9 Hrs

Module IV Thermochemistry Enthalpies of formation, combustion, neutralization, solution and hydration. Relation between heat of reaction at constant volume and constant pressure, variation of heat of reaction with temperature. Kirchoff's equation, Hess's law and application – bond dissociation energies and bond energies of different types of bonds, their calculation and enthalpies of reaction. 9 hrs

References

1.Atomic structure and chemical bonding with introduction to Molecular spectroscopy – Manas Chanda.

2.Concise Inorgantic Chemistry – J.D. Lee

3.Elements of Nuclear Chemistry – Arnikar

4.Environmental Chemistry – A.K. De

5.Principles of Physical Chemistry Puri, Sharma, Pathania.

6.Physical Chemistry - N. M. Kapoor.

Model Question . complementary Chemistry - offered to Geology majors Course Code - CH1131 .2 Semester I Course – I

Principles of Chemistry I

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)

Answer all questions.

I. 1. The angular momentum of the electron according to the Bohr model is an integral multiple of ……

2. A subshell with n=6 and l=3 is designated as …….

3. For a reversible adiabatic process….is equal to zero

4. At constant temperature if $\Delta H=T\Delta S$,the process is said to be……

II. 5. A process in which temperature is kept constant is called……..

6. For a spontaneous process the change in Gibbs Free energy is…..

7. The state of hybridization of Boron in BCl3 is…….

8. The N-O bondorder in NO_3- ion is…….

III. 9. For elementary substances in their standard state, enthalpy is equal to……..

10. Thermochemical equations represent……..changes accompanying chemical reactions.

11. Deexcitation of electron from outer shell to the second shell produces _____ series of lines.

12. Give the relationship between heat of reaction at constant volume and at constant pressure.

IV.13. The power of an atom to attract the shared pair of electron in covalent bond is called……..

14. The number of antibonding electrons in nitrogen molecule is…….

15. _____ principle deals with the distribution of electrons in various orbitals based on energy
16. Write Kirchoff's equation. **1×4 = 4**

Section B, weightage 1 each (short answer type).

Answer any eight questions from the following. Each answer must contain 4 points.

17. State and explain Pauli's exclusion principle.
18. Name two types of hydrogen bonding with example.
19. State and explain Fajan's rule.
20. Define(1) work function (2) Gibb's free energy function.
21. State and explain Hess's law.
22. Define standard enthalpy of formation of a compound.
23. Calculate the wavelength of radiation emitted when the electron in the hydrogen atom jumps from n=4 to n=2 level
24. Define the terms Cp and Cv of an ideal gas. How are they related.?
25. Define enthalpy of neutralization.
26. Give Schrodinger wave equation and explain the terms.
27. Explain VSEPR theory with examples of regular and irregular geometry.
28. State the second law of thermodynamics. **1×8 =8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Distinguish between bond dissociation energy and bond energy.
30. Distinguish between diathermic work and adiabatic work.
31. Derive Kirchoff's equation. Calculate the heat of formation of ethane from the following data
    $C_2H_6(g)+31/2O_2(g)\ldots\ldots>2CO_2(g)+3H_2O(l)\ \Delta H=-1560KJ$
    $C+O_2(g)\ldots.>.CO_2(g)\ \Delta H=-393.5KJ$
    $H_2(g)+1/2O_2(g)\ldots\ldots>H_2O(l)\ \ \Delta H=-284.5KJ$
32. Explain Hund's rule of maximum multiplicity.
33. Explain dsp2 and dsp3 hybridisation with examples.
34. Write the postulates of Bohr theory.
35. Explain reversible process and maximum work.
36. Explain electronegativity scales of Pauling and Mulliken. **2×5 =10**

Section D, weightage 4 each (long essay).

Answer any two from the following.

37. What are the postulates of M.O.T. Compare bonding molecular orbital and antibonding molecular orbital.
38. Write briefly on the four quantum numbers and their significances.
39. Derive an expression for the work done in reversible isothermal expansion of an ideal gas. Calculate the work done when 5 moles of an ideal gas is expanded isothermally and reversibly from a pressure of 10 atm to 2 atm at 270 c. **4×2 = 8**

SYLLABUS OF COMPLEMENTARY COURSE

(For students of Geology Majors)

PRINCIPLES OF CHEMISTRY II

SEMESTER II Complementary Course No.- 2 Course Code-CH1231 .2Credit – 2

Total Hours - 36 L-T-P 2-0-2

Module – I: Radio Activity

Radio active equilibrium (qualitative only) detection of radio activity by Wilson's cloud chamber and Geiger Muller Scintillation counter – units of radio activity – curie and rutherford – Radio Carbon dating , Rock dating, Neutron activation analysis Applications in agriculture and medicine. A brief study of the biological effects of radiation such as pathological and genetic damage, Dosimetry – Units – rad, gray and roentgen. Fricke dosimeter and ceric sulphate dosimeter. Nuclear Chemistry – stability of Nucleus – n/p ratio, artificial transmutation and radio activity, mass defect, binding energy, atomic fission and fusion. 9 Hrs

Module II Spectroscopy

Regions of electromagnetic spectrum – different units to represent energy such as erg, joule, calorie, cm^{-1}, Hz and eV, their interconversions – interaction of radiation with matter, different types of energy levels of molecules – rotation, vibration and electronic levels. Rotation spectroscopy Microwave spectrum of diatomic molecules – expressions for rotational energy, selection rule – frequency separation and determination of bond length – vibrational spectrum – harmonic oscillator, equation for frequency of vibration, expression for vibrational energy, selection rule, frequency separation, calculations of force constant, Electronic spectroscopy –types of transition and regions where they absorb.

Raman spectroscopy – stokes and anti stokes lines, quantum theory of Raman spectrum – advantages and disadvantages of Raman spectrum, rotational Raman spectrum, selection rules and frequency separation. Vibrational Raman spectrum – Complementary with IR spectrum, mutual exclusion principle, NMR spectroscopy, principle of NMR spectroscopy, nuclear spin, interaction with external magnet, energy

spacing, transition between nuclear energy levels in hydrogen nucleus, low resolution spectrum, chemical shift, spin – spin coupling – fine structure spectrum, application to simple molecule 9 Hrs

Module III Electro Chemistry

Transport number – definition, determination by Hittorfs method and moving boundary method, application of conductance measurements. Conductometric titrations involving strong acid – strong base, strong acid – weak base, weak acid – strong base and weak acid – weak base.

EMF – Galvanic cells, measurement of emf, cell and electrode potential, IUPAC sign convention, Reference electrodes, SHE and calomel electrode, standard electrode potential, Nernst equation, anion and cation reversible electrodes, redox electrode with examples, quinhydrone electrode, glass electrode concentration cell without transference, potentiometric titration, over voltage and passivity, corrosion of metals – prevention of corrosion, Fuel cells – H_2 – O_2 and hydrocarbon – O_2 type. 9 Hrs

Module IV Analytical Method

Analytical method in Chemistry – principles of volumetric analysis, primary standard, standard solution, normality and molarity, theory of acid - base titration, permanganometric and dichrometric titration, theory of acid – base and redox indicators.

Evaluation of analytical data – accuracy and precision, classification of errors. Detection and correction of determinate errors, standard deviation, variance and co-efficient of variation. 9 Hrs

References

1.Atomic structure and chemical bonding with introduction to Molecular spectroscopy – Manas Chanda.

2.Concise Inorgantic Chemistry – J.D. Lee

3.Elements of Nuclear Chemistry – Arnikar

4.Environmental Chemistry – A.K. De

5.Principles of Physical Chemistry Puri, Sharma, Pathania.

6.Physical Chemistry - N. M. Kapoor.

Model Question complementary Course - II for Geology majors
Semester II Course CodeCH1231 .2
Principles of Chemistry II

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 (answer in one word \ sentence)

Answer all questions .

I. 1. The energy needed for separating the nucleons from the nucleus is ……
2. The reciprocal of decay constant is called ……
3. Radiation of wavelength 600 nm falls in…….region.
4. Shift towards longer wavelength region is termed…….

II. 5. ……..is known as zero point energy.
6. Which among the molecules O2,H2and Hcl is microwave active.
7. Elastic collisions cause ……..
8. Which of the following will show Raman spectrum HCl,CS2,CCl4,Br2.

III. 9. Conductance of unit volume of conductor is called……..
10. Equivalent conductance…….with dilution.
11. Ionic product of water is equal to……
12. The standard electrode potential of Zn and Ag are -0.80v and -0.76v respectively. The standard EMF of the cell is ……..

IV. 13. A saltbridge eliminates the …….
14. The tendency of an electrode to gain electrons is called its……..
15. Phenolphthalein is not suitable for titration of strong acid against…….
16. A solution of accurately known concentration is known as a……solution.

1×4 = 4

Section B, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. What is meant by artificial transmutation ?
18. Define(1)Chromophore (2)Auxochrome (3)hyperchromic effect (4)Hypochromic effect.
19. What are the different types of electronic transitions?
20. What is Raman effect?
21. Explain the rule of mutual exclusion.
22. Define transport number of an ion
23. The equivalent conductance of 0.05N solution of acetic acid is106ohm-1cm2 eq-1.Calculate the degree of dissociation of acetic acid at this concentration,given that the ionic conductance of H +and CH3COO- are 349.5 and 40 ohm-1cm2eq-1.
24. What are redox titrations?
25. Calculate the normality of 10 percent solution of NaOH
26. Whatiselectromagneticspectrum?
27. What is a primary standard?
28. What are the units of radioactivity? Explain. **1×8 = 8**

Section C, weightage 2 each. (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Sketch and explain the low resolution and high resolution spectra of ethanol
30. How will you determine the transport number by moving boundary method?

31. Write a note on Rotational Raman spectrum.
32. How are errors classified ?
33. Write briefly on over voltage.
34. Explain carbon dating.
35. In weak base- strong acid titration methyl orange is used while in strong base-weak acid titration phenolphthalein is used. Why ?
36. Explain mass defect and binding energy. **2×5 = 10**

Section D, weightage 4 each (Long essay)

Answer any two questions

37. Briefly explain the working of H2-O2 and hydrocarbon –O2 fuel cell.
38. Write a note on conductometric titrations.
39. Write notes on (1) Neutron activation analysis.(2)Fricke Dosimeter. **4×2 = 8**

Complementary Chemistry

(For Geology Majors)

Physical , Analytical and Inorganic Chemistry

Semester III Course-3 Credit-3Course Code – CH1331 .2

L-T-P 3-0-2 Total 54 hrs

Module I – Gascous State

Maxwell's distribution of molecular velocities (no derivation), average, most probable and RMS velocities collision number and collision frequency, mean free path, deviation of gases from ideal behaviour – Boyle temperature, derivation of Vander Waal's constants and critical constants, law of corresponding states – reduced equation of state, Joule Thomson coefficient, liquefaction of gases –Linde's and Claudes process. 9 Hrs

Module II – Crystalline State

Isotropy and anisotropy – symmetry elements in crystals – the seven crystal systems – Miller indices, Bravais lattices, primitive, bcc and fcc lattices of cubic crystals – Bragg equation - diffraction of X rays by crystals – single crystal and powder method. Detailed study of structure of NaCl and KCl crystals. Liquid crystals – mesomorphic state, types of liquidcrystals, application and examples. 9 hrs

Module III – Chemical Cycles and Group Properties

Carbon, Sulphur, Nitrogen, phosphorous and hydrologic cycle.

Group properties (reactions) of anions in common minerals – Carbonate, Sulphate, Phosphate, Sulphides and fluorides.

Classification of oxides – Acidic, Basic, Amphoteric and neutral 9 hrs

Module IV Co ordination Chemistry

Types of ligands, Werner's co-ordination theory, valence bond theory of bonding in octahedral and tetrahedral complexes – drawbacks of valence bond theory. Crystal field theory of octahedral and tetrahedral complexes – examples – high and low spin complexes. 9hrs

Module V Inorganic Polymers

General properties of inorganic polymer, phosphazenes – preparation of linear and cyclo phosphazene with examples, properties, and application, silicones – General methods of preparation and properties examples. Application of Silicones, Silicone rubber, silicone resins**.** 9 Hrs

Module VI – Soil and Water Chemistry

Soil – Composition, mineral matter in soil process of soil formation, weathering – physical (mention), chemical (detail) + biological (mention)

Saline and alkaline soil (brief explanation) Rocks – different types (Igneous, sedimentary and Meta morphic.) Analysis of lime stone qualitative treatment only.

Water Analysis Water quality parameters COD, BOD, main quality characteristics of water (alkalinity, hardness, total solids and oxidation)

Water treatment including chemical (Precipitation, aeration, osonisation,chlorination) and physical methods of sterilization. 9 hrs

References

1) Physical Chemistry-Rakshit
2) Principles of Physical Chemistry- Puri,Sharma, Pathania
3) Instrumental methods of Chemical Amalysis- B.K.Sharma
4) Vogel's Text book of Quantitative Chemical Analysis –VI Edition
5) Atomic structure with introduction to Molecular Spectroscopy – Manas Chanda
6) Physical Chemistry- N.M.Kapoor
7) Soil and Noise pollution- B.K.Sharma
8. Industrial Chemistry – B.K.Sharma.

Model Question Paper Chemistry (complementary) for Geology (major)
Semester III Course Code – CH1331 .2 Course – III
Physical, Analytical and Inorganic Chemistry
Time : Three Hours Total Weightage : 30

Section A, weightage – 1 each (answer in one word \ sentence)

Answer all questions.

I 1. The average distance travelled by the gas molecules between two successive collisions is called -----
2. Theoretical pressure correction for n moles of an ideal gas is _____ .
3. Theoretical temperature above which a gas can not be liquified by the application of Pressure is _____ .
4. _____ is an example of a high spin complex of manganese.

II 5. The geometry of the crystal if the radius ratio is in the range 0.414-0.732
6. The coordination number in CsCl is------
7. Total number of Bravais lattice in crystal systems is _____ .
8. Number of atoms per unit cell of a FCC crystal is -----

III 9. The pH of saline soil is -----
10. Gypsum is ------
11. ------ is more scientific than biological oxygen demand
12. The general formula of silica is _____ .

IV 13. Al_2O_3 is ---------in nature
14. The major source of nitrogen
15. Atmospheric nitrogen is converted into -----by nitrogen fixing bacteria
16. Stalagmite is deposits of --------- **1×4 = 4**

Section B, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Distinguish between most probable velocity and average velocity.
18. State law of corresponding states
19. Differentiate between isotropy and anisotropy.
20. Find the Miller indices of a crystal plane with intercepts 2a,2b and 3c.
21. Explain COD and BOD.
22. How will you analyse limestone qualitatively?
23. Distinguish between primary and secondary valencies in Werner's coordination theory
24. Explain the hybridization and geometry of $[Co(NH3)_6]Cl_3$
25. Give the structure of $(NPCl_3)_3$
26. Define Boyle temperature.
27. What is Bragg's equation?
28. What is Joule- Thomson coefficient? **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. What are the causes for the deviation of real gases from ideality? How is it solved?
30. Explain symmetry elements in crystals..
31. Give an account of weathering with emphasis to chemical weathering.

32. How would you explain the splitting of d orbitals in an octahedral field? Explain with diagrams
33. Give any one method for the preparation of silicones. What are the important applications of silicones?
34. Give an account of carbon cycle..
35. Explain Crystal field theory of octahedral complexes.
36. Explain Linde's process of liquefaction of gases. **2×5 = 10**

Section D, weightage 4 each (Long essay)

Answer any two questions.

37. Explain liquid crystals with examples for each type
38. Explain high spin and low spin complexes with examples.
39. Give an account of the preparation, properties and important applications of inorganic polymers. **4×2 = 8**

Semester IV – Geology Majors

Physical and Analytical Chemistry -II

Course-4 Credit -3Course Code – CH1431 .2

L-T-P 3-0-2 Total 54 Hrs

Module I Metallurgy

Metallurgy of Titanium, Iron, cobalt, Nickel, Thorium, Uranium. Extraction of lanthanides**.** 9 Hrs

Module II- Petro Chemicals

Introduction to crude oil, exploratory methods, constitution of crude oil, natural gas - constituents. Distillation of crude oil, separation of natural gas and different fractions. Meaning of terms such as ignition point, flash point, octane number. Types of hydrocarbon fuels and their characteristics. Cracking – catalytic cracking, hydro cracking, isomerisation, reforming, sulphur, hydrogen, petroleum, coke and nitrogen compounds from petroleum. 9Hrs

Module III Chemical Kinetics

Rates of reactions, various factors influencing rates of reactions – order and molecularity - Zero, first, second and third order reactions – derivation of integrated rate equation, fractional life time – units of rate constants, influence of temperature on reaction rates – Arrhenius equation, calculation of Arrhenices parameters – Collision theory of rates. 9 hrs

Module IV : Catalysis and Photo Chemistry

Theories of catalysis, outline of intermediate compound formation theory and adsorption theory.

Photo Chemistry**:** Laws of photo Chemistry .Grotthus Draper Law, Einstein's law, Beer lambert law, Photo Chemical equivalence and quantum yield, explanation for high and low quantum yields, H_2-Cl_2 reaction, H_2-Br_2 reaction, Photosensitisation and Chemiluminescence. 9hrs

Module – V : Chemical Equilibrium

Reversible reactions, KP, Kc and Kx and their interrelationship – Free energy change and equilibrium, Van't Hoff reaction isotherm and isochore. Influence of pressure and temperature on the following reactions

1) $N2+3H_2 \rightleftharpoons 2NH_3$ 2)$P\ Cl_5 \rightleftharpoons P\ Cl_3 + Cl_2$ 3)$2SO_2+O_2 \rightleftharpoons 2SO_3$ Le-chatelier's principle and the discussion of the above reactions on its basis. 9 hrs

Module VI : Instrumental methods of analysis

Spectral methods – Atomic Absorption Spectroscopy (AAS) principle, measurement, advantages, disadvantages, and applications.Flame Emission Spectroscopy (FES) principle, measurement,(single beam method) applications.

Thermal methods: Themogravimetric analysis (TG) principle and method, Factors affecting thermogravimetric analysis, Application, Differential Thermal Analysis (DTA) –principle, method, factors affecting DTA Applications. 9 hrs

References

1. Physical Chemistry-Rakshit
2. Principles of Physical Chemistry- Puri,Sharma, Pathania
3. Instrumental methods of Chemical Amalysis- B.K.Sharma
4. Vogel's Text book of Quantitative Chemical Analysis –VI Edition
5. Atomic structure with introduction to Molecular Spectroscopy – Manas Chanda
6. Physical Chemistry- N.M.Kapoor
7. Soil and Noise pollution- B.K.Sharma
8. Industrial Chemistry – B.K.Sharma.

Model Question Pape Chemistry (complementary) for Geology major
Semester IVCourse Code CH1431 .2 Course- IV
Physical and Analytical Chemistry II

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)

Answer all questions.

I 1. The rate law for a reaction is $r = k[A][B]^2$. The order of the reaction with respect to B is -------

2. Ore of thorium found in beach sands of Kerala is --------
3. Acid hydrolysis of ester is ------order reaction
4. In a multistep reaction the --------step is the rate determining step

II 5. Give an example of a negative catalyst with the chemical reaction which it catalyses

6. _____ is an example of a hydrocarbon fuel.
7. _____ is the expression for Beer-Lambert's law
8. Catalyst used in the oxidation of SO_2 to SO_3 is _____

III 9. Kp is related to Kc by the reaction _____ .

10. Give the relationship between free energy change and equilibrium constant
11. _____ is an ore of iron.
12. Theoretical catalyst in the Haber process for the manufacture of ammonia is _____.

IV 13. In thermogravimetric analysis ------of a sample is recorded against time or temperature

14. The most widely used flame in atomic absorption spectroscopy is _____.
15. Heat evolved or absorbed versus temperature is studied in--------
16. In atomic absorption spectroscopy -------law is obeyed over a wide range of Concentration. **1×4 = 4**

Section B, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points

17. What is the influence of temperature on reaction rate?
18. A substance decomposes following first order kinetics. The half life period of the reaction is 35 minutes. What is its rate constant?
19. State Einstein's law of photochemical equivalence
20. Define quantum yield of a photochemical reaction.
21. Explain van't Hoff reaction isotherm
22. What is the influence of pressure and temperature in the following reaction $2SO_2 + O_2 \leftrightarrow 2SO_3$
23. Write the principle of AAS.
24. How do you differentiate a TG curve from a DTA curve?
25. What is smelting.
26. Distinguish between order and molecularity?
    What is octane number ?
27. What is Grotthus- Draper law?
28. Explain chemiluminescence.

1×8 = 8

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Give the Arrhenius equation. How will you determine the Arrhenius parameters?
30. Explain photosensitization reaction with an example
31. State and explain Le Chatelier principle with an example
32. What is the principle of flame emission spectroscopy? Mention its important applications.
33. What are the general methods for refining of metals
34. Give an account of different types of hydrocarbon fuels and their characteristics.
35. Distinguish between isotherm and isochore.
36. Explain quantum yield in terms of H_2-Cl_2 reaction . **2×5 = 10**

Section D, weightage 4 each (long essay)

Answer any two questions.

37. a. Derive the expression for the rate constant of a first order reaction.
    b. How will you express the units of rate constant for reactions of order 1, 2 and 3?
38. Discuss the factors affecting TG curve.
39. Give a note on the applications of TG and DTA **4×2 = 8**

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY Course CodeCH1432 .2 Credit 2 For Physics & Geology Majors

Semesters 1, 2, 3 & 4

Reactions and identification of cations : Hg^{+}, Pb^{2+}, Ag^{+}, Hg^{2+}, Bi^{3+}, Cd^{2+}, As^{3+}, Sb^{3+}, Sn^{2+}, Sn^{4+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Mn^{2+}, Zn^{2+}, Ni^{2+}, Cd^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+} and NH_4^{+}

The cations must be provided in solutions. A student must analyse at least ten mixtures containing two cations each.

Volumetric analysis

C. Acidimetry and Alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

D. Permanganometry

a. Standardisation of $KMnO_4$ by oxalic acid sodium oxalate and Mohr's salt

b. Estimation of oxalic acid / sodium oxalate

c. Estimation of Mohr's Salt.

d. Estimation of calcium

C. Dichrometry

e. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

f. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodometry and Iodimetry

g. Standardization of sodium thiosulphate using std. potassium dichromate.

h. Estimation of copper in a solution

i. Estimation of iodine

E. **Complexometric titrations**

j. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution

k. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Gravimetric Analysis

1.Estimation of water of hydration in barium chloride crystals.

2. Estimation of barium chloride solution.

COURSE OFFERING AND CREDITS

Semester IV; credits: Two

COURSE OBJECTIVES

To equip the students with skill in qualitative and quantitative chemical analysis of inorganic materials.

After the course completion, the student will have the necessary training required for laboratory based wet chemical analysis.

COURSE TRANSACTION FORMAT

Lecture-Tutorial-Lab: 0-0-2 hours per week; eighteen 5-day weeks per semester.

Contact hours per semester: 36 hrs lab instruction.

MODE OF EVALUATION

Continuous Evaluation: The Continuous evaluation will have 25% percentage weightage. Grades A-E will be awarded for each component. There will be two quizzes / tests for which, the average of the two grades obtained will form part of CE. The CE components are: (i) Attendance for laboratory sessions (ii) Experiment (Lab) Report on completion of each set of experiments (iii) Laboratory Skill and (iv) Quiz / Test. These are summarized below. Total Weightage is 4.

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

Evaluation of the Experiment (Lab) report and Lab Skill: On completion of each experiment, an "experiment (lab) report" should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, tables of data collected, equations, calculations, graphs, other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits

Mode of Experiment (Lab) Report Evaluation		
No	*Main Component*	*Grades*
1	Punctual submission and Neat presentation	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Inclusion of aim, materials, procedure etc.	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

Mode of Lab Skill Evaluation		
No	*Main Component*	*Grades*
1	Punctuality and experiment completion on time	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Lab skill & Neat arrangements of table and apparatus in lab	
3	Prompt and neat recording of observations in lab note book.	
4	Experimental Skill and attention to safety	

Details of the Lab Quiz / Test: The test for a lab course may be in the form of a quiz and two such tests are to be conducted. Based on the performance in answering the quiz, grades A-E may be awarded and the average grade earned in these two will be counted

for CE. Two teachers, one of which is the course teacher, should conduct the quiz/test within the assigned lab contact hours.

End Semester Evaluation: 75% percentage weightage. Total Weightage is 30. The ESE of the qualitative experiment(analysis of the mixture of two cations for the physics\geology majors and organic compound analysis for the zoology, botany, biochemistry and homescience majors) and quantitative volumetric analysis of Course CH1432 will be on the 4th semester. The Examination will be of 3- hr duration.

The main components of the ESE for the Course CH1432 will be (i) Principle and Procedure, (ii) Experiment Report & Lab Skill, (iii) Calculations & Result and (iv) Lab Course Record and each of these components should be assessed as part of the ESE of lab courses based on the sub-components as given below.

Main Components of ESE For Lab Courses			
No	*Main Components in General*	*Weightage*	*Grades*
1	Principle and Procedure	4	A-E
2	Experiment Report & Lab Skill	8	A-E
3	Calculations & Result	12	A-E
4	Lab Course Record	6	A-E

If necessary this table may be modified by the Board of Examiners

The subdivisions in the case of (i) Inorganic Qualitative Analysis and (ii) Quantitative Volumetric Analysis are given below.

Semester IV Course Code CH1432 .2 1.Inorganic Qualitative Analysis

Analysis of a mixture of two cations. Physics\Geology majors

Examination in 4th semester with 3- hrs duration. Total weightage for ESE is 30 and for CE is 4.

Sub-Components for End Sem Evaluation of Inorganic Qualitative Analysis				
No	*Main Component*	*Weightage*	*Sub-Components*	*Grades*
1	Principle and Procedure	2	i. Principle of the experiment stated ii. Aim of the experiment stated iii. Separation Scheme stated iv. Materials & apparatus specified.	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
2	Experiment Report &Lab Skill	4	i. Preliminary experiments done ii. Preliminary reports correct iii Satisfactory skill in experimentation iv. Neatness of data and result presentation	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
3	Calculations & Result	6	i. 4 correct tests for the two ions ii. 3 tests correctly for the ions iii.2 correct tests iv.1 correct test v. 0 correct test	A B C D E
4	Lab Course Record Book	3	i. Required No: of Experiments done ii. Data and experimental details sufficient iii. Correctness of results reported iv. Neatness of presentation and absence of errors/mistakes in the Record Book	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E

If necessary this table may be modified by the Board of Examiners

2. Inorganic Quantitative Analysis(Volumetric Analysis)

Estimation of ion or salt in Volumetric Analysis .

To all complementary Courses

Sub-Components for End Sem Evaluation of Quantitative Volumetric Analysis				
No	*Main Component*	*Weightage*	*Sub-Components*	*Grades*
1	Principle and Procedure	2	i. Principle of the experiment stated & correct ii. Aim of the experiment stated & correct iii. Procedure stated & correct iv. Materials & apparatus specified	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
2	Experiment Report &Lab Skill	4	i. Standardization Calculation correct ii. Estimation Calculation correct iii Unknown Weight Calculation correct iv. Neatness of data and result presentation	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
3	Calculations & Result	6	i. $\leq$1% ii. >1- $\leq$ 1.4 iii.> 1.4 - $\leq$ 1.8 iv.> 1.8 - $\leq$ 2.2 v. > 2.2	A B C D E
4	Lab Course Record Book	3	i. Required No: of Experiments done ii. Data and experimental details sufficient iii. Correctness of results reported iv. Neatness of presentation and absence of errors/mistakes in the Record Book	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E

If necessary this table may be modified by the Board of Examiners.

CE for each half practical course(volumetric , cations, organic)

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

If necessary this table may be modified by the Board of Examiners

UNIVERSITY OF KERALA

FIRST DEGREE PROGRAMME

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

SCHEME AND SYLLABI

2010 ADMISSION ONWARDS

Complementary Chemistry offered to Botany Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry Complementary

Complementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .3		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .3		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .3		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .3 CH1432 .3		3×18 =54 2×18 = 36

GENERAL ASPECTS OF EVALUATION

MODE OF EVALUATION - COMMON TO CORE , ELECTIVE, COMPLEMENTARY AND FOUNDATION COURSE

Evaluation of each course shall involve Continuous Evaluation (CE) with a weightage of 25 % and End Semester evaluation (ESE) with a weightage of 75 % . A system of performance based direct grading will be used with Grades A-E and the Grade Points as shown below

Performance	Grade	Grade Point	Grade Range
Excellent	A	4	3.50-4.00
Very Good	B	3	2.50-3.49
Good	C	2	1.50-2.49
Average	D	1	0.50-1.49
Below Average	E	0	0.00-0.49

I. 1. CONTINUOUS EVALUATION FOR LECTURE COURSES

The Continuous evaluation will have 25% percentage weightage and will be done continuously during the semester. CE components are

(i) Attendance for lecture and laboratory sessions (to be noted separately where both lecture and laboratory hours have been specified within a course);

(ii) assignment /seminar and

(iii) test

Grades A-E will be awarded for each component. There will be two class tests for which, the average of the two grades obtained will form part of CE. Seminar for each course to be organized by the course teacher and assessed along with a group of teachers in the Dept. The topic selection by the student for assignments/seminar will be with the approval of the course teacher. Total weightage is 4.

Components of CE For Lecture Courses

No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Assignment / Seminar	1	A-E
3	Test paper	2	A-E

I. 1. 1. EVALUATION OF THE ASSIGNMENTS AND SEMINAR

The assignment typed/written on A4 size paper should be 4-6 pages. The minimum duration of the seminar is fifteen minutes and the mode of delivery may use audio-visual aids if available. Both the assignment and the seminar will first be evaluated by awarding

grades A-E based for each of the four components below. The seminar is to be conducted within the contact hour allotted for the course.

Mode of Assignments / Seminar Evaluation		
No	*Main Component*	*Grades*
1	Adherence to overall structure & submission deadline	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Content & grasp of the topic	
3	Lucidity / Clarity of presentation	
4	References / Interaction/Overall effort	

The following guidelines are suggested as tentatively for the evaluation of each of the above main components. Thus, if all sub-components are present/satisfactory, then Grade A may be assigned to the main component.

Guidelines for Assignments / Seminar Evaluation		
No	*Main Component*	*Sub-Components*
1	Adherence to overall structure & submission deadline	i. Punctual submission ii. Adequate length/duration iii. Inclusion of Introduction, Discussion & Summary sections iv. Absence of errors/mistakes
2	Content & grasp of the topic	i. Coverage of topic ii. Understanding of topic iii. Logical organization iv. Originality (No copying from a source or plagiarism)
3	Lucidity / Clarity	i. Clarity ii. Effective presentation/delivery iii. Neatness of presentation iv. Inclusion of appropriate diagrams /equations /structures etc
4	References / Interaction/Overall effort	i. Listing of references ii. Use of more than one reference source/Use of Web resource iii. Correct Response to quiz /questions iv. Overall effort in preparing assignment/seminar

I. 1. 2. DETAILS OF THE CLASS TEST

1. The test has a duration of 1 hour.
2. Each question paper has four parts: A, B, C and D
3. Part A contains two questions. Each question contains four sub questions. Each question has a weight = 1. The questions may be in the forms - multiple choices, match the following, name the following or fill in the blanks or any one word- answer question (Objective).
4. Part B contains four questions. Out of these, the students have to answer two questions. Each answer should contain four points. Each question has a weight = 1(Short Answer).
5. Part C contains two questions of which the candidate has to answer one. Each question has a weight = 2. The answer must contain 8 points (Short Essay).
6. Part D contains two questions of which the candidate has to answer one. Each question has a weight = 4. Each answer must contain 16 points (Long Essay).
7. Total weightage for the entire questions to be answered is 10.

Question Paper Pattern for Test		
Question No	*Type of Question*	*Weightage*
Part A: I. 1-4; II. 4-8	2; Objective	1
Part B: 9-12	2 out of 4; Short Answer	1
Part C: 13,14	1 out of 2; Short Essay	2
Part D: 15,16	1 out of 2; Long Essay	4 Total = 10

I. 2. CONTINUOUS EVALUATION FOR LABORATORY COURSES

The Continuous evaluation will have 25% percentage weightage. For 5th semester, only CE evaluation will be done; the corresponding ESE will be in 6th semesters. Grades A-E will be awarded for each component. There will be two quizzes / tests for which, the average of the two grades obtained will form part of CE. The CE components are: (i) Attendance for laboratory sessions (ii) Experiment (Lab) Report on completion of each

set of experiments (iii) Laboratory Skill and (iv) Quiz / Test. These are summarized below. Total Weightage is 4.

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

The guidelines for evaluating the two main components 2-4 using sub-component are presented below.

I. 2. 1. EVALUATION OF THE EXPERIMENT (LAB) REPORT

On completion of each experiment, a report should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, tables of data collected, equations, calculations, graphs,other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

Mode of EXPERIMENT (LAB) Report Evaluation		
No	*Main Component*	*Grades*
1	Punctual submission and Neat presentation	All four sub-components: A Only three : B Only two : C Only one : D None : E
2	Inclusion of aim, materials, procedure etc.	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

I. 2. 2. EVALUATION OF THE LAB SKILL

Mode of Lab Skill Evaluation		
No	*Main Component*	*Grades*
1	Punctuality and experiment completion on time	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Lab skill & Neat arrangements of table and apparatus in lab	
3	Prompt and neat recording of observations in lab note book.	
4	Experimental Skill and attention to safety	

I. 2. 3. EVALUATION OF THE LAB QUIZ / TEST

The test for a lab course may be in the form of a quiz and two such tests are to be conducted. Based on the performance in answering the quiz, grades A-E may be awarded and the average grade earned in these two will be counted for CE. Two teachers, one of which is the course teacher, should conduct the quiz/test within the assigned lab contact hours.

II. 1. END SEMESTER EVALUATION FOR LECTURE COURSES

The end semester evaluation will be done by the University at the end of the semester and it will have a 75% percentage weightage. End of semester University theory examination will be of 3-hr duration. Grades A-E will be awarded as per Regulations and the general aspects of evaluation.

II. 1. 1. END SEMESTER QUESTION PAPER PATTERN

1. The theory examination has a duration of 3 hours
2. Each question paper has four parts: A, B , C and D
3. Part A contains four questions . Each question contains four sub questions. Each question has a weight = 1. The questions may be in the forms - multiple choices,

match the following, name the following or fill in the blanks or any one word- answer question (Objective type).

4. Part B contains twelve questions. Out of these twelve questions, the students have to answer eight questions. Each answer should contain four points. Each question has a weight = 1 (Short Answer type).
5. Part C contains eight questions of which the candidate has to answer five. Each question has a weight = 2. The answer must contain 8 points (Short Essay type).
6. Part D contains three questions of which the candidate has to answer two. Each question has a weight = 4. Each answer must contain 16 points (Long Essay type).
7. The total weightage for the entire questions to be answered is 30.

SYLLABUS OF COMPLEMENTARY COURSE

Theoretical Chemistry (For Students of Botany Majors)

SEMESTER 1 Complementary Course No. - 1 Course Code-CH1131 .3 Credit-2

L-T-P 2-0-2 36 Hours

Module I – Atomic Structure (9 hrs)

Atomic spectrum of hydrogen - different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (mention only, no derivation), concept of orbitals, the four quantum numbers and their significances. Orbitalwise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, Stability of filled and half filled orbitals. Electronic configuration of lanthanides and actinides, Lanthanide contraction

Module II – Chemical Bonding (9 hrs)

Energetics of bond formation – Born-Haber cycle. Hybridisation and structure of molecules – sp, sp^2, sp^3, dsp^2, dsp^3, sp^3d^2 and sp^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia. VSEPR theory with regular and irregular geometry –. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility. Partial covalent character of the ionic bond – Fajan's Rules. A brief review of molecular orbital approach – LCAO method – bond order, bond distance and stability of O_2, O_2^{2+}, O_2^{2-}, NO, NO^+, CO and HF.

Module III – Analytical Principles (9 hrs)

Principles of volumetric analysis – primary standard – standard solutions normality and molarity, theory of acid-base titrations, permagnometric and dichrometric titrations, iodometry and complexometric titrations. Theory of acid-base indicator – redox indicators. Principles of colorimetric titration.

Module IV – Organometallics (9 hrs)

Definition and classification, Organo metallic compounds of Mg, Sn, Li, Hg, Fe and their synthesis, applications. Biological and environmental aspects of organic compounds – Organometallic compounds in medicines – organomercury, organoboron, organosilicon and organo arsenic compounds – outline of preparation and uses. Antitumour drugs, silylated derivatives of bioactive organic compounds in agriculture and horticulture. Environmental aspects of Organometallic compounds.

Reference:

1. Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
2. Concise Inorganic Chemistry – J.D. Lee
3. Environmental Chemistry A. K. De
4. Modern Inorganic Chemistry A.D. Madan

5.Co-ordination Chemistry – Bosolo and Johns

6.Chemistry of Organometallics – Rochoco.

MODEL QUESTION PAPER - CHEMISTRY (Complementary) offered to Botany majors Course Code – CH1131 .3 Semester I Course- I

Theoretical Chemistry

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)

Answer all questions.

I. 1. Give the relation between energy and frequency.
2. Write the valence shell configuration of Cu (atomic number 29).
3. The Bohr wave number equation is ……..
4. Sketch the shape of p_x orbital.

II. 5. What is the hybridization of nitrogen in ammonia?
6. Dipole moment = …….. x distance
7. Write a molecule possessing intra molecular hydrogen bonding.
8. Give the expression for calculating bond order of a molecule.

III. 9. Normality of 10 % solution of NaOH is ……
10. Indicator suitable for the titration of $H_2C_2O_4$ against NaOH is ……
11. Give an example for a redox indicator.
12. The equivalent weight of $KMnO_4$ is ……

IV. 13. Give an example for sigma bonded organometallic compound.
14. Alkyl magnesium halides are generally known as …….
15. Give the formula of Zeise's salt.
16. Give an example for an organomercury compound used as antiseptic.

1×4 = 4

Section B, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Mention the type of hybridization in the following compounds.
a. BF_3 b. CH_4 c. PCl_5 d. SF_6
18. 18. Explain the factors influencing polarity of covalent bond.
19. Explain the different series in the atomic spectrum of hydrogen.
20. State and explain Pauli's exclusion principle.
21. What are redox titrations? Give two examples.
22. How will you prepare 100 ml 0.05 M Mohr's salt solution?
23. What is Ferrocene? How is it synthesized?
24. What are Grignard Reagents? Mention any two uses.
25. What is Cis Platin? Give its structure.
26. Explain Hund's rule of maximum multiplicity.
27. Explain Fajan's rule.
28. What is a primary standard? **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Write a note on the four quantum numbers.
30. What is meant by dipole moment? How it is helpful in explaining the structure of molecule.
31. Explain the theory of acid-base indicators.
32. Explain the bond angles in NH_3 & H_2Ousing VSEPR theory.

33. With examples, differentiate between intermolecular and intramolecular hydrogen bonding.
34. Differentiate between bonding and antibonding molecular orbitals. Calculate the bond order of O_2^+ ion.
35. Write a note on environmental aspects of organometallic compounds.
36. Distinguish between normality and molarity. **2×5 =10**

Section D, weightage 4 each (long essay)

Answer any two questions.

37. What is lattice energy? Write a note on Born-Haber cycle.
38. Derive Bohr frequency equation. Calculate the wavelength of the first spectral line of Balmer series.
39. Briefly explain different type of acid- base tirations and their indicators with suitable examples **4×2 = 8**

INORGANIC AND BIOINORGANIC CHEMISTRY

Complementary Chemistry for BOTANY Majors

SEMESTER II Course code-CH1231 .3 Credit-2 36 hrs

L-T-P 2-0-2

Module I – Environmental Chemistry (9 hrs)

Nature of environmental threats and role of chemistry. Green house effect, ozone layer and its depletion.. Water pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents, treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electrodialysis.-Dissolved oxygen-BOD,COD

Module II - Coordination Chemistry (9 hrs)

Nomenclature, Coordination number and geometry of chelates – isomerism – structural and stereo isomerism valence bond theory of bonding in octahedral and tetrahedral complexes – drawbacks of valence bond theory – high and low spin complexes – magnetic properties. Application in qualitative and quantitative analysis.

Module III – Bio inorganic compounds (9 hrs)

Metalloporphyrins – cytochromes – chlorophyll photosynthesis and respiration – haemoglobin and myoglobin, mechanism of O_2 – CO_2 transportation, nitrogen fixation, carbon fixation and carbon cycle. Biochemistry of iron toxicity and nutrition, essential and trace elements in biological systems.

Module IV – Spectroscopy – I (9 hrs)

Regions of electromagnetic spectrum - interaction of radiation with matter – Different types of energy levels in molecules – rotation, vibration and electronic levels. Various types of molecular spectra – Microwave spectroscopy – spectra of diatomic molecules – Expression for rotational energy - selection rule – frequency separation., Infra red spectra – equation for frequency of vibration – expression for vibrational energy. Selection rule, calculation of force constant.

Reference:

4. Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
5. Concise Inorganic Chemistry – J.D. Lee
6. Environmental Chemistry A. K. De

4. Modern Inorganic Chemistry A.D. Madan

5.Co-ordination Chemistry – Bosolo and Johns

6.Chemistry of Organometallics – Rochoco.

MODEL QUESTION PAPER – BOTANY Majors CHEMISTRY (Complementary) Semester II Course Code- CH1231 .3 Course –II

Inorganic and Bio- inorganic Chemistry

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)

:. Answer all questions

I. 1. Global warming is a consequence of …….

2. Give one example for air pollutants.

3. …….. is responsible for ozone layer depletion.

4. What is the oxidation state of iron in haemoglobin.

II. 5. Write the IUPAC name of $K_4[Fe(CN)_6]$.

6. Coordination number of Cu^{2+} in $[Cu(NH_4)_2]^{2+}$.

7. Give an example for a hexadentate ligand.

8. Write the oxidation number of gold in $Na[Au(CN)_2]$.

III. 9. …….. is an example for a haemoprotein.

10. Which is the metal present in Chlorophyll?

11. During assimilation of nitrate, plants and micro organisms reduce nitrate to……..

12. During fixation of carbon, carbon dioxide is converted to …….

IV. 13. The essential requirement for a molecule to be microwave active is ……

14. Number of waves which pass through a given point in one second is known as ……

15. Give the selection rule for IR spectroscopy.

16. Write the expression to calculate the force constant of a molecule. **1×4 = 4**

SectionB, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Explain BOD and COD.

18 How pesticides and fertilizers cause soil pollution?

19 Explain high spin and low spin complexes with an example for each.

20 Explain carbon cycle.

21 Write a note on nitrogen fixation.

22 Explain myoglobin and its importance.

23 Explain electromagnetic spectrum.

24 The force constant of CO is 1840 cm^{-1}. Calculate the vibrational frequency in cm^{-1}. (Atomic mass $C^{12} = 19.9 \times 10^{-27}$ kg, $O^{16} = 26.6 \times 10^{-27}$ kg.)

25 What is a chelate? Illustrate with examples.

26. What is acid rain?

27. What is stability constant?

28. HCl is microwave active, H_2 is not. Why ? **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29 Explain Fajan's rule.
30 What are the draw backs of valence bond theory?
31 What is meant by green house effect? Explain its consequences.
32 Write a note on the biochemistry of iron.
33 Compare photosynthesis and respiration.
34 Explain the applications of coordination compounds in qualitative analysis.
35. Write a note on industrial waste management..
36. Write a short note on environmental pollution. **2×5 = 10**

Section D, weightage 4 each (long essay)

Answer any two questions.

37 Explain the various types of isomerism in coordination compounds with an example each.
38 Give an account of rotational vibrational spectrum and its applications.
39 What are cytochromes? Discuss their importance in biological systems.

4×2 = 8

SYLLABUS OF COMPLEMENTARY COURSE

Physical & Inorganic Chemistry (For Students of Botany Majors)

SEMESTER III Course-3 Credit-3 Course Code – CH1331 .3

L-T-P 3-0-2 Total 54 Hours

Module I. Chemical kinetics 9 Hrs

Chemical kinetics, catalysis, rate of reactions, various factors influencing rate, order, molecularity, zero, first, second, third order reactions (derivation of first order only) fractional life time, units of rate constants, influence of temperature on reaction rates, Arrehinius equation, Calculation of Arrhenius parameters, Collision theory, catalysis, different types of catalysis, intermediate compound formation theory and adsorption theory.

Module II. Ionic equilibrium 9 Hrs

Arrhenius, Lowry- Bronstead concept of acids and bases, Kw and pH, pH of strong and weak acids, Ka and Kb, mechanism of buffer action, pH of buffer, Hydrolysis of salt, Degree of hydrolysis and hydrolysis constant .

Module III. Solutions 9 Hrs

Completely miscible liquid pairs, composition curve, boiling point- composition curve- ideal and non ideal solutions, fractional distillations, azeotropes, CST, phenol- water, nicotine-water system, Effect of impurities on miscibility and CST, immiscible liquid pairs, steam distillation- Distribution law and its limitations, applications of solvent extractions.

Module IV. Chromatography 9 Hrs

Outline study of adsorption and partition chromatography, paper , thin layer, ion exchange ,

gas chromatography and HPLC, Rf and Rt value, separation of amino acids and dyes.

Module V - Radioactivity and Nuclear Chemistry 9Hrs

Radio active equilibrium, Detection of radioactivity by Wilson's cloud Chamber and Geiger Muller counter, Units of radioactivity - Curie and Rutherford. Applications in agriculture and Medicine. A brief study of the biological effects of radiation such as pathological and genetic damage. Nuclear Chemistry - Stability of nucleus, n/p ratio, artificial transmutation and radioactivity. Mass defect, binding energy, neutron activation analysis.

Module VI UV spectroscopy 9 Hrs

Basic characteristics of electromagnetic radiations- absorption of light by molecules-electronic, vibrational and rotational energies- Beer lambert's law-colorimetry, Colorimetric estimation of glucose and iron, UV spectroscopy-principle-λ_{max} – auxochrome and chromophore, red shift and blue shift, simple applications of UV spectroscopy, conjugation, functional group and geometrical isomerism.

Module VI NMR spectroscopy 9 Hrs

Principle of NMR, nuclear spin, chemical shift, spin-spin coupling, τ and δ, PMR of simple organic molecules, principle of MRI .

REFERENCES FOR SEMESTER III

1. Organic Chemistry of Natural Products, Chatwal**,**Gurdeep**.**R, Himalaya Publications
2. Principles of physical chemistry, Puri Shrama Pathania, Vishal
3. Chemistry of natural products, P.S. Kalsi, New Age International Private Ltd
4. Elementary organic spectroscopy, Y.R Sharma, S chand & Company
5. Principles of Physical Chemistry**,** B.R.Puri**,** R.L**.**Sharma & Pathania, Vishal Publishing
6. Essentials of Physical Chemistry, B.S. Bahl., G.D. Tuli & Arun Bahl , S.Chand & Co., New Delhi.
7. Simplified Course in Physical Chemistry, R.L. Madan, G.D. Tuli , S.Chand & Co.
8. Chromatography, . B.K .Sharma, GOEL Publishing house, Meerut
9. Text Book of Pharmaceutical Chemistry, . Atherden L.M**,** Bentley and Driver**,** Oxford. University Press

MODEL QUESTION THIRD SEMESTER

Complementary course-Botany majors Course–III course code CH1331 .3

Physical and Inorganic Chemistry

Time : Three Hours **Total Weightage : 30**

SECTION A, weightage 1 each (answer in one word \ sentence)

Answer all the questions.

I 1. Write an example for first order reaction
2. Write Arrhenius equation for dependence of rate on temperature.
3. What is the unit of rate constant for third order reactions?
4. What is the order of radio active decay?

II 5. How Ka is related to pKa.
6. Write one examples of Lewis acid.
7. Write an example of acid buffer.
8. What is the value Kw of pure water?

III 9. Write an example of ideal solution?
10. Write any one condition for a solution to be ideal
11. Write an example of azeotropic solution
12. Write one example for purification of a substance by steam distillation.

IV 13. Write any one commonly used adsobent in column chromatography
14. Write any one carrier gas used in gas chromatography
15. Which spary reagent is commonly used for identification of amino acids?
16. Write any one detector used in gas chromatography **1×4 = 4**

SECTION B, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Explain the buffer action of a mixture of weak acid and its salt
18. What is the principle of steam distillation?
19. Explain fractional distillation?
20. What is retention volume?
21. What is Rf value?
22. What is Beer- Lamberts law
23. What are ion exchange resins?
24. What is chemical shift?
25. What are auxochromes and chromophores
26. What is the difference between adsorption and partition chromatography?
27. Explain binding energy.
28. Write a note on ∂ and τ scales used in nmr. **1×8 = 8**

SECTION C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Derive the rate equation for first order reaction
30. What is the pH of 0.01M sodium acetate? Ka of acetic acid =1.7 X 10^{-4})
31. What is meant by critical solution temperature?
32. What is HPLC
33. What are red and blue shift? Explain
34. Draw the low resolution and high reslolution ^{1}H NMR of ethanol.
35. Explain mass defect.
36. What are the units of radioactivity? **2×5 = 10**

SECTION D, weightage4 each (long essay)

Answer any two questions

37. Explain collision theory.
38. Derive an equation for pH of an acid buffer.
39. Explain the procedure for estimation of iron colorimetrically. **4×2 = 8**

SYLLABUS OF COMPLEMENTARY COURSE

Organic Chemistry (For Students of Botany Majors)

SEMESTER IV Course-4 Credit -3 Course Code CH1431 .3

L-T-P 3-0-2 Total 54 Hours

Module - 1 : Alkaloids 9 Hrs

General methods of isolation, general properties, classification, physiological action of alkaloids. Strutcure of conine, morphine and nicotine (no structural elucidation)
plant alkaloids as drugs- vincridine and vinblastine

Module - II : Terpenes 9 Hrs

classification, isoprene rule, essential oils, elementary study of Citral and Geraniol, natural rubber, synthetic rubber, synthesis of Buna - N, Buna - S, neoprene and thiokol. Classification of polymers with specific examples.

Module III Vitamins, Hormones, Lipids 9 Hrs

Classification of Vitamins, structure and properties of Vitamin A, C and D ,Deficiency diseases, Hormones -cholesterol, bile acids, artificial hormones, Lipids –classification of oils, fats and iodine value, saponification value, phospholipids (no structural elucidation).

Module IV Insecticides and pesticides 9Hrs

Pesticides, insecticides, herbicides, fungicides, Classification of Insecticides, Phosphorus, chlorine and carbamates, detection and identification of insecticides by TLC. Structure and synthesis of DDT, BHC, malathion, carbamates, Toxicity.

Module V Dyes 9Hrs

Theory of colour and constitution, classification of dyes, Natural dyes, Synthesis of methyl orange, congo red, malachite green, phenolphthalein, Schiffs reagent.

Module VI Drugs 9Hrs

Classification of drugs- analgesic, antipyretic, antibiotic, hypnotics, suphadrugs, antacids, antimalarials, Synthesis of aspirin, sulphaguanidine, chloramphenicol, Drugs of plant origin-anticancer compounds from plants.

REFERENCES FOR SEMESTER IV

1. Organic Chemistry of Natural Products, Chatwal**,**Gurdeep**.**R, Himalaya Publications
2. Principles of physical chemistry, Puri Shrama Pathania, Vishal
3. Chemistry of natural products, P.S. Kalsi, New Age International Private Ltd
4. Elementary organic spectroscopy, Y.R Sharma, S chand & Company

5. Principles of Physical Chemistry, B.R.Puri, R.L.Sharma & Pathania, Vishal Publishing

6. Essentials of Physical Chemistry, B.S. Bahl., G.D. Tuli & Arun Bahl , S.Chand & Co., New Delhi.

7. Simplified Course in Physical Chemistry, R.L. Madan, G.D. Tuli , S.Chand & Co.

8 . Chromatography, . B.K .Sharma, GOEL Publishing house, Meerut

9. Text Book of Pharmaceutical Chemistry, . Atherden L.M, Bentley and Driver, Oxford. University Press

MODELQUESTION FOURTH SEMESTER Complementary course-Botany majors
Course–IV course code CH1431 .3
Organic Chemistry

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)

Answer all the questions.

I 1. Name two alkaloids from vinca rosa
2. Name of the alkaloid isolated from Hemlock seeds
3. Write any one characteristic of alkaloids
4. Write any one method used for separation of alkaloids from plants.

II 5. Write one example of synthetic rubber.
6. What is the IUPAC name of monomer of natural rubber?
7. Write the name of a Fibre
8. Write the name of a step growth polymer.

III 9. What is the chemical name of Vitamin C.?
10. Which decease is caused by the deficiency of Vitamin A?
11. Which alcohol is present in simple lipids?
12. Write the name of two water soluble vitamins.

IV 13. Write the name of one chloro insecticide
14. Write the name of one phosphorus insecticide
15. What are the raw materials used in the preparation of DDT?
16 Which spray reagent is used for the detection of carbamate? **1×4 = 4**

Section B, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. State isoprene rule
18. How vitamins are classified?
19. What is iodine value?
20. How would you prepare methylorange?
21. Draw the structure of DDT and BHC?
22. Name three anticancer copounds ?
23. How would you synthesize aspirin from salicylic acid?
24. What is redox titration?
25. What is binding energy?
26. What are bile acids?
27. Write the structure of conine.

28. What is Buna- N ? **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Write few examples of plant alkaloids as drugs
30. What are neoprene and thiokol ?
31. Draw the structure of vitamin C
32. What are carbamates
33. What is chromophore and auxochome? Explain with examples
34. How chloramphenicol synthesized.
35. Distinguish between natural rubber and synthetic rubber.
36. Explain vitamin deficiency diseases**. 2×5 = 10**

Section D, weightage 4 each (long essay)

Answer any two questions

37. What is step growth and chain growth polymerization ? Explain with examples
38. How would you determine saponification value of an oil?.
39. Explain the classification of Lipids? **4×2 = 8**

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY

Course V Course Code CH1432 .3 Credit 2 Semesters 1,2,3 & 4

For students of Botany, Zoology, Home Science and Biochemistry majors

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – polynuclear hydrocarbons, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.

Organic preparations

1. Acetanilide from aniline
2. Metadinitrobenzene from nitro benzene
3. Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

A. Acidimetry and alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard.

b. Estimation of sodium hydroxide using (i) Std oxalic acid and (ii) Std HCl

c. Determination of sodium hydroxide and sodium carbonate in a mixture (indicator method)

B. Permanganometry

a. Standardization of KMnO4 by oxalic acid/sodium oxalate and Mohr's salt

b. Estimation of oxalic acid/sodium oxalate

c. Estimation of Mohr's salt

d. Estimation of calcium

C. Dichrometry

a. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodimetry and Iodometry

a. Standardisation of sodium thiosulphate using std potassium dichromate

b. Estimation of copper in a solution

c. Estimation of iodine

E. Complexometric titrations

a. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

b. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Gravimetric Analysis

1. Estimation of water of hydration in barium chloride crystals

2. Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1st ,2nd , 3rd and 4th semesters

COURSE OFFERING AND CREDITS

Semester IV; credits: Two

COURSE OBJECTIVES

To equip the students with skill in qualitative and quantitative chemical analysis of inorganic materials.

After the course completion, the student will have the necessary training required for laboratory based wet chemical analysis.

COURSE TRANSACTION FORMAT

Lecture-Tutorial-Lab: 0-0-2 hours per week; eighteen 5-day weeks per semester.

Contact hours per semester: 36 hrs lab instruction.

MODE OF EVALUATION

Continuous Evaluation: The Continuous evaluation will have 25% percentage weightage. Grades A-E will be awarded for each component. There will be two quizzes / tests for which, the average of the two grades obtained will form part of CE. The CE components are: (i) Attendance for laboratory sessions (ii) Experiment (Lab) Report on completion of each set of experiments (iii) Laboratory Skill and (iv) Quiz / Test. These are summarized below. Total Weightage is 4.

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

Evaluation of the Experiment (Lab) report and Lab Skill: On completion of each experiment, an "experiment (lab) report" should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, tables of data collected, equations, calculations, graphs, other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

Mode of Experiment (Lab) Report Evaluation		
No	*Main Component*	*Grades*
1	Punctual submission and Neat presentation	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Inclusion of aim, materials, procedure etc.	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

Mode of Lab Skill Evaluation		
No	*Main Component*	*Grades*
1	Punctuality and experiment completion on time	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Lab skill & Neat arrangements of table and apparatus in lab	
3	Prompt and neat recording of observations in lab note book.	
4	Experimental Skill and attention to safety	

Details of the Lab Quiz / Test: The test for a lab course may be in the form of a quiz and two such tests are to be conducted. Based on the performance in answering the quiz,

grades A-E may be awarded and the average grade earned in these two will be counted for CE. Two teachers, one of which is the course teacher, should conduct the quiz/test within the assigned lab contact hours.

End Semester Evaluation: 75% percentage weightage. Total Weightage is 30. The ESE of the qualitative experiment(analysis of the mixture of two cations for the physics\geology majors and organic compound analysis for the zoology, botany, biochemistry and homescience majors) and quantitative volumetric analysis of Course CH1432 will be on the 4th semester. The Examination will be of 3- hr duration.

The main components of the ESE for the Course CH1432 will be (i) Principle and Procedure, (ii) Experiment Report & Lab Skill, (iii) Calculations & Result and (iv) Lab Course Record and each of these components should be assessed as part of the ESE of lab courses based on the sub-components as given below.

Main Components of ESE For Lab Courses			
No	*Main Components in General*	*Weightage*	*Grades*
1	Principle and Procedure	4	A-E
2	Experiment Report & Lab Skill	8	A-E
3	Calculations & Result	12	A-E
4	Lab Course Record	6	A-E

If necessary this table may be modified by the Board of Examiners

The subdivisions in the case of (i) Inorganic Qualitative Analysis and (ii) Quantitative Volumetric Analysis are given below.

Semester IV Course Code CH1432 .3

1. Inorganic Quantitative Analysis(Volumetric Analysis)

Estimation of ion or salt in Volumetric Analysis .

To all complementary Courses

Sub-Components for End Sem Evaluation of Quantitative Volumetric Analysis				
No	*Main Component*	*Weightage*	*Sub-Components*	*Grades*
1	Principle and Procedure	2	i. Principle of the experiment stated & correct ii. Aim of the experiment stated & correct iii. Procedure stated & correct iv. Materials & apparatus specified	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
2	Experiment Report &Lab Skill	4	i. Standardization calculation correct Ii Estimation Calculation correct iii Unknown weight calculation correct iv. Neatness of data and result presentation	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
3	Calculations & Result	6	i. ≤1% ii. >1- ≤ 1.4 iii.> 1.4 - ≤ 1.8 iv.> 1.8 - ≤ 2.2 v. > 2.2	A B C D E
4	Lab Course Record Book	3	i. Required No: of Experiments done ii. Data and experimental details sufficient iii. Correctness of results reported iv. Neatness of presentation and absence of errors/mistakes in the Record Book	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E

If necessary this table may be modified by the Board of Examiners

2. Organic Qualitative Analysis

Organic Compound Analysis-Zoology, Botany,Biochemistry& homescience majors

Sub-Components for End Sem Evaluation of Organic Qualitative Analysis				
No	*Main Component*	*Weightage*	*Sub-Components*	*Grades*
1	Principle and Procedure	2	i. Principle of the experiment stated ii. Aim of the experiment stated iii. Neatness iv. Materials & apparatus specified.	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
2	Experiment Report &Lab Skill	4	i. Preliminary experiments done ii. Detection of elements iii Saturated-unsaturated iv. Aromatic or not aromatic	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
3	Calculations & Result	6	i. 4 correct tests ii. 3 tests correct iii.2 correct tests iv.1 correct test v. 0 correct test	A B C D E
4	Lab Course Record Book	3	i. Required No: of Experiments done ii. Data and experimental details sufficient iii. Correctness of results reported iv. Neatness of presentation and absence of errors/mistakes in the Record Book	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E

If necessary this table may be modified by the Board of Examiners

Total weightage for ESE is 30 and for CE is 4.

CE for each half practical course(volumetric , cations, organic)

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

If necessary this table may be modified by the Board of Examiners

UNIVERSITY OF KERALA

FIRST DEGREE PROGRAMME IN CHEMISTRY

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

SCHEME AND SYLLABI

2010 ADMISSION ONWARDS

Complementary Chemistry offered to Zoology Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry Complementary

Complementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .4		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .4		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .4		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .4 CH1432 .4		3×18 =54 2×18 = 36

GENERAL ASPECTS OF EVALUATION

MODE OF EVALUATION - COMMON TO CORE , ELECTIVE, COMPLEMENTARY AND FOUNDATION COURSES

Evaluation of each course shall involve Continuous Evaluation (CE) with a weightage of 25 % and End Semester evaluation (ESE) with a weightage of 75 % . A system of performance based direct grading will be used with Grades A-E and the Grade Points as shown below.

Performance	Grade	Grade Point	Grade Range
Excellent	A	4	3.50-4.00
Very Good	B	3	2.50-3.49
Good	C	2	1.50-2.49
Average	D	1	0.50-1.49
Below Average	E	0	0.00-0.49

I. 1. CONTINUOUS EVALUATION FOR LECTURE COURSES

The Continuous evaluation will have 25% percentage weightage and will be done continuously during the semester. CE components are

(i) Attendance for lecture and laboratory sessions (to be noted separately where both lecture and laboratory hours have been specified within a course);

(ii) assignment /seminar and

(iii) test

Grades A-E will be awarded for each component. There will be two class tests for which, the average of the two grades obtained will form part of CE. Seminar for each course to be organized by the course teacher and assessed along with a group of teachers in the Dept. The topic selection by the student for assignments/seminar will be with the approval of the course teacher. Total weightage is 4.

Components of CE For Lecture Courses

No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Assignment / Seminar	1	A-E
3	Test paper	2	A-E

I. 1. 1. EVALUATION OF THE ASSIGNMENTS AND SEMINAR

The assignment typed/written on A4 size paper should be 4-6 pages. The minimum duration of the seminar is fifteen minutes and the mode of delivery may use audio-visual aids if available. Both the assignment and the seminar will first be evaluated by awarding grades A-E based for each of the four components below. The seminar is to be conducted within the contact hour allotted for the course.

Mode of Assignments / Seminar Evaluation		
No	*Main Component*	*Grades*
1	Adherence to overall structure & submission deadline	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Content & grasp of the topic	
3	Lucidity / Clarity of presentation	
4	References / Interaction/Overall effort	

The following guidelines are suggested as tentatively for the evaluation of each of the above main components. Thus, if all sub-components are present/satisfactory, then Grade A may be assigned to the main component.

Guidelines for Assignments / Seminar Evaluation		
No	*Main Component*	*Sub-Components*
1	Adherence to overall structure & submission deadline	i. Punctual submission ii. Adequate length/duration iii. Inclusion of Introduction, Discussion & Summary sections iv. Absence of errors/mistakes
2	Content & grasp of the topic	i. Coverage of topic ii. Understanding of topic iii. Logical organization iv. Originality (No copying from a source or plagiarism)
3	Lucidity / Clarity	i. Clarity ii. Effective presentation/delivery iii. Neatness of presentation iv. Inclusion of appropriate diagrams /equations /structures etc
4	References / Interaction/Overall effort	i. Listing of references ii. Use of more than one reference source/Use of Web resource iii. Correct Response to quiz /questions iv. Overall effort in preparing assignment/seminar

I. 1. 2. DETAILS OF THE CLASS TEST

1. The test has a duration of 1 hour.
2. Each question paper has four parts: A, B, C and D
3. Part A contains two questions. Each question contains four sub questions. Each question has a weight = 1. The questions may be in the forms - multiple choices, match the following, name the following or fill in the blanks or any one word- answer question (Objective).
4. Part B contains four questions. Out of these, the students have to answer two questions. Each answer should contain four points. Each question has a weight = 1(Short Answer).
5. Part C contains two questions of which the candidate has to answer one. Each question has a weight = 2. The answer must contain 8 points (Short Essay).
6. Part D contains two questions of which the candidate has to answer one. Each question has a weight = 4. Each answer must contain 16 points (Long Essay).
7. Total weightage for the entire questions to be answered is 10.

Question Paper Pattern for Test		
Question No	*Type of Question*	*Weightage*
Part A: I. 1-4; II. 4-8	2; Objective	1
Part B: 9-12	2 out of 4; Short Answer	1
Part C: 13,14	1 out of 2; Short Essay	2
Part D: 15,16	1 out of 2; Long Essay	4 Total = 10

I. 2. CONTINUOUS EVALUATION FOR LABORATORY COURSES

The Continuous evaluation will have 25% percentage weightage. For 5th semester, only CE evaluation will be done; the corresponding ESE will be in 6th semesters. Grades A-E will be awarded for each component. There will be two quizzes / tests for which, the average of the two grades obtained will form part of CE. The CE components are: (i) Attendance for laboratory sessions (ii) Experiment (Lab) Report on completion of each

set of experiments (iii) Laboratory Skill and (iv) Quiz / Test. These are summarized below. Total Weightage is 4.

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

The guidelines for evaluating the two main components 2-4 using sub-component are presented below.

I. 2. 1. EVALUATION OF THE EXPERIMENT (LAB) REPORT

On completion of each experiment, a report should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, tables of data collected, equations, calculations, graphs,other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

Mode of EXPERIMENT (LAB) Report Evaluation		
No	*Main Component*	*Grades*
1	Punctual submission and Neat presentation	All four sub-components: A Only three : B Only two : C Only one : D None : E
2	Inclusion of aim, materials, procedure etc.	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

I. 2. 2. EVALUATION OF THE LAB SKILL

Mode of Lab Skill Evaluation		
No	*Main Component*	*Grades*
1	Punctuality and experiment completion on time	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Lab skill & Neat arrangements of table and apparatus in lab	
3	Prompt and neat recording of observations in lab note book.	
4	Experimental Skill and attention to safety	

I. 2. 3. EVALUATION OF THE LAB QUIZ / TEST

The test for a lab course may be in the form of a quiz and two such tests are to be conducted. Based on the performance in answering the quiz, grades A-E may be awarded and the average grade earned in these two will be counted for CE. Two teachers, one of which is the course teacher, should conduct the quiz/test within the assigned lab contact hours.

II. 1. END SEMESTER EVALUATION FOR LECTURE COURSES

The end semester evaluation will be done by the University at the end of the semester and it will have a 75% percentage weightage. End of semester University theory examination will be of 3-hr duration. Grades A-E will be awarded as per Regulations and the general aspects of evaluation.

II. 1. 1. END SEMESTER QUESTION PAPER PATTERN

1. The theory examination has a duration of 3 hours
2. Each question paper has four parts: A, B , C and D
3. Part A contains four questions . Each question contains four sub questions. Each question has a weight = 1. The questions may be in the forms - multiple choices, match the following, name the following or fill in the blanks or any one word- answer question (Objective type).

4. Part B contains twelve questions. Out of these twelve questions, the students have to answer eight questions. Each answer should contain four points. Each question has a weight = 1 (Short Answer type).
5. Part C contains eight questions of which the candidate has to answer five. Each question has a weight = 2. The answer must contain 8 points (Short Essay type).
6. Part D contains three questions of which the candidate has to answer two. Each question has a weight = 4. Each answer must contain 16 points (Long Essay type).
7. The total weightage for the entire questions to be answered is 30.

SYLLABUS OF COMPLEMENTARY COURSE

Theoretical Chemistry (For Students of Zoology Majors)

SEMESTER 1 Complementary Course No. - 1 Course Code-CH1131 .4 Credit-2

L-T-P 2-0-2 36 Hours

Module I – Atomic Structure (9 hrs)

Atomic spectrum of hydrogen - different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (mention only, no derivation), concept of orbitals, the four quantum numbers and their significances. Orbitalwise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, Stability of filled and half filled orbitals. Electronic configuration of lanthanides and actinides, Lanthanide contraction

Module II – Chemical Bonding (9 hrs)

Energetics of bond formation – Born-Haber cycle. Hybridisation and structure of molecules – sp, sp^2, sp^3, dsp^2, dsp^3, sp^3d^2 and sp^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia. VSEPR theory with regular and irregular geometry –. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility. Partial covalent character of the ionic bond – Fajan's Rules. A brief review of molecular orbital approach – LCAO method – bond order, bond distance and stability of O_2, O_2^{2+}, O_2^{2-}, NO, NO^+, CO and HF.

Module III – Analytical Principles (9 hrs)

Principles of volumetric analysis – primary standard – standard solutions normality and molarity, theory of acid-base titrations, permagnometric and dichrometric titrations, iodometry and complexometric titrations. Theory of acid-base indicator – redox indicators. Principles of colorimetric titration.

Module IV – Organometallics (9 hrs)

Definition and classification, Organo metallic compounds of Mg, Sn, Li, Hg, Fe and their synthesis, applications. Biological and environmental aspects of organic compounds – Organometallic compounds in medicines – organomercury, organoboron, organosilicon and organo arsenic compounds – outline of preparation and uses. Antitumour drugs, silylated derivatives of bioactive organic compounds in agriculture and horticulture. Environmental aspects of Organometallic compounds.

Reference:

1. Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
2. Concise Inorganic Chemistry – J.D. Lee
3. Environmental Chemistry A. K. De
4. Modern Inorganic Chemistry A.D. Madan
5. Co-ordination Chemistry – Bosolo and Johns
6. Chemistry of Organometallics – Rochoco.

MODEL QUESTION PAPER - CHEMISTRY (Complementary) offered to Zoology majors Course Code – CH1131 .4 Semester I Course- I

Theoretical Chemistry

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)

Answer all questions.

I. 1. Give the relation between energy and frequency.
2. Write the valence shell configuration of Cu (atomic number 29).
3. The Bohr wave number equation is ……..
4. Sketch the shape of p_x orbital.

II. 5. What is the hybridization of nitrogen in ammonia?
6. Dipole moment = …….. x distance
7. Write a molecule possessing intra molecular hydrogen bonding.
8. Give the expression for calculating bond order of a molecule.

III. 9. Normality of 10 % solution of NaOH is ……
10. Indicator suitable for the titration of $H_2C_2O_4$ against NaOH is ……
11. Give an example for a redox indicator.
12. The equivalent weight of $KMnO_4$ is ……

IV. 13. Give an example for sigma bonded organometallic compound.
14. Alkyl magnesium halides are generally known as …….
15. Give the formula of Zeise's salt.
16. Give an example for an organomercury compound used as antiseptic.

1×4 = 4

Section B, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Mention the type of hybridization in the following compounds.
a. BF_3 b. CH_4 c. PCl_5 d. SF_6
18. 18. Explain the factors influencing polarity of covalent bond.
19. Explain the different series in the atomic spectrum of hydrogen.
20. State and explain Pauli's exclusion principle.
21. What are redox titrations? Give two examples.
22. How will you prepare 100 ml 0.05 M Mohr's salt solution?
23. What is Ferrocene? How is it synthesized?
24. What are Grignard Reagents? Mention any two uses.
25. What is Cis Platin? Give its structure.
26. Explain Hund's rule of maximum multiplicity.
27. Explain Fajan's rule.
28. What is a primary standard? **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Write a note on the four quantum numbers.
30. What is meant by dipole moment? How it is helpful in explaining the structure of molecule.
31. 31 Explain the theory of acid-base indicators.
32. Explain the bond angles in NH_3 & H_2Ousing VSEPR theory.

33. With examples, differentiate between intermolecular and intramolecular hydrogen bonding.
34. Differentiate between bonding and antibonding molecular orbitals. Calculate the bond order of O_2^+ ion.
35. Write a note on environmental aspects of organometallic compounds.
36. Distinguish between normality and molarity. **2×5 = 10**

Section D, weightage 4 each (long essay)

Answer any two questions.

37. What is lattice energy? Write a note on Born-Haber cycle.
38. Derive Bohr frequency equation. Calculate the wavelength of the first spectral line of Balmer series.
39. Briefly explain different type of acid- base tirations and their indicators with suitable examples **4×2 = 8**

INORGANIC AND BIOINORGANIC CHEMISTRY

Complementary Chemistry for ZOOLOGY Majors

SEMESTER II Course code-CH1231 .4 Credit-2 36 hrs

L-T-P 2-0-2

Module I – Environmental Chemistry (9 hrs)

Nature of environmental threats and role of chemistry. Green house effect, ozone layer and its depletion.. Water pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents, treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electrodialysis.-Dissolved oxygen-BOD,COD

Module II - Coordination Chemistry (9 hrs)

Nomenclature, Coordination number and geometry of chelates – isomerism – structural and stereo isomerism valence bond theory of bonding in octahedral and tetrahedral complexes – drawbacks of valence bond theory – high and low spin complexes – magnetic properties. Application in qualitative and quantitative analysis.

Module III – Bio inorganic compounds (9 hrs)

Metalloporphyrins – cytochromes – chlorophyll photosynthesis and respiration – haemoglobin and myoglobin, mechanism of O_2 – CO_2 transportation, nitrogen fixation, carbon fixation and carbon cycle. Biochemistry of iron toxicity and nutrition, essential and trace elements in biological systems.

Module IV – Spectroscopy – I (9 hrs)

Regions of electromagnetic spectrum - interaction of radiation with matter – Different types of energy levels in molecules – rotation, vibration and electronic levels. Various types of molecular spectra – Microwave spectroscopy – spectra of diatomic molecules – Expression for rotational energy - selection rule – frequency separation., Infra red spectra – equation for frequency of vibration – expression for vibrational energy. Selection rule, calculation of force constant.

Reference:

1.Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
2.Concise Inorganic Chemistry – J.D. Lee
3.Environmental Chemistry A. K. De
4. Modern Inorganic Chemistry A.D. Madan

5.Co-ordination Chemistry – Bosolo and Johns

6.Chemistry of Organometallics – Rochoco**.**

MODEL QUESTION PAPER – Zoology Majors CHEMISTRY
(Complementary) Semester II Course Code- CH1231 .4 Course – II
Inorganic and Bio inorganic Chemistry
Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)
Answer all questions

I. 1. Global warming is a consequence of …….
2. Give one example for air pollutants.
3. …….. is responsible for ozone layer depletion.
4. What is the oxidation state of iron in haemoglobin.

II. 5. Write the IUPAC name of $K_4[Fe(CN)_6]$.
6. Coordination number of Cu^{2+} in $[Cu(NH_4)_2]^{2+}$.
7. Give an example for a hexadentate ligand.
8. Write the oxidation number of gold in $Na[Au(CN)_2]$.

III. 9. …….. is an example for a haemoprotein.
10. Which is the metal present in Chlorophyll?
11. During assimilation of nitrate, plants and micro organisms reduce nitrate to……..
12. During fixation of carbon, carbon dioxide is converted to …….

IV. 13. The essential requirement for a molecule to be microwave active is ……
14. Number of waves which pass through a given point in one second is known as ……
15. Give the selection rule for IR spectroscopy.
16. Write the expression to calculate the force constant of a molecule. **1×4 = 4**

Section B, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Explain BOD and COD.
18 How pesticides and fertilizers cause soil pollution?
19 Explain high spin and low spin complexes with an example for each.
20 Explain carbon cycle.
21 Write a note on nitrogen fixation.
22 Explain myoglobin and its importance.
23 Explain electromagnetic spectrum.
24 The force constant of CO is 1840 cm^{-1}. Calculate the vibrational frequency in cm^{-1}. (Atomic mass $C^{12} = 19.9 \times 10^{-27}$ kg, $O^{16} = 26.6 \times 10^{-27}$ kg.)
25 What is a chelate? Illustrate with examples.
26. What is acid rain?
27. What is stability constant?
28. HCl is microwave active, H_2 is not. Why ? **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29 Explain Fajan's rule.
30 What are the draw backs of valence bond theory?
31 What is meant by green house effect? Explain its consequences.
32 Write a note on the biochemistry of iron.
33 Compare photosynthesis and respiration.
34 Explain the applications of coordination compounds in qualitative analysis.
35. Write a note on industrial waste management..
36. Write a short note on environmental pollution. **2×5 = 10**

Section D, weightage 4 each (long essay)

Answer any two questions.

37 Explain the various types of isomerism in coordination compounds with an example each.
38 Give an account of rotational vibrational spectrum and its applications.
39 What are cytochromes? Discuss their importance in biological systems.

4×2 = 8

ORGANIC AND BIOPHYSICAL CHEMISTRY I

Complementary Chemistry for ZOOLOGY MAJORS

SEMESTER III Course-3 Credit-3 Course Code – CH1331 .4 L-T-P 3-0-2

Total - 54 hrs

Module I – Mechanisms in organic substitution reactions (9 hrs)

Electron displacement in organic compounds – Inductive, electromeric and mesomeric effects, influence of inductive effect on acidic and basic properties of organic compounds, hyperconjugation and steric effect.

Reaction mechanism - Bond fission, rate determining step, nucleophilic substitution of alkyl halides, S_N^1, S_N^2 reactions. Effect of structure on reactivity as illustrated by methyl, ethyl, isopropyl and tertiary butyl groups. Electrophilic addition to ethene and propene – Markownikoff's rule, free radical addition, peroxide effect.

Module II – Stereochemistry (9 hrs)

Optical isomerism, chirality, recemisation and resolution, relative and absolute configuration, asymmetric synthesis, optical isomerism due to restricted rotation. Geometrical isomerism, E and Z nomenclature. Aldoximes and ketoximes.

Rotational isomerism. Rotation about carbon – carbon single bond, conformation of ethane, propane, butane cyclohexane, axial and equatorial bonds.

Module III – Carbohydrates

Classification, configuration, glyceraldehyde, erythrose, threose, ribose, 2-deoxy ribose, arabinose, glucose, fructose and mannose. Pyranoside structures of glucose and fructose, furanoside structure of fructose (structure elucidation not expected). Mutarotation and epimerization. Conversion of glucose into fructose and viceversa.

Module IV – Spectroscopy II (9 hrs)

Raman spectroscopy:- Stokes and antistokes lines. Quantum theory of Raman spectrum. Advantages and disadvantages of Raman spectrum. Rotational Raman Spectrum. Selection rule and frequency separation. Mutual exclusion principle.

NMR spectroscopy. Principle of NMR spectroscopy nuclear spin – interaction with external magnetic field. Chemical shift. Spin – spin coupling. Applications.

Module V – Heterocyclics and alkaloids (9 hrs**)**

An outline study of the preparation and properties of furan, pyrrole, thiophene, pyridine. Hoffmann's exhaustive methylation.

Alkaloids – General methods of isolation, general properties, physiological action of alkaloids, conine, morphine and nicotine (no structural elucidation expected)

Module VI – Vitamins & Hormones(9hrs)

Classification of vitamins, Source, Isolation, Physiological function and deficiency diseases caused by Vitamin A_1(retinol) A_2 (axerophthol) Vitamin B – B1(thiamine) B_2(riboflavin and folic acid) B_5(niacin) B_6(pyridoxine) B_{12}(cyanocobalamine) Vitamin C(ascorbic acid) Vitamin D_2 (ergo calciferol) Vitamin E(Tochopherols) Vitamin H(biotin) and Vitamin K.

Hormones – Steroids – Cholestrol, Bile acids, Artificial hormones (only elementary study)

Reference:

1. Organic Chemistry Vol I and II – I.L. Finar
2. Biophysical Chemistry – Principles and Techniques – A. Upadhyay. K.Upadhyay & N. Nath
3. Reaction Mechanism in Organic Chemistry – Mukherjee and Singh – Macmillan
4. Physical Chemistry – Rakshit
5. Essentials of Physical Chemistry – Bahl, Tuli & Arun Bahl
6. Principles of Organic Chemistry – M. K. Jain, S. Nagin & Co

MODEL QUESTION PAPER - ZOOLOGY (Majors) –CHEMISTRY (complementary) Course code CH1331 .4 Semester III Course – III

Organic and Bio- physical Chemistry I

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)

Answer all questions

I. 1. Which is more strong – acetic acid or formic acid?

2. The permanent displacement of electrons in a pi bond is known as …….

3. Write the rate determining step of nucleophilic substitution in alkyl halides.

4. Anti-Markonikov's addition to unsymmetrical alkene takes place in presence of ……..

II. 5. The process of separation of racemic modification into D and L forms is known as …….

6. ……. is the cause of optical activity of a molecule.

7. Which is the stable conformation of ethane molecule?

8. Write the structure of L - glyceraldehyde.

III. 9. Give an example for a ketohexose.

10. Aldoses differing only in the configuration of α- carbon atom from one another are called …….

11 c. Glucose $\xrightarrow[\text{Oxidation}]{HNO_3}$ .....

d. $C_6H_{12}O_6 \xrightarrow{\text{Zymase}}$ .....

12

IV. 13. Beri beri is caused by the deficiency of …….

14. Which is the most abundant steroid?

15. Write an example for a vitamin which is neither water soluble nor fat soluble.

16. Write an example for a sex hormone. **1×4 = 4**

Section B, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Explain hyper conjugation with an example.
18. Explain Markownikoff's rule with example.
19. What is asymmetric synthesis? Illustrate.
20. Explain racemisation.
21. How will you convert glucose to fructose?
22. What is Raman effect? Explain.
23. Explain chemical shift.
24. Write a note on electrophilic substitution in furan with example.
25. Explain the physiological action of conine.
26. Explain mutual exclusion principle.
27. Denote the axial and equatorial bonds of cyclohexane.
28. Distinguish between mutarotation and epimerization. **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Explain steric effects with suitable examples.
30. Draw and explain different conformations of ethane and cyclohexane.
31. Give an account of the structure of glucose.
32. How will you use NMR spectroscopy in the identification of organic molecule? Explain with example.
33. Write the structures of vitamin A_1, B_2 and C .
34. Give a note on vitamin deficiency diseases.
35. Explain the physiological action of alkaloids.
36. Explain vitamin deficiency diseases. **2×5 10**

Section D, weightage 4 each (long essay)

Answer any two questions.

37. Explain nucleophilic substitution reactions in alkyl halides with mechanisms..
38. Write a note on the quantum theory of Raman effect.
39. Write a note on optical isomerism in biphenyls with examples. **4×2 = 8**

ORGANIC AND BIOPHYSICAL CHEMISTRY II

Complementary Chemistry for ZOOLOGY MAJORS

SEMESTER IV Course-4 Credit-3 Course Code CH1431 .4 L-T-P 3-0-2

Total 54 hrs

Module I – Amino acid and Proteins (9 hrs)

Classification and properties – synthesis of glycine, alanine and tryptophan – polypeptides and proteins, peptide linkage, peptide synthesis, polypeptides, primary,

secondary, tertiary and quarternary structure of proteins, test for proteins, Enzymes – Characteristics, catalytic action, theory of enzyme catalysis – Michaelis – Menton theory – Co-enzymes.

Module II – Nucleic acids and Lipids (9 hrs)

RNA, DNA – their biological role, hydrolysis of nucleoproteins, elementary idea regarding the structure of nucleic acids.

Lipids – Classification oils, fats and waxes, iodine value and saponification value, properties of oils and fats – phospholipids

Module III – Polymers (9 hrs)

Classification with example – natural and synthetic polymers – condensation and addition polymerization. Elastic fibres, thermoplastics and thermosetting plastics. Terpenes – classification, isoprene rule, essential oils, elementary study of citral and geraniol (structure elucidation not required) . Rubber - structure – Vulcanisation of rubber – synthetic rubber – neoprene, butyl rubber, Buna S, Buna N

Module IV – Bio physical Analysis (9 hrs)

Osmosis – osmotic pressure, isotonic solutions, determination of molar mass by osmotic pressure measurement – reverse osmosis. Adsorption – Types of adsorption – applications. Factors influencing adsorption – Langumuir theory of adsorption

Module V – Colloids (9 hrs)

Properties of Colloids – Tyndal effect – Ultramicroscope – Brownian movements – electrophoresis – electro osmosis sedimentation and streaming potential – stability of colloids – zeta potential – Hardy Schultz rule. Protective Colloids – gold number – emulsions, Gels – application of Colloids – delta formation medicines – sewage disposal – emulsification and cleansing action of detergents and soaps.

Module VI – Chromatography 9 hrs

Introduction to Chromatography, Classification, Adsorption, Column chromatography, Introduction, Principle, Experimental details, Theory of development, factors affecting column efficiency, Applications, Paper chromatography, Types of paper chromatography, Experimental details, Applications. TLC – Introduction, Features, Advantages and limitations, Detecting agents.

Reference:

1 .Organic Chemistry Vol I and II – I.L. Finar

2.. Biophysical Chemistry – Principles and Techniques – A. Upadhyay. K.Upadhyay & N. Nath

4. Reaction Mechanism in Organic Chemistry – Mukherjee and Singh – Macmillan
5. Physical Chemistry – Rakshit
6. Essentials of Physical Chemistry – Bahl, Tuli & Arun Bahl
7. Principles of Organic Chemistry – M. K. Jain, S. Nagin & Co

MODEL QUESTION PAPER - ZOOLOGY (Majors) Course - IV
CHEMISTRY (complementary) Course code CH1431 .4 Semester IV
Organic and Bio-physical Chemistry II

Time : Three Hours **Total Weightage : 30**

Section A, weitage 1 each (answer in one word \ sentence)

Answer all questions

I. 1. ……. is an example for neutral amino acid.
2. Compounds formed by the condensation of two or more amino acids are known as ……
3. …….. is Millon's reagent.
4. Name the enzyme, which catalyses the hydrolysis of urea.

II. 5. Name the RNA, which provides the site for protein synthesis in cytoplasm.
6. Relationship between the base sequence in DNA and the amino acid sequence in protein is known as ……..
7. …….. is the difference between saponification value and acid value.
8. Nucleoside + …… = Nucleotide.

III. 9. Polymer formed by the condensation of hexamethylene diamine and adipic acid is ……..
10. Give an example for a natural fibre.
11. Monomer of natural rubber is ……
12. Give an example for a thermosetting plastic.

IV. 13. Colloid of liquid in liquid is known as …….
14. Write the name of any one carrier gas used in gas chromatography.
15. By which method, metal colloids are generally prepared?
16. Scattering of light by colloidal particles is known as ……**1×4 = 4**

Section B, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Define the terms, a. acid value b. saponification value.
18. Explain the isoelectric point of amino acids.
19. Explain osmosis and reverse osmosis.
20. Differentiate between addition polymerization and condensation polymerization with examples.
21. Write a note on adsorption.
22. Explain the different reasons for the coagulation of colloids.
23. Write a note on paper chromatography.
24. Explain the cleansing action of soap.
25. What are the different factors affecting column chromatography.
26. Explain Schulz – Hardy rule.
27. What is vulcanization of rubber?
28. Explain peptide synthesis. **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Explain the theory of enzyme catalysis.
30. Discuss the different functions of DNA and RNA.
31. Write a note on synthetic rubbers.

32. Explain the determination of molar mass by osmotic pressure measurement.
33. Differentiate between lyophilic and lyophobic colloids.
34. What are the advantages and limitations of thin layer chromatography?
35. Explain Michaelis – Menten theory?
36. Explain classification of lipids. **2×5 = 10**

Section D, weightage 4 each (long essay)

Answer any two questions.

37. Write on the various properties of colloids.
38. Briefly explain the structure of proteins.
39. Write a note on the different factors affecting adsorption and Langmuir theory of adsorption. **4×2 =8**

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY

Course V Course Code CH1432 .4 Credit 2 Semesters 1,2,3 & 4

For students of Botany, Zoology, Home Science and Biochemistry majors

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – polynuclear hydrocarbons, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given

Organic preparations

1.Acetanilide from aniline

2.Metadinitrobenzene from nitro benzene

3.Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

I.Acidimetry and alkalimetry

a.Preparation and standardization of decinormal HCl using sodium carbonate as primary standard.

b.Estimation of sodium hydroxide using (i) Std oxalic acid and (ii) Std HCl

c. Determination of sodium hydroxide and sodium carbonate in a mixture (indicator method)

II.Permanganometry

d. Standardization of KMnO4 by oxalic acid/sodium oxalate and Mohr's salt

e. Estimation of oxalic acid/sodium oxalate

f. Estimation of Mohr's salt

g. Estimation of calcium

III.Dichrometry

h. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

i. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

IV.Iodimetry and Iodometry

j. Standardisation of sodium thiosulphate using std potassium dichromate

k. Estimation of copper in a solution

l. Estimation of iodine.

V.Complexometric titrations

m. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

n. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Gravimetric Analysis

1.Estimation of water of hydration in barium chloride crystals

2.Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st} ,2^{nd} , 3^{rd} and 4^{th} semesters

COURSE OFFERING AND CREDITS

Semester IV; credits: Two

COURSE OBJECTIVES

To equip the students with skill in qualitative and quantitative chemical analysis of inorganic materials.

After the course completion, the student will have the necessary training required for laboratory based wet chemical analysis.

COURSE TRANSACTION FORMAT

Lecture-Tutorial-Lab: 0-0-2 hours per week; eighteen 5-day weeks per semester.

Contact hours per semester: 36 hrs lab instruction.

MODE OF EVALUATION

Continuous Evaluation: The Continuous evaluation will have 25% percentage weightage. Grades A-E will be awarded for each component. There will be two quizzes / tests for which, the average of the two grades obtained will form part of CE. The CE components are: (i) Attendance for laboratory sessions (ii) Experiment (Lab) Report on completion of each set of experiments (iii) Laboratory Skill and (iv) Quiz / Test. These are summarized below. Total Weightage is 4.

Components of CE For Lab Courses

No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

Evaluation of the Experiment (Lab) report and Lab Skill: On completion of each experiment, an "experiment (lab) report" should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on

sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, tables of data collected, equations, calculations, graphs, other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

Mode of Experiment (Lab) Report Evaluation		
No	*Main Component*	*Grades*
1	Punctual submission and Neat presentation	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Inclusion of aim, materials, procedure etc.	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

Mode of Lab Skill Evaluation		
No	*Main Component*	*Grades*
1	Punctuality and experiment completion on time	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Lab skill & Neat arrangements of table and apparatus in lab	
3	Prompt and neat recording of observations in lab note book.	
4	Experimental Skill and attention to safety	

Details of the Lab Quiz / Test: The test for a lab course may be in the form of a quiz and two such tests are to be conducted. Based on the performance in answering the quiz, grades A-E may be awarded and the average grade earned in these two will be counted for CE. Two teachers, one of which is the course teacher, should conduct the quiz/test within the assigned lab contact hours.

End Semester Evaluation: 75% percentage weightage. Total Weightage is 30. The ESE of the qualitative experiment(analysis of the mixture of two cations for the physics\geology majors and organic compound analysis for the zoology, botany, biochemistry and homescience majors) and quantitative volumetric analysis of Course CH1432

will be on the 4th semester. The Examination will be of 3- hr duration.

The main components of the ESE for the Course CH1432 will be (i) Principle and Procedure, (ii) Experiment Report & Lab Skill, (iii) Calculations & Result and (iv) Lab Course Record and each of these components should be assessed as part of the ESE of lab courses based on the sub-components as given below.

Main Components of ESE For Lab Courses			
No	*Main Components in General*	*Weightage*	*Grades*
1	Principle and Procedure	4	A-E
2	Experiment Report & Lab Skill	8	A-E
3	Calculations & Result	12	A-E
4	Lab Course Record	6	A-E

If necessary this table may be modified by the Board of Examiners

The subdivisions in the case of (i) Inorganic Qualitative Analysis and (ii) Quantitative Volumetric Analysis are given below

Semester IV Course Code CH1432 .4

1. Inorganic Quantitative Analysis(Volumetric Analysis)

Estimation of ion or salt in Volumetric Analysis .

To all complementary Courses.

Sub-Components for End Sem Evaluation of Quantitative Volumetric Analysis				
No	*Main Component*	*Weightage*	*Sub-Components*	*Grades*
1	Principle and Procedure	2	i. Principle of the experiment stated & correct ii. Aim of the experiment stated & correct iii. Procedure stated & correct iv. Materials & apparatus specified	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
2	Experiment Report &Lab Skill	4	i. Standardization calculation correct ii. Estimation Calculation correct iii Unknown weight calculation correct iv. Neatness of data and result presentation	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
3	Calculations & Result	6	i. ≤1% ii. >1- ≤ 1.4 iii.> 1.4 - ≤ 1.8 iv.> 1.8 - ≤ 2.2 v. > 2.2	A B C D E
4	Lab Course Record Book	3	i. Required No: of Experiments done ii. Data and experimental details sufficient iii. Correctness of results reported iv. Neatness of presentation and absence of errors/mistakes in the Record Book	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E

If necessary this table may be modified by the Board of Examiners

2. Organic Qualitative Analysis

Organic Compound Analysis-Zoology, Botany,Biochemistry& homescience majors

Sub-Components for End Sem Evaluation of Organic Qualitative Analysis				
No	*Main Component*	*Weightage*	*Sub-Components*	*Grades*
1	Principle and Procedure	2	i. Principle of the experiment stated ii. Aim of the experiment stated iii. Neatness iv. Materials & apparatus specified.	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
2	Experiment Report &Lab Skill	4	i. Preliminary experiments done ii. Detection of elements iii Saturated-unsaturated iv. Aromatic or not aromatic	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
3	Calculations & Result	6	i. 4 correct tests ii. 3 tests correct iii.2 correct tests iv.1 correct test v. 0 correct test	A B C D E
4	Lab Course Record Book	3	i. Required No: of Experiments done ii. Data and experimental details sufficient iii. Correctness of results reported iv. Neatness of presentation and absence of errors/mistakes in the Record Book	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E

If necessary this table may be modified by the Board of Examiners

Total weightage for ESE is 30 and for CE is 4.

CE for each half practical course(volumetric , cations, organic)

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

If necessary this table may be modified by the Board of Examiners

UNIVERSITY OF KERALA

FIRST DEGREE PROGRAMME

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

SCHEME AND SYLLABI

2010 ADMISSION ONWARDS

Complementary Chemistry offered to Homescience Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry Complementary

Complementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .5		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .5		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .5		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .5 CH1432 .5		3×18 =54 2×18 = 36

GENERAL ASPECTS OF EVALUATION

MODE OF EVALUATION - COMMON TO CORE , ELECTIVE, COMPLEMENTARY AND FOUNDATION COURSES

Evaluation of each course shall involve Continuous Evaluation (CE) with a weightage of 25 % and End Semester evaluation (ESE) with a weightage of 75 % . A system of performance based direct grading will be used with Grades A-E and the Grade Points as shown below.

Performance	Grade	Grade Point	Grade Range
Excellent	A	4	3.50-4.00
Very Good	B	3	2.50-3.49
Good	C	2	1.50-2.49
Average	D	1	0.50-1.49
Below Average	E	0	0.00-0.49

I. 1. CONTINUOUS EVALUATION FOR LECTURE COURSES

The Continuous evaluation will have 25% percentage weightage and will be done continuously during the semester. CE components are

(i) Attendance for lecture and laboratory sessions (to be noted separately where both lecture and laboratory hours have been specified within a course);

(ii) assignment /seminar and

(iii) test

Grades A-E will be awarded for each component. There will be two class tests for which, the average of the two grades obtained will form part of CE. Seminar for each course to be organized by the course teacher and assessed along with a group of teachers in the Dept. The topic selection by the student for assignments/seminar will be with the approval of the course teacher. Total weightage is 4.

Components of CE For Lecture Courses

No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Assignment / Seminar	1	A-E
3	Test paper	2	A-E

I. 1. 1. EVALUATION OF THE ASSIGNMENTS AND SEMINAR

The assignment typed/written on A4 size paper should be 4-6 pages. The minimum duration of the seminar is fifteen minutes and the mode of delivery may use audio-visual aids if available. Both the assignment and the seminar will first be evaluated by awarding

grades A-E based for each of the four components below. The seminar is to be conducted within the contact hour allotted for the course.

Mode of Assignments / Seminar Evaluation		
No	*Main Component*	*Grades*
1	Adherence to overall structure & submission deadline	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Content & grasp of the topic	
3	Lucidity / Clarity of presentation	
4	References / Interaction/Overall effort	

The following guidelines are suggested as tentatively for the evaluation of each of the above main components. Thus, if all sub-components are present/satisfactory, then Grade A may be assigned to the main component.

Guidelines for Assignments / Seminar Evaluation		
No	*Main Component*	*Sub-Components*
1	Adherence to overall structure & submission deadline	i. Punctual submission ii. Adequate length/duration iii. Inclusion of Introduction, Discussion & Summary sections iv. Absence of errors/mistakes
2	Content & grasp of the topic	i. Coverage of topic ii. Understanding of topic iii. Logical organization iv. Originality (No copying from a source or plagiarism)
3	Lucidity / Clarity	i. Clarity ii. Effective presentation/delivery iii. Neatness of presentation iv. Inclusion of appropriate diagrams /equations /structures etc
4	References / Interaction/Overall effort	i. Listing of references ii. Use of more than one reference source/Use of Web resource iii. Correct Response to quiz /questions iv. Overall effort in preparing assignment/seminar

I. 1. 2. DETAILS OF THE CLASS TEST

1. The test has a duration of 1 hour.
2. Each question paper has four parts: A, B, C and D
3. Part A contains two questions. Each question contains four sub questions. Each question has a weight = 1. The questions may be in the forms - multiple choices, match the following, name the following or fill in the blanks or any one word- answer question (Objective).
4. Part B contains four questions. Out of these, the students have to answer two questions. Each answer should contain four points. Each question has a weight = 1(Short Answer).
5. Part C contains two questions of which the candidate has to answer one. Each question has a weight = 2. The answer must contain 8 points (Short Essay).
6. Part D contains two questions of which the candidate has to answer one. Each question has a weight = 4. Each answer must contain 16 points (Long Essay).
7. Total weightage for the entire questions to be answered is 10.

Question Paper Pattern for Test		
Question No	*Type of Question*	*Weightage*
Part A: I. 1-4; II. 4-8	2; Objective	1
Part B: 9-12	2 out of 4; Short Answer	1
Part C: 13,14	1 out of 2; Short Essay	2
Part D: 15,16	1 out of 2; Long Essay	4 Total = 10

I. 2. CONTINUOUS EVALUATION FOR LABORATORY COURSES

The Continuous evaluation will have 25% percentage weightage. For 5th semester, only CE evaluation will be done; the corresponding ESE will be in 6th semesters. Grades A-E will be awarded for each component. There will be two quizzes / tests for which, the average of the two grades obtained will form part of CE. The CE components are: (i) Attendance for laboratory sessions (ii) Experiment (Lab) Report on completion of each

set of experiments (iii) Laboratory Skill and (iv) Quiz / Test. These are summarized below. Total Weightage is 4.

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

The guidelines for evaluating the two main components 2-4 using sub-component are presented below.

I. 2. 1. EVALUATION OF THE EXPERIMENT (LAB) REPORT

On completion of each experiment, a report should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, tables of data collected, equations, calculations, graphs,other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

Mode of EXPERIMENT (LAB) Report Evaluation		
No	*Main Component*	*Grades*
1	Punctual submission and Neat presentation	All four sub-components: A Only three : B Only two : C Only one : D None : E
2	Inclusion of aim, materials, procedure etc.	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

I. 2. 2. EVALUATION OF THE LAB SKILL

Mode of Lab Skill Evaluation		
No	*Main Component*	*Grades*
1	Punctuality and experiment completion on time	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Lab skill & Neat arrangements of table and apparatus in lab	
3	Prompt and neat recording of observations in lab note book.	
4	Experimental Skill and attention to safety	

I. 2. 3. EVALUATION OF THE LAB QUIZ / TEST

The test for a lab course may be in the form of a quiz and two such tests are to be conducted. Based on the performance in answering the quiz, grades A-E may be awarded and the average grade earned in these two will be counted for CE. Two teachers, one of which is the course teacher, should conduct the quiz/test within the assigned lab contact hours.

II. 1. END SEMESTER EVALUATION FOR LECTURE COURSES

The end semester evaluation will be done by the University at the end of the semester and it will have a 75% percentage weightage. End of semester University theory examination will be of 3-hr duration. Grades A-E will be awarded as per Regulations and the general aspects of evaluation.

II. 1. 1. END SEMESTER QUESTION PAPER PATTERN

1. The theory examination has a duration of 3 hours
2. Each question paper has four parts: A, B , C and D
3. Part A contains four questions . Each question contains four sub questions. Each question has a weight = 1. The questions may be in the forms - multiple choices, match the following, name the following or fill in the blanks or any one word- answer question (Objective type).

4. Part B contains twelve questions. Out of these twelve questions, the students have to answer eight questions. Each answer should contain four points. Each question has a weight = 1 (Short Answer type).
5. Part C contains eight questions of which the candidate has to answer five. Each question has a weight = 2. The answer must contain 8 points (Short Essay type).
6. Part D contains three questions of which the candidate has to answer two. Each question has a weight = 4. Each answer must contain 16 points (Long Essay type).
7. The total weightage for the entire questions to be answered is 30.

Syllabus for complementary courses

(for Home Science Majors)

Semester-1 Complementary Course No. - 1 Course Code-CH1131 .5 Credit-2 L-T-P 2-0-2

SEMESTER 1

Inorganic and Analytical Chemistry **36 hrs**

Module I –Atomic structure 9 hrs

Atomic spectra of hydrogen,-different series, Rydberg equation. Bohr theory-postulates –statement of Bohr energy equation –derivation of spectral frequency from Bohr equation-Schrodinger wave equation(mention only), concepts of orbitals, the four quantum numbers and their significance- Orbitalwise electron configuration,energy sequence rule, Pauli's principle, Hund's rule, stability of filled and half filled orbitals.

Module II- Analytical Principles 9 hrs

Principles of volumetric analysis, primary standards, Standard solutions, normality and molarity, numerical problems, theory of acid base titrations, permanganometric and dichrometric titrations, theory of acid base and redox indicators.(Numerical problems are to be worked out)

Module III- Radioactivity and Nuclear Chemistry 9 hrs

Radioactive equilibrium, , detection of radio activity, Geiger Muller Counter, Wilson cloud chamber, Units of radioactivity-Curie and Rutherford. Applications of radio activity- in medicine and agriculture, biological effects of radiation, pathological and genetic damage, Nuclear Chemistry-stability of nucleus, n/p ratio, artificial transmutation and radioactivity, mass defect, binding energy, neutron activation analysis

Module IV- Organometallics and biomolecules 9 hrs

Organometallic compounds –Definition and classification, Biological and environmental aspects of organometallics-organometallics in medicine ,Organo mercury, boron, silicon and arsenic compounds. Biomolecules –Metallo porphyrins, Haemoglobin and Myoglobin.

References

1. Concise Inorganic Chemistry J. D. Lee

2. Inorganic Chemistry Puri and Sharma

3. Chemistry of Organometallics Rochow

4. Organic Chemistry Vol 2 I.L. Finar

5. Chemistry of natural products Vol. 1 Gurdeep Chatwal

6 The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

7. Modern Inorganic Chemistry R D Madan.

Model Question Paper of Chemistry complementary for Homescience Majors
Semester I CH1131 .6 Course- I
Inorganic and Analytical Chemistry

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)
Answer all questions.

I. 1 . Angular momentum of an electron is a whole number multiple of _____.
2 . Give the relationship between wavelength, frequency and velocity of electromagnetic radiation.
3. The Rydberg equation for calculating wave number of radiation is _____.
4. Give Schrödinger equation which describes the behaviour of the electron in an atom.

II. 5. A substance which is in the pure and stable form is called _____
6. _____ indicator is used for the titration between strong base and weak acid.
7. Name the internal indicator used for the estimation of Fe SO_4
8. _____ is the normality of 5% NaOH solution.

III. 9. Complete the equation $^{238}U_{92} \rightarrow$ _____ + $^{4}He_2$ + _____
10. Who introduced packing fraction?
11. What is meant by transmutation?
12. Name a device used to detect radioactivity.

IV. 13. Give example of one organometallic compound.
14. What are Grignard reagents?
15. Which is the solvent used in the preparation of Grignard reagents?
16. Myoglobin contains _____ in the high spin state. **1×4 = 4**

Section B , weightage 1 each (short answer type)
Answer any eight questions from the following. Each answer must contain 4 points.

17. Draw the shapes of d orbitals
18. Give the names of 2 redox indicators
19. Write a note on stability of nucleus by n\p ratio.
20. Explain a method of preparation of organo mercuric compound.
21. Draw the structure of Mg Porphyrin
22. Calculate the weight of Na_2CO_3 required to prepare 250 ml N\10 solution..
23. Why HCl is not used in permanganometric titrations?
24. Mention any 2 applications of radioactivity.
25. Give the structure of 2 organo arsenic compounds .
26. Explain Hund's rule with a suitable example.
27. Define electronegativity, explain Pauling's electronegativity scale.
28. What are the units of radioactivity. Explain. **1×8 = 8**

Section C, weightage 2 each (short essay)
Answer any 5 questions from the following. Each answer must contain 8 points.

29. Explain the wave nature of material objects. ii.What is uncertainty principle?
30. Explain mass defect and binding energy.
31. Write a short note on applications of organometallic compounds in medicine.

32. What are the functions of Myoglobin and Haemoglobin
33. Explain nuclear fission and nuclear fusion.
34. Explain normality, molarity and molality.
35. What are quantum numbers? Explain its significance.
36. What are the applications of radioactivity in agriculture ? **2×5 = 10**

Section D, weightage 4 each (long essay)

Answer any 2.

37. Derive Bohr frequency equation.
38. Write a note on acid base indicators.
39. W hat are biological effects of radiation? **4×2 = 8**

Syllabus(Complementary course Chemistry)

(For Students of Home Science Majors)

Organic Chemistry I

SEMESTER 2 Course No. 2 Course Code CH1231 .5 Credit 2

36 hrs L-T-P 2-0-2

Module I: Carbohydrates 9hrs

Classification, configuration of glyceraldehydes, erythrose, threose, ribose,2-deoxy ribose, arabinose, glucose, fructose and mannose. Reactions of glucose and fructose Pyranoside structures of glucose and fructose Furanoside structure of fructose (structure elucidation not expected), muta rotation, epimerization, conversion of glucose into fructose and vice versa

Module II Vitamins 9hrs

Classification, source, isolation, physiological function and deficiency diseases caused by Vitamin A_1(retinol), A_2(axerophthol), Vitamin B-B_1 (thiamine), B_2(riboflavin and folic acid), B_5(niacin), B_6(Pyridoxine), B_{12} (Cyano cobalamine) Vitamin C (ascorbic acid),–Vitamin,D_2 (ergocalciferol), Vitamin E (Tochopherols), Vitamin H(biotin) and Vitamin K

Module III : Aminoacids and Proteins 9hrs

Classification,synthesis of glycine, alanine, phenyl alanine and aspartic acid, zwitter ion, isoelectric point,, reactions of aminoacids, peptide linkage, peptide synthesis, polypeptides, primary, secondary, tertiary and quarternary structure of proteins, classification, biological importance and tests for proteins.

Module IV: Enzymes and Hormones 9hrs

Enzymes- Characteristics, classification, factors influencing enzyme action, mechanism of enzyme action, Michaelis –Menton theory, enzyme inhibitors.

Hormones- Introduction, isolation, functions and abnormalities due to oxytocin, thyroxin, adrenalin, glutathione, progesterone, estrogens, cortisone, corticosterone, adrenalin

References

1. Concise Inorganic Chemistry J. D. Lee

2. Inorganic Chemistry Puri and Sharma

3. Chemistry of Organometallics Rochow

4. Organic Chemistry Vol 2 I.L. Finar

5. Chemistry of natural products Vol. 1 Gurdeep Chatwal

6 The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

7. Modern Inorganic Chemistry R D Madan.

Model Question paper for S_2 Complementary Chemistry-Course - II
Semester 2 CH1231 .5 (For Students of Home Science majors)
Organic Chemistry I

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)
Answer all questions.

I 1. Give the structure of D-glyceraldehyde?
2. Name an aldo pentose.
3. Give an example of a ketohexose
4. _____ is dextro rotatory

II 5. Which is the metal present in Vitamin B_{12}
6. Name a steroid vitamin
7. Deficiency of _____ causes xerophthalmia
8. Beriberi can be prevented by supplementing _____

III 9. Give an example of acidic amino acid
10. _____ is a peptide linkage
11. Isoelectric point of glycine is _____ .
12. Which is the reagent used in xanthoproteic test?

IV 13. _____ are biological catalysts.
14. Which is the optimum P^H of enzyme action
15. Abnormality caused by excess of cortisone in blood is _____ .
16. Name a protein Hormone **1×4 = 4**

Section B, Weightage1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Draw the ring structure of glucose and fructose
18. What is mutarotation?
19. Give an example each of fat soluble and water soluble vitamin
20. What is a zwitter ion?
21. How can you prepare glycine?
22. What is a prosthetic group?
23. What are the functions of oxytocin?
24. What is the action of bromine water on glucose?
25. What is the physiological function and deficiency disease caused by Vitamin C?
26. What is epimerisation?
27 .Explain classification of vitamins.
28. What is bile acid? **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Give relevant equations for conversion of fructose to fructosazone
30. Explain the isolation and physiological function of retinol.
31. What are fibrous and globular proteins? Explain.
32. What are the abnormalities shown by the imbalance of thyroxin?
33. What is vitamin E ? Mention its importance.
34. How can you convert pyruvic acid to alanine?
35. Write any two tests for protein
36. Deduce the D and L configuration of threose and erythrose. **2×5 = 10**

Section D, weightage 4 eaqch (long essay)

Answer any 2.

37. How can you convert glucose to fructose and vice versa?
38. Explain the secondary structure of protein.
39. What is enzyme catalysis? Give Michaelis -Menton theory of enzyme action.

4×2 = 8

Syllabus (Complementary course Chemistry)
(For Students of Home Science majors
SEMESTER 3 Course-3 Credit-3 Course Code – CH1331 .5
L-T-P 3-0-2
Organic Chemistry II Total - 54 hrs

Module 1: Colloids 9hrs

Introduction, dispersed phase, dispersion medium, classification, multi molecular, macromolecular and associated colloids. Preparation - condensation and dispersion methods, purification -dialysis and ultra filtration, properties of colloidal solution-optical, kinetic and electrical properties, coagulation, Hardy-Schultz rule, protective colloid, applications of colloidal systems, emulsions, emulsifiers and cleansing action of soap.

Module 2: Adsorption and Chromatography 9hrs

Adsorption-Adsorbent, adsorbate, desorption, types of adsorption, physical and chemical adsorption, kinds of adsorption, interactions, adsorption of gases and solutions on solids, importance of adsorption phenomena(applications)- adsorption in catalysis, Chromatography-Column, TLC, paper and gas chromatography.

Module 3: Colour and constitution, Dyes 9hrs

Colours, complimentary colours, chromophore-auxochrome theory, modern theory of colours, classification of dyes, preparation and uses of para red and methyl orange, phenolphthalein and fluorescein , Alizarin, malachite green

Module 4: Terpenes 9hrs

Introduction, isolation, occurrence, isoprene rule, classification, physical and chemical properties and uses of citral, geraniol, menthol and camphor. An elementary idea of the structure of natural rubber, synthetic rubber, Buna-N, Buna-S, Neoprene and Thiokol.

Module 5: Alkaloids 9hrs

Occurrence, general methods of isolation, functional group analysis, functional nature of oxygen containing groups -OH,-COOH,-CHO, >C= O groups, nature of

nitrogen, Hoffmann exhaustive methylation, structure and physiological actions of coniine, nicotine, quinine, morphine and codeine (structure elucidation is not expected)

Module 6: Polymers 9hrs

Natural and synthetic polymers, preparation and uses of vinyl polymers-PE, PVC, PVA, PS, PVF, PMMA, PTFE, Synthetic fibres-Nylon, Nylon 66,Terylene, Di methyl teraphthalat, polymers in medicine and surgery

Semester 3 References

1. Chemistry of natural products Vol. 1 Gurdeep Chatwal

2. The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

3. Organic Chemistry Vol 1 & 2 I.L. Finar

4. The Text Book of Organic Chemistry Arun Bahl & B S Bahl

5. Polymer Chemistry B.K Sharma

6. Inorganic Polymer Chemistry G S Misra

7. Bio Physical Chemistry Principles and techniques Avinash Upadhyay. Kakoli Upadhyay. Nirmalendu Nath

8. Food Chemistry L. H. Mayer

Model Question paper for S_3 Complementary Chemistry Course - III

(For Home Science Programme) Course Code CH1331 .5

Organic Chemistry II

Time : Three Hours Total Weightage : 30

Section A, weightage 1 each

(Answer all questions.)

I 1. Give an example of a sol
2. A liquid in liquid system of colloid is called_____
3. Name a purification method of colloidal system
4 Name an optical property shown by colloids

II 5. Adsorbent in TLC is _____.
6. Enthalpy of adsorption is negative. True or false.
7. The process of removing the adsorbed substance is known as _____.
8. Paper is _____ phase in paper chromatography?

III 9. Colour fixing group of a dye is known as _____.
10. An example of a chromophore is ____.
11. Give an example of an azo dye.
12. Name a dye that is used in acid base titration

IV 13. Draw the structure of citral.
14. Natural rubber is a _____ isomer.
15. How many isoprene units are there in sesquiterpenes?
16. What is the monomer of neoprene **1×4 = 4**

Section B, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. What is meant by coagulation of colloids?
18. Write any two applications of adsorption
19. What is the adsorbent used in chromatography? Differentiate adsorption and partition column chromatography
20. Give the preparation of methyl orange.
21. Give the structure of a phthalein dye.
22. Define isoprene and special isoprene rule
23. What is the action of Ag_2O on citral?
24. How is the functional nature of OH analysed in alkaloids?
25. Give the structure of Nylon 6,6
26. Expain the principle of ultramicroscope.
27. What is Bakelite?
28. Write the structure of coniine. **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. What is gold number ? Explain protective colloid
30. Give the preparation of alizarin
31. How is Thiokol prepared?
32. Explain Hoffmann exhaustive methylation.
33. Give the structure and physiological action of coniine.
34. How is polystyrene synthesised?
35. What is Hardy- Schultz rule ? Explain with an example.
36. Explain Delta formation. **2×5 = 10**

Section D, weightage 4 each (long essay)

(Answer any 2.)

37. Write an essay on the role of polymers in medicine and surgery.
38. What are emulsifiers? Explain the cleansing action of soap.
39. Give preparation and uses (1) PVC (2) PMMA (3) Terylene (4) PTFE

4×2 = 8

Syllabus (Complementary course Chemistry)
(For Students of Home Science majors)
SEMESTER 4 Course-4 Credit-3Course Code – CH1431 .5
Organic and Medicinal Chemistry

L-T-P 3-0-2 **Total- 54 hrs**

Module-1: Medicinal Chemistry 9hrs

Chemo therapy-Drugs- Classification, Elementary study of analgesics, antipyretics, antibiotics, antimalarials, sulphadrugs, mode of action of drugs, synthesis of aspirin and paracetamol

Module-2: Food additives 9hrs

Preservatives –Calcium propionate, sodium benzoate and sodiumbisulphite antioxidants-Structure and functions of Butylated hydroxy anisole(BHA), Butylated

hydroxy toluene(BHT),Vitamine A,E and C. Artificial sweeteners –Structure and applications of saccharin, aspartame and cyclamate. Emulsifiers-chitin

Module-3: Heterocyclics 9hrs

Introduction, Classification and nomenclature. Isolation, preparation, physical properties, acidic and basic character, addition , substitution, oxidation and resonance structures of of pyrrole, furan, thiophene and pyridine.

Module-4: Insecticides and pesticides 9hrs

Insecticides - classification and preparation of compounds like DDT, DDE and BHC. Methoxy chlor, malathion, parathion and carbamates(mention only).

An elementary study of antiseptics, disinfectants, pesticides, rodenticides, herbicides and fungicides.

Module-5: Environmental Chemistry -I 9hrs

Air and soil pollution-Introduction, different types of air and soil pollution, air pollutants SO_2, SO_3, NO,.NO_2 and smog. Acid rains, CO_2, CO, green house effect, O_3, importance of ozone layer, causes and effects of ozone layer depletion. Aerosol, photochemical oxidants, PAN, hydrocarbons, particulates, dust, smoke, asbestos, lead mercury, cadmium. Control of air pollution

Module-6: Environmental Chemistry - II 9hrs

Water pollution-Factors affecting the purity of water, sewage water, Industrial waste, agricultural pollution such pesticides, fertilizers, detergents; treatment of industrial waste, water using activated charcoal, synthetic resins, reverse osmosis and electro dialysis.

Semester 4 References

1. Chemistry of natural products Vol. 1 Gurdeep Chatwal

2. The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

3. Organic Chemistry Vol 1 & 2 I.L. Finar

4. The Text Book of Organic Chemistry Arun Bahl & B S Bahl

5. Polymer Chemistry B.K Sharma

6. Inorganic Polymer Chemistry G S Misra

7. Bio Physical Chemistry Principles and techniques Avinash Upadhyay.
Kakoli Upadhyay.
Nirmalendu Nath

8. Food Chemistry L. H. Mayer

Model Question paper for S_4 Complementary Course - IV
Course Code – CH1431 .5
(For Students of Home Science Programme)
Organic and Medicinal Chemistry

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)
(Answer all questions.)

I 1. Give the structure of aspirin.
2. Name a sulpha drug.
3. _____ is an analgesic
4. What is an antipyretic

II 5. _____ is a food preservative
6. A vitamin that can act as antioxidant.
7. Draw the structure of Saccharin
8. Write an example for emulsifier.

III 9. What is the product obtained on complete reduction of furan?
10. Give a reaction showing the acidic character of pyrrole.
11. A five membered heterocyclic containing sulphur atom is _____ .
12. Gas responsible for green house effect is _____

IV 13. Draw the structure of DDT.
14. BHC stands for _____ .
15. Write an example of an antiseptic.
16. What is the use of methoxychlor ? **1×4 = 4**

Section B, weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Name two antibiotics.
18. What is BHT? What are its functions?
19. What is the function of a food preservative?
20. How is thiophene isolated?
21. Give the sulphonation reaction of pyrrole.
22. Write two chemicals used for sterilisation
23. What is an aerosol ? Give example.
24. Explain reverse osmosis.
25. How is water freed from toxic organic matter?
26. Distinguish between hard and soft water.
27. What are the different types of pollutants in air?
28. Explain electrodialysis**. 1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Give the synthesis of aspirin.
30. What is the mode of action of drugs?
31. Explain the resonance structure of thiophene.
32. What are malathion and parathion?
33. Write a note on green house effect.
34. Explain the term photochemical oxidant. Give example.
35. Explain the preparation and properties of furan.

36. How are the following prepared ? (1) DDT (2) DDE (3) methoxychlor (4) BHC

2×5 = 10

Section D, weightage 4 each (long essay)

Answer any 2.

37. Give an outline of control of air pollution.
38. Explain the causes and effects of ozone layer depletion
39. Write the structure and applications of saccharine, aspartane and cyclamate. What is chitin ? Give its applications**.** **4×2 = 8**

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY

Course V Course Code CH1432 .5 Credit 2 Semesters 1,2,3 & 4

For students of Botany, Zoology, Home Science and Biochemistry majors

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – polynuclear hydrocarbons, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.

Organic preparations

1.Acetanilide from aniline

2.Metadinitrobenzene from nitro benzene

3.Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

I.Acidimetry and alkalimetry

a.Preparation and standardization of decinormal HCl using sodium carbonate as primary standard.

b.Estimation of sodium hydroxide using (i) Std oxalic acid and (ii) Std HCl

c.Determination of sodium hydroxide and sodium carbonate in a mixture (indicator method)

II.Permanganometry

a.Standardization of KMnO4 by oxalic acid/sodium oxalate and Mohr's salt

b.Estimation of oxalic acid/sodium oxalate

c.Estimation of Mohr's salt

d.Estimation of calcium

II.Dichrometry

a.Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b.Estimation of ferric iron by reduction with stannous chloride (internal indicator).

III.Iodimetry and Iodometry

a.Standardisation of sodium thiosulphate using std potassium dichromate

b.Estimation of copper in a solution

c.Estimation of iodine

IV.Complexometric titrations

a.Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

b.Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Gravimetric Analysis

1.Estimation of water of hydration in barium chloride crystals

2.Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st} ,2^{nd} , 3^{rd} and 4^{th} semesters

COURSE OFFERING AND CREDITS

Semester IV; credits: Two

COURSE OBJECTIVES

To equip the students with skill in qualitative and quantitative chemical analysis of inorganic materials.

After the course completion, the student will have the necessary training required for laboratory based wet chemical analysis.

COURSE TRANSACTION FORMAT

Lecture-Tutorial-Lab: 0-0-2 hours per week; eighteen 5-day weeks per semester.

Contact hours per semester: 36 hrs lab instruction.

MODE OF EVALUATION

Continuous Evaluation: The Continuous evaluation will have 25% percentage weightage. Grades A-E will be awarded for each component. There will be two quizzes / tests for which, the average of the two grades obtained will form part of CE. The CE components are: (i) Attendance for laboratory sessions (ii) Experiment (Lab) Report on completion of each set of experiments (iii) Laboratory Skill and (iv) Quiz / Test. These are summarized below. Total Weightage is 4.

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

Evaluation of the Experiment (Lab) report and Lab Skill: On completion of each experiment, an "experiment (lab) report" should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, tables of data collected, equations, calculations, graphs, other diagrams etc. as necessary and final results. Careless

experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

Mode of Experiment (Lab) Report Evaluation		
No	*Main Component*	*Grades*
1	Punctual submission and Neat presentation	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Inclusion of aim, materials, procedure etc.	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

Mode of Lab Skill Evaluation		
No	*Main Component*	*Grades*
1	Punctuality and experiment completion on time	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Lab skill & Neat arrangements of table and apparatus in lab	
3	Prompt and neat recording of observations in lab note book.	
4	Experimental Skill and attention to safety	

Details of the Lab Quiz / Test: The test for a lab course may be in the form of a quiz and two such tests are to be conducted. Based on the performance in answering the quiz, grades A-E may be awarded and the average grade earned in these two will be counted for CE. Two teachers, one of which is the course teacher, should conduct the quiz/test within the assigned lab contact hours.

End Semester Evaluation: 75% percentage weightage. Total Weightage is 30. The ESE of the qualitative experiment(analysis of the mixture of two cations for the physics\geology majors and organic compound analysis for the zoology, botany, biochemistry and homescience majors) and quantitative volumetric analysis of Course CH1432 will be on the 4th semester. The Examination will be of 3- hr duration.

The main components of the ESE for the Course CH1432 will be (i) Principle and Procedure, (ii) Experiment Report & Lab Skill, (iii) Calculations & Result and (iv) Lab Course Record and each of these components should be assessed as part of the ESE of lab courses based on the sub-components as given below.

Main Components of ESE For Lab Courses			
No	*Main Components in General*	*Weightage*	*Grades*
1	Principle and Procedure	4	A-E
2	Experiment Report & Lab Skill	8	A-E
3	Calculations & Result	12	A-E
4	Lab Course Record	6	A-E

If necessary this table may be modified by the Board of Examiners

The subdivisions in the case of (i) Inorganic Qualitative Analysis and (ii) Quantitative Volumetric Analysis are given below.

Semester IV Course Code CH1432 .5

1. Inorganic Quantitative Analysis(Volumetric Analysis)

Estimation of ion or salt in Volumetric Analysis .

To all complementary Courses

Sub-Components for End Sem Evaluation of Quantitative Volumetric Analysis				
No	*Main Component*	*Weightage*	*Sub-Components*	*Grades*
1	Principle and Procedure	2	i. Principle of the experiment stated & correct ii. Aim of the experiment stated & correct iii. Procedure stated & correct iv. Materials & apparatus specified	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
2	Experiment Report &Lab Skill	4	i. Standardization calculation correct ii. Estimation Calculation correct iii Unknown Weight Calculation Correct iv. Neatness of data and result presentation	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
3	Calculations & Result	6	i. ≤1% ii. >1- ≤ 1.4 iii.> 1.4 - ≤ 1.8 iv.> 1.8 - ≤ 2.2 v. > 2.2	A B C D E
4	Lab Course Record Book	3	i. Required No: of Experiments done ii. Data and experimental details sufficient iii. Correctness of results reported iv. Neatness of presentation and absence of errors/mistakes in the Record Book	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E

If necessary this table may be modified by the Board of Examiners

2. Organic Qualitative Analysis

Organic Compound Analysis-Zoology, Botany,Biochemistry& homescience majors

Sub-Components for End Sem Evaluation of Organic Qualitative Analysis				
No	*Main Component*	*Weightage*	*Sub-Components*	*Grades*
1	Principle and Procedure	2	i. Principle of the experiment stated ii. Aim of the experiment stated iii. Neatness iv. Materials & apparatus specified.	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
2	Experiment Report &Lab Skill	4	i. Preliminary experiments done ii. Detection of elements iii Saturated-unsaturated iv. Aromatic or not aromatic	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
3	Calculations & Result	6	i. 4 correct tests ii. 3 tests correct iii.2 correct tests iv.1 correct test v. 0 correct test	A B C D E
4	Lab Course Record Book	3	i. Required No: of Experiments done ii. Data and experimental details sufficient iii. Correctness of results reported iv. Neatness of presentation and absence of errors/mistakes in the Record Book	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E

If necessary this table may be modified by the Board of Examiners

Total weightage for ESE is 30 and for CE is 4.

CE for each half practical course(volumetric , cations, organic)

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

If necessary this table may be modified by the Board of Examiners

UNIVERSITY OF KERALA

FIRST DEGREE PROGRAMME

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

SCHEME AND SYLLABI

2010 ADMISSION ONWARDS

Complementary Chemistry offered to Biochemistry Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry Complementary

Complementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .6		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .6		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .6		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .6 CH1432 .6		3×18 =54 2×18 = 36

GENERAL ASPECTS OF EVALUATION

MODE OF EVALUATION - COMMON TO CORE , ELECTIVE, COMPLEMENTARY AND FOUNDATION COURSES

Evaluation of each course shall involve Continuous Evaluation (CE) with a weightage of 25 % and End Semester evaluation (ESE) with a weightage of 75 % . A system of performance based direct grading will be used with Grades A-E and the Grade Points as shown below.

Performance	Grade	Grade Point	Grade Range
Excellent	A	4	3.50-4.00
Very Good	B	3	2.50-3.49
Good	C	2	1.50-2.49
Average	D	1	0.50-1.49
Below Average	E	0	0.00-0.49

I. 1. CONTINUOUS EVALUATION FOR LECTURE COURSES

The Continuous evaluation will have 25% percentage weightage and will be done continuously during the semester. CE components are

(i) Attendance for lecture and laboratory sessions (to be noted separately where both lecture and laboratory hours have been specified within a course);

(ii) assignment /seminar and

(iii) test

Grades A-E will be awarded for each component. There will be two class tests for which, the average of the two grades obtained will form part of CE. Seminar for each course to be organized by the course teacher and assessed along with a group of teachers in the Dept. The topic selection by the student for assignments/seminar will be with the approval of the course teacher. Total weightage is 4.

Components of CE For Lecture Courses

No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Assignment / Seminar	1	A-E
3	Test paper	2	A-E

I. 1. 1. EVALUATION OF THE ASSIGNMENTS AND SEMINAR

The assignment typed/written on A4 size paper should be 4-6 pages. The minimum duration of the seminar is fifteen minutes and the mode of delivery may use audio-visual aids if available. Both the assignment and the seminar will first be evaluated by awarding grades A-E based for each of the four components below. The seminar is to be conducted within the contact hour allotted for the course.

Mode of Assignments / Seminar Evaluation		
No	*Main Component*	*Grades*
1	Adherence to overall structure & submission deadline	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Content & grasp of the topic	
3	Lucidity / Clarity of presentation	
4	References / Interaction/Overall effort	

The following guidelines are suggested as tentatively for the evaluation of each of the above main components. Thus, if all sub-components are present/satisfactory, then Grade A may be assigned to the main component.

Guidelines for Assignments / Seminar Evaluation		
No	*Main Component*	*Sub-Components*
1	Adherence to overall structure & submission deadline	i. Punctual submission ii. Adequate length/duration iii. Inclusion of Introduction, Discussion & Summary sections iv. Absence of errors/mistakes
2	Content & grasp of the topic	i. Coverage of topic ii. Understanding of topic iii. Logical organization iv. Originality (No copying from a source or plagiarism)
3	Lucidity / Clarity	i. Clarity ii. Effective presentation/delivery iii. Neatness of presentation iv. Inclusion of appropriate diagrams /equations /structures etc
4	References / Interaction/Overall effort	i. Listing of references ii. Use of more than one reference source/Use of Web resource iii. Correct Response to quiz /questions iv. Overall effort in preparing assignment/seminar

I. 1. 2. DETAILS OF THE CLASS TEST

1. The test has a duration of 1 hour.

2. Each question paper has four parts: A, B, C and D
3. Part A contains two questions. Each question contains four sub questions. Each question has a weight = 1. The questions may be in the forms - multiple choices, match the following, name the following or fill in the blanks or any one word- answer question (Objective).
4. Part B contains four questions. Out of these, the students have to answer two questions. Each answer should contain four points. Each question has a weight = 1(Short Answer).
5. Part C contains two questions of which the candidate has to answer one. Each question has a weight = 2. The answer must contain 8 points (Short Essay).
6. Part D contains two questions of which the candidate has to answer one. Each question has a weight = 4. Each answer must contain 16 points (Long Essay).
7. Total weightage for the entire questions to be answered is 10.

Question Paper Pattern for Test		
Question No	*Type of Question*	*Weightage*
Part A: I. 1-4; II. 4-8	2; Objective	1
Part B: 9-12	2 out of 4; Short Answer	1
Part C: 13,14	1 out of 2; Short Essay	2
Part D: 15,16	1 out of 2; Long Essay	4 Total = 10

I. 2. CONTINUOUS EVALUATION FOR LABORATORY COURSES

The Continuous evaluation will have 25% percentage weightage. For 5th semester, only CE evaluation will be done; the corresponding ESE will be in 6th semesters. Grades A-E will be awarded for each component. There will be two quizzes / tests for which, the average of the two grades obtained will form part of CE. The CE components are: (i) Attendance for laboratory sessions (ii) Experiment (Lab) Report on completion of each set of experiments (iii) Laboratory Skill and (iv) Quiz / Test. These are summarized below. Total Weightage is 4.

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

The guidelines for evaluating the two main components 2-4 using sub-component are presented below.

I. 2. 1. EVALUATION OF THE EXPERIMENT (LAB) REPORT

On completion of each experiment, a report should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, tables of data collected, equations, calculations, graphs,other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

Mode of EXPERIMENT (LAB) Report Evaluation		
No	*Main Component*	*Grades*
1	Punctual submission and Neat presentation	All four sub-components: A Only three : B Only two : C Only one : D None : E
2	Inclusion of aim, materials, procedure etc.	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

I. 2. 2. EVALUATION OF THE LAB SKILL

Mode of Lab Skill Evaluation		
No	*Main Component*	*Grades*
1	Punctuality and experiment completion on time	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Lab skill & Neat arrangements of table and apparatus in lab	
3	Prompt and neat recording of observations in lab note book.	
4	Experimental Skill and attention to safety	

I. 2. 3. EVALUATION OF THE LAB QUIZ / TEST

The test for a lab course may be in the form of a quiz and two such tests are to be conducted. Based on the performance in answering the quiz, grades A-E may be awarded and the better grade earned in these two will be counted for CE. Two teachers, one of which is the course teacher, should conduct the quiz/test within the assigned lab contact hours.

II. 1. END SEMESTER EVALUATION FOR LECTURE COURSES

The end semester evaluation will be done by the University at the end of the semester and it will have a 75% percentage weightage. End of semester University theory examination will be of 3-hr duration. Grades A-E will be awarded as per Regulations and the general aspects of evaluation.

II. 1. 1. END SEMESTER QUESTION PAPER PATTERN

1. The theory examination has a duration of 3 hours
2. Each question paper has four parts: A, B , C and D
3. Part A contains four questions . Each question contains four sub questions. Each question has a weight = 1. The questions may be in the forms - multiple choices, match the following, name the following or fill in the blanks or any one word- answer question (Objective type).

4. Part B contains twelve questions. Out of these twelve questions, the students have to answer eight questions. Each answer should contain four points. Each question has a weight = 1 (Short Answer type).
5. Part C contains eight questions of which the candidate has to answer five. Each question has a weight = 2. The answer must contain 8 points (Short Essay type).
6. Part D contains three questions of which the candidate has to answer two. Each question has a weight = 4. Each answer must contain 16 points (Long Essay type).
7. The total weightage for the entire questions to be answered is 30.

Syllabus for complementary courses

(for Bio Chemistry Majors)

Semester-1 Complementary Course No. - 1 Course Code-CH1131 .6 Credit-2 L-T-P 2-0-2

SEMESTER 1

Inorganic and Analytical Chemistry **36 hrs**

Module I –Atomic structure 9 hrs

Atomic spectra of hydrogen,-different series, Rydberg equation. Bohr theory-postulates –statement of Bohr energy equation –derivation of spectral frequency from Bohr equation-Schrodinger wave equation(mention only), concepts of orbitals, the four quantum numbers and their significance- Orbitalwise electron configuration, energy sequence rule, Pauli's principle, Hund's rule, stability of filled and half filled orbitals.

Module II- Analytical Principles 9 hrs

Principles of volumetric analysis, primary standards, Standard solutions, normality and molarity, numerical problems, theory of acid base titrations, permanganometric and dichrometric titrations, theory of acid base and redox indicators.(Numerical problems are to be worked out)

Module III- Radioactivity and Nuclear Chemistry 9 hrs

Radioactive equilibrium, , detection of radio activity, Geiger Muller Counter, Wilson cloud chamber, Units of radioactivity-Curie and Rutherford. Applications of radio activity- in medicine and agriculture, biological effects of radiation, pathological and genetic damage, Nuclear Chemistry-stability of nucleus, n/p ratio, artificial transmutation and radioactivity, mass defect, binding energy, neutron activation analysis

Module IV- Organometallics and biomolecules 9 hrs

Organometallic compounds –Definition and classification, Biological and environmental aspects of organometallics-organometallics in medicine ,Organo mercury, boron, silicon and arsenic compounds. Biomolecules –Metallo porphyrins, Haemoglobin and Myoglobin.

References

1. Concise Inorganic Chemistry J. D. Lee

2. Inorganic Chemistry Puri and Sharma

3. Chemistry of Organometallics Rochow

4. Organic Chemistry Vol 2 I.L. Finar

5. Chemistry of natural products Vol. 1 Gurdeep Chatwal

6 The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

7. Modern Inorganic Chemistry R D Madan

Model Question Paper Chemistry complementary for Biochemistry Majors
Semester I CH1131 .6 Course- I
Inorganic and Analytical Chemistry
Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)
Answer all questions.

I. 1 . Angular momentum of an electron is a whole number multiple of _____.
2 . Give the relationship between wavelength, frequency and velocity of electromagnetic radiation.
3. The Rydberg equation for calculating wave number of radiation is _____.
4. Give Schrödinger equation which describes the behaviour of the electron in an atom.

II. 5. A substance which is in the pure and stable form is called _____
6. _____ indicator is used for the titration between strong base and weak acid.
7. Name the internal indicator used for the estimation of Fe SO_4
8. _____ is the normality of 5% NaOH solution.

III. 9. Complete the equation $^{238}U_{92} \rightarrow$ _____ + $^{4}He_2$ + _____
10. Who introduced packing fraction?
11. What is meant by transmutation?
12. Name a device used to detect radioactivity.

IV. 13. Give example of one organometallic compound.
14. What are Grignard reagents?
15. Which is the solvent used in the preparation of Grignard reagents?
16. Myoglobin contains _____ in the high spin state. **1×4 = 4**

Section B , weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Draw the shapes of d orbitals
18. Give the names of 2 redox indicators
19. Write a note on stability of nucleus by n\p ratio.
20. Explain a method of preparation of organo mercuric compound.
21. Draw the structure of Mg Porphyrin
22. Calculate the weight of Na_2CO_3 required to prepare 250 ml N\10 solution..
23. Why HCl is not used in permanganometric titrations?
24. Mention any 2 applications of radioactivity.
25. Give the structure of 2 organo arsenic compounds .
26. Explain Hund's rule with a suitable example.
27. Define electronegativity, explain Pauling's electronegativity scale.
28. What are the units of radioactivity. Explain. **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Explain the wave nature of material objects. ii.What is uncertainty principle?
30. Explain mass defect and binding energy.
31. Write a short note on applications of organometallic compounds in medicine.
32. What are the functions of Myoglobin and Haemoglobin

33. Explain nuclear fission and nuclear fusion.
34. Explain normality, molarity and molality.
35. What are quantum numbers? Explain its significance.
36. What are the applications of radioactivity in agriculture ? **2×5 = 10**

Section D, weightage 4 each (long essay)

Answer any 2.

37. Derive Bohr frequency equation.
38. Write a note on acid base indicators.
39. W hat are biological effects of radiation? **4×2 = 8**

Syllabus(Complementary course Chemistry)
(For Students of Bio Chemistry Majors)

SEMESTER 2 Course No. 2 Course Code . CH1231 .6 Credit 2
L-T-P 2-0-2

Organic Chemistry 36 hrs

Module I: Carbohydrates 9hrs

Classification, configuration of glyceraldehydes, erythrose, threose, ribose,2-deoxy ribose, arabinose, glucose, fructose and mannose. Reactions of glucose and fructose Pyranoside structures of glucose and fructose Furanoside structure of fructose (structure elucidation not expected), muta rotation, epimerization, conversion of glucose into fructose and vice versa

Module II Vitamins 9hrs

Classification, source, isolation, physiological function and deficiency diseases caused by Vitamin A_1(retinol), A_2(axerophthol), Vitamin B-B_1 (thiamine), B_2(riboflavin and folic acid), B_5(niacin), B_6(Pyridoxine), B_{12} (Cyano cobalamine) Vitamin C (ascorbic acid),–Vitamin,D_2 (ergocalciferol), Vitamin E (Tochopherols), Vitamin H(biotin) and Vitamin K

Module III : Aminoacids and Proteins 9hrs

Classification,synthesis of glycine, alanine, phenyl alanine and aspartic acid, zwitter ion, isoelectric point,, reactions of aminoacids, peptide linkage, peptide synthesis, polypeptides, primary, secondary, tertiary and quarternary structure of proteins, classification, biological importance and tests for proteins.

Module IV: Enzymes and Hormones 9hrs

Enzymes- Characteristics, classification, factors influencing enzyme action, mechanism of enzyme action, Michaelis –Menton theory, enzyme inhibitors.

Hormones- Introduction, isolation, functions and abnormalities due to oxytocin, thyroxin, adrenalin, glutathione, progesterone, estrogens, cortisone, corticosterone, adrenalin

References

1. Concise Inorganic Chemistry J. D. Lee

2. Inorganic Chemistry Puri and Sharma

3. Chemistry of Organometallics Rochow

4. Organic Chemistry Vol 2 I.L. Finar

5. Chemistry of natural products Vol. 1 Gurdeep Chatwal

6 The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

7. Modern Inorganic Chemistry R D Madan

Model Question paper for S_2 Complementary Chemistry Course - II
Semester 2 CH1231 .6 (For Students of Bio Chemistry majors)
Organic Chemistry
Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)
Answer all questions.

I 1. Give the structure of D-glyceraldehyde?
2. Name an aldo pentose.
3. Give an example of a ketohexose
4. _____ is dextro rotatory

II 5. Which is the metal present in Vitamin B_{12}
6. Name a steroid vitamin
7. Deficiency of _____ causes xerophthalmia
8. Beriberi can be prevented by supplementing _____

III 9. Give an example of acidic amino acid
10. _____ is a peptide linkage
11. Isoelectric point of glycine is _____ .
12. Which is the reagent used in xanthoproteic test?

IV 13. _____ are biological catalysts.
14. Which is the optimum P^H of enzyme action
15. Abnormality caused by excess of cortisone in blood is _____ .
16. Name a protein Hormone **1×4 = 4**

Section B, Weightage1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Draw the ring structure of glucose and fructose
18. What is mutarotation?
19. Give an example each of fat soluble and water soluble vitamin
20. What is a zwitter ion?
21. How can you prepare glycine?
22. What is a prosthetic group?
23. What are the functions of oxytocin?
24. 24.What is the action of bromine water on glucose?
25. What is the physiological function and deficiency disease caused by Vitamin C?
26. What is epimerisation?
27. Explain classification of vitamins.
28. What is bile acid? **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Give relevant equations for conversion of fructose to fructosazone
30. Explain the isolation and physiological function of retinol.
31. What are fibrous and globular proteins? Explain.
32. What are the abnormalities shown by the imbalance of thyroxin?
33. What is vitamin E ? Mention its importance.
34. How can you convert pyruvic acid to alanine?
35. Write any two tests for protein
36. Deduce the D and L configuration of threose and erythrose. **2×5 = 10**

Section D, weightage 4(long essay)

Answer any 2.

37. How can you convert glucose to fructose and vice versa?
38. Explain the secondary structure of protein.
39. What is enzyme catalysis? Give Michaelis -Menton theory of enzyme action

4×2 = 8

Syllabus for complementary course

(for Biochemistry Majors)

Semester-3 Course-3 Credit-3Course Code – CH1331 .6

Inorganic and Organic Chemistry and Spectroscopy Total - 54hrs

L-T-P 3-0-2

Module I: Chemical Bonding 9hrs

Energies of bond formation Born-Haber cycle, hybridization and structure of molecules-sp, sp^2,sp^3,dsp^2,dsp^3,sp^3d^2 hybridisation with examples, explanation of bond angle in water and ammonia, VSEPR Theory with regular and irregular geometry , polarity of covalent bond, its relation with electronegativity, electronegativity scale-Paulings and Mullickens approaches, factors influencing polarity, dipole moment, its relation to geometry, hydrogen bond, intra and intermolecular hydrogen bond, its consequence on BP, volatility and solubility, partial covalent character of ionic bond, Fajan's rule

Module II: Coordination Chemistry 9hrs

Nomenclature, coordination number, geometry, chelates, isomerism, structural and stereoisomerism, Valence Bond theory of bonding in octahedral and tetrahedral complexes, high spin and low spin complexes, drawbacks of Valence Bond theory, magnetic properties and application in qualitative and quantitative analysis

Module III : Mechanism in Organic Substitution Reactions 9hrs

Electron displacement in organic molecules, inductive, electromeric and mesomeric effects, hyper conjugation and steric effect , bond fission, rate determining step nucleophilic substitution of alkyl halides, SN1, SN2 reactions, effect of structure on reactivity as illustrated by methyl, ethyl, isopropyl and tertiary groups, aromatic electrophilic substitution reactions, directive influence

Module IV: Stereochemistry 9hrs

Optical isomerism, chirality, racemisation and resolution, relative and absolute configuration, asymmetric synthesis, optical isomerism, E and Z nomenclature, aldoxims and ketoxims, rotational isomerism, rotation about carbon – carbon single bond, conformation of ethane, propane, butane, cyclohexane, axial and equatorial bonds

Module V : Spectroscopy – I 9hrs

Regions of electromagnetic spectrum interaction radiation with matter, different types of energy levels in molecules, rotation , vibration and electronic levels, various types of molecular spectra, microwave spectroscopy, spectra of diatomic molecules, expression for rotational energy, selection rules, frequency separation, equation for frequency of vibration, expression for vibrational energy, selection rule, calculation of force constant

Module VI: Hetrocyclics and Alkaloids 9hrs

An outline study of the preparation and propertifs of Furan, Pyrrole, Thiophene, Pyridine, Hoffmans exhaustive methylation, Alkaloids, general method of isolation, general properties, physiological action of alkaloids, conine, morphine and nicotine(no structural elucidation expected)

References :

1. Basic Inorganic Chemistry : F. A. Cotton G. Wilkinson and P. L. Gaus, Wlley
2. Concise Inorganic Chemistry : J. D. Lee, ELBS
3. Essentials of Nuclear Chemistry : H. S. Arniker
4. Environmental Pollution : B. K. Sharma
5. Inorganic Chemistry : J. E. Huheey
6. Coordination Chemistry : Bosolo and Johnson
7. Bio Inorganic Chemistry : M.N. Hughes
8. Organic Chemistry : Peter Sykes
9. Organic Chemistry : F. A. Carey, Mc Graw Hill
10. Organic Chemistry : Morrison & Boyd
11. Reaction Mechanism of Organic Chemistry : S. M. Mukherji and S. P. Singh, Mc Millan
12. Organic Chemistry, Vol. I & II I. L. Finar, Longman
13. Advanced Organic Chemistry : Jerry March

Model Question paper for S_2 Complementary Chemistry Course - II

Semester 2 CH1231 .6 (For Students of Bio Chemistry majors)

Inorganic and Organic Chemistry and Spectroscopy

Time : Three Hours **Total Weightage : 30**

Section A, weightage 1 each (answer in one word \ sentence)

Answer all questions.

I 1. Give the structure of D-glyceraldehyde?
2. Name an aldo pentose.
3. Give an example of a ketohexose
4. _____ is dextro rotatory

II 5. Which is the metal present in Vitamin B_{12}

6. Name a steroid vitamin
7. Deficiency of _____ causes xerophthalmia
8. Beriberi can be prevented by supplementing _____

III 9. Give an example of acidic amino acid
10. _____ is a peptide linkage
11. Isoelectric point of glycine is _____ .
12. Which is the reagent used in xanthoproteic test?

IV 13. _____ are biological catalysts.
14. Which is the optimum P^H of enzyme action
15. Abnormality caused by excess of cortisone in blood is _____ .
16. Name a protein Hormone **1×4 = 4**

Section B, Weightage1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. Draw the ring structure of glucose and fructose
18. What is mutarotation?
19. Give an example each of fat soluble and water soluble vitamin
20. What is a zwitter ion?
21. How can you prepare glycine?
22. What is a prosthetic group?
23. What are the functions of oxytocin?
24 .What is the action of bromine water on glucose?
25. What is the physiological function and deficiency disease caused by Vitamin C?
26. What is epimerisation?
27. Explain classification of vitamins.
28. What is bile acid? **1×8 = 8**

Section C, weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Give relevant equations for conversion of fructose to fructosazone
30. Explain the isolation and physiological function of retinol.
31. What are fibrous and globular proteins? Explain.
32. What are the abnormalities shown by the imbalance of thyroxin?
33. What is vitamin E ? Mention its importance.
34. How can you convert pyruvic acid to alanine?
35. Write any two tests for protein
36 .Deduce the D and L configuration of threose and erythrose.**2×5 = 10**

Section D, weightage 4 each (long essay)

Answer any 2.

37. How can you convert glucose to fructose and vice versa?
38. Explain the secondary structure of protein.
39. What is enzyme catalysis? Give Michaelis -Menton theory of enzyme action.

4×2 = 8

Syllabus for complementary course

(for Biochemistry students)

Semester-4 Course-4 Credit-3Course Code –CH1431 .6

Organic Chemistry and Spectroscopy-II L-T-P 3-0-2 Total 54hrs

Module I: Chromatography 9hrs

Adsorption and partition chromatography, column, paper and thin layer chromatography, Rf value, applications, gas chromatography, applications, ion-exchange chromatography, applications

Module II : Nucleic acids and Lipids 9hrs

Nucleic acids: RNA and DNA, their biological role, hydrolysis of nucleoproteins, elementary idea regarding the structure of nucleic acids, Lipids: Classification, oils, fats and waxes, iodine value, saponification value, properties of oils and fats, phospholipids

Module III : Polymers and Terpenes 9hrs

Polymers- Classification with examples- natural and synthetic condensation and addition polymerization, elastic fibre, thermoplastics and thermosetting plastics, Rubber structure, vulcanisation of rubber, neoprene, butyl rubber, Buna-S, Buna-N, synthetic polymers, Nylon-6, Nylon-66, Bakelite, elementary idea of the structure of natural rubber, Terpenes- classification, isoprene rule, essential oils, elementary study of citral and geraniol(structural elucidation not required)

Module IV : Biophysical Analysis 9hrs

Osmosis osmotic pressure, isotonic solution, determination of molar mass by osmotic pressure method, reverse osmosis, adsorption - types of adsorption, applications factors influencing adsorption, Langmuir theory of adsorption

Module V: Colloids 9hrs

Properties of colloids , Tyndal effect, ultra microscope, Brownian movement, elecrophoresis, electroosmosis, sedimentation and streaming potential stability of colloids, Zeta potential, Hardy- Schultz protective colloids, gold number, emulsion, gels, application of colloids, delta formation, medicines, sewage disposal, emulsification and cleansing action of detergents and soaps.

Module VI : Spectroscopy II 9hrs

Raman spectroscopy, stokes and antistokes lines, quantum theory of Raman spectrum, advantages and disadvantages of Raman spectrum, rotational Raman, vibrational Raman spectrum, complementary with IR spectrum, mutual exclusion principle, NMR spectroscopy, principle of NMR spectroscopy, nuclear spin, interaction with external magnetic field, chemical schift, spin-spin coupling, applications

References :

1. Basic Inorganic Chemistry : F. A. Cotton G. Wilkinson and P. L. Gaus, Wlley
2. Concise Inorganic Chemistry : J. D. Lee, ELBS
3 .Essentials of Nuclear Chemistry : H. S. Arniker
4. Environmental Pollution : B. K. Sharma
5 .Inorganic Chemistry : J. E. Huheey
6. Coordination Chemistry : Bosolo and Johnson
7. Bio Inorganic Chemistry : M.N. Hughes
8 .Organic Chemistry : Peter Sykes

9. Organic Chemistry : F. A. Carey, Mc Graw Hill
10. Organic Chemistry : Morrison & Boyd
11. Reaction Mechanism of Organic Chemistry : S. M. Mukherji and S. P. Singh, Mc Millan
12. Organic Chemistry, Vol. I & II I. L. Finar, Longman
13 Advanced Organic Chemistry : Jerry March

Model Questions Semester IV (for Bio chemistry Majors)
Course Code CH1431 .6 Course – IV
Organic Chemistry and Spectroscopy II
Time : Three Hours Total Weightage : 30

Section A, Weightage 1 each (answer in one word \ sentence)

I 1. Rf value is _____-
2. If concentration at the surface is greater than that in the bulk the phenomenon is called _____.
3. The chromatographic method where the components are separated in stacks is called _____.
4. Sugar present in RNA is _____.

II 5. Write the expansion of DNA.
6. Name one lipid.
7. Name the components obtained on hydrolysing nucleoprotein.
8. Name the two main types of polymers.

III 9. Nylon 66 is _____.
10. Bakelite is the polymer of formaldehyde and _____.
11. _____ is the monomer of natural rubber.
12. An example of a monoterpene is _____.

IV 13. Write the expression of Langmuir's adsorption isotherm.
14. The zig-zag migration of particles in a colloid is called _____.
15. _____ and _____ are examples of nmr active nuclei
16. ESR spectrum is shown by _____magnetic substances. **1×4 = 4**

Section B, Weightage 1 each (short answer type)

Answer any eight questions from the following. Each answer must contain 4 points.

17. What are Stokes and anti Stokes lines?
18. Write in brief "Ion exchange chromatography."
19. What is paper chromatography.
20. What is iodine value ?
21. Explain saponification value.
22. What are terpenes ?
23. Explain the stereochemistry of double bond in natural rubber..
24. What are isotonic solutions ?
25. What is Tyndall effect ?
26. What is Hardy-Schultz rule?
27. Explain mutual exclusion rule ?
28. What is chemical shift? **1×8 = 8**

Section C, Weightage 2 each (short essay)

Answer any 5 questions from the following. Each answer must contain 8 points.

29. Write a note on partition chromatography.
30. Explain biological roles of RNA and DNA.
31. Distinguish between addition and condensation polymerization.
32. Distinguish between thermoplastics and thermosetting plastics.
33. What are the different types of adsorption and the factors influencing adsorption.
34. Define elecrophoresis and electro osmosis.
35. Explain the terms (1) emulsion (2) gel
36. Explain spin-spin coupling in nmr spectroscopy. **2×5 = 10**

Section D, Weightage 4 each (long essay)

37. Briefly explain the theory and principle of Raman spectroscopy.
38. Explain in detail the applications of colloids.
39. (a) How is molar mass determined by osmotic pressure method.
    (b) Writ a note on cleansing action of soaps and detergents. **4×2 = 8**

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY

Course V Course Code CH1432 .6 Credit 2 Semesters 1,2,3 & 4

For students of Botany, Zoology, Home Science and Biochemistry majors

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – polynuclear hydrocarbons, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.

Organic preparations

1.Acetanilide from aniline

2.Metadinitrobenzene from nitro benzene

3.Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

I.Acidimetry and alkalimetry

a.Preparation and standardization of decinormal HCl using sodium carbonate as primary standard.

b.Estimation of sodium hydroxide using (i) Std oxalic acid and (ii) Std HCl

c.Determination of sodium hydroxide and sodium carbonate in a mixture (indicator method)

II.Permanganometry

a.Standardization of KMnO4 by oxalic acid/sodium oxalate and Mohr's salt

b.Estimation of oxalic acid/sodium oxalate

c.Estimation of Mohr's salt

d.Estimation of calcium

III.Dichrometry

a.Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b.Estimation of ferric iron by reduction with stannous chloride (internal indicator).

IV.Iodimetry and Iodometry

a.Standardisation of sodium thiosulphate using std potassium dichromate

b.Estimation of copper in a solution

c.Estimation of iodine

V.Complexometric titrations

a.Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

b.Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Gravimetric Analysis

1.Estimation of water of hydration in barium chloride crystals

2.Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1st ,2nd , 3rd and 4th semesters

COURSE OFFERING AND CREDITS

Semester IV; credits: Two

COURSE OBJECTIVES

To equip the students with skill in qualitative and quantitative chemical analysis of inorganic materials.

After the course completion, the student will have the necessary training required for laboratory based wet chemical analysis.

COURSE TRANSACTION FORMAT

Lecture-Tutorial-Lab: 0-0-2 hours per week; eighteen 5-day weeks per semester.

Contact hours per semester: 36 hrs lab instruction.

MODE OF EVALUATION

Continuous Evaluation: The Continuous evaluation will have 25% percentage weightage. Grades A-E will be awarded for each component. There will be two quizzes / tests for which, the average of the two grades obtained will form part of CE. The CE components are: (i) Attendance for laboratory sessions (ii) Experiment (Lab) Report on completion of each set of experiments (iii) Laboratory Skill and (iv) Quiz / Test. These are summarized below. Total Weightage is 4.

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

Evaluation of the Experiment (Lab) report and Lab Skill: On completion of each experiment, an "experiment (lab) report" should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, tables of data collected, equations, calculations, graphs, other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

Mode of Experiment (Lab) Report Evaluation		
No	*Main Component*	*Grades*
1	Punctual submission and Neat presentation	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Inclusion of aim, materials, procedure etc.	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

Mode of Lab Skill Evaluation		
No	*Main Component*	*Grades*
1	Punctuality and experiment completion on time	All four sub-components : A Only three : B Only two : C Only one : D None : E
2	Lab skill & Neat arrangements of table and apparatus in lab	
3	Prompt and neat recording of observations in lab note book.	
4	Experimental Skill and attention to safety	

Details of the Lab Quiz / Test: The test for a lab course may be in the form of a quiz and two such tests are to be conducted. Based on the performance in answering the quiz, grades A-E may be awarded and the average grade earned in these two will be counted

for CE. Two teachers, one of which is the course teacher, should conduct the quiz/test within the assigned lab contact hours.

End Semester Evaluation: 75% percentage weightage. Total Weightage is 30. The ESE of the qualitative experiment(analysis of the mixture of two cations for the physics\geology majors and organic compound analysis for the zoology, botany, biochemistry and homescience majors) and quantitative volumetric analysis of Course CH1432 will be on the 4th semester. The Examination will be of 3- hr duration.

The main components of the ESE for the Course CH1432 will be (i) Principle and Procedure, (ii) Experiment Report & Lab Skill, (iii) Calculations & Result and (iv) Lab Course Record and each of these components should be assessed as part of the ESE of lab courses based on the sub-components as given below.

Main Components of ESE For Lab Courses			
No	*Main Components in General*	*Weightage*	*Grades*
1	Principle and Procedure	4	A-E
2	Experiment Report & Lab Skill	8	A-E
3	Calculations & Result	12	A-E
4	Lab Course Record	6	A-E

If necessary this table may be modified by the Board of Examiners

The subdivisions in the case of (i) Inorganic Qualitative Analysis and (ii) Quantitative Volumetric Analysis are given below.

Semester IV Course Code CH1432 .6

1. Inorganic Quantitative Analysis(Volumetric Analysis)

Estimation of ion or salt in Volumetric Analysis .

To all complementary Courses.

Sub-Components for End Sem Evaluation of Quantitative Volumetric Analysis				
No	*Main Component*	*Weightage*	*Sub-Components*	*Grades*
1	Principle and Procedure	2	i. Principle of the experiment stated & correct ii. Aim of the experiment stated & correct iii. Procedure stated & correct iv. Materials & apparatus specified	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
2	Experiment Report &Lab Skill	4	i. Standardization calculation correct ii. Estimation Calculation correct iii Unknown Weight Calculation Correct iv. Neatness of data and result presentation	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
3	Calculations & Result	6	i. ≤1% ii. >1- ≤ 1.4 iii.> 1.4 - ≤ 1.8 iv.> 1.8 - ≤ 2.2 v. > 2.2	A B C D E
4	Lab Course Record Book	3	i. Required No: of Experiments done ii. Data and experimental details sufficient iii. Correctness of results reported iv. Neatness of presentation and absence of errors/mistakes in the Record Book	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E

If necessary this table may be modified by the Board of Examiners

2. Organic Qualitative Analysis

Organic Compound Analysis-Zoology, Botany,Biochemistry& homescience majors

Sub-Components for End Sem Evaluation of Organic Qualitative Analysis				
No	*Main Component*	*Weightage*	*Sub-Components*	*Grades*
1	Principle and Procedure	2	i. Principle of the experiment stated ii. Aim of the experiment stated iii. Neatness iv. Materials & apparatus specified.	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
2	Experiment Report &Lab Skill	4	i. Preliminary experiments done ii. Detection of elements iii Saturated-unsaturated iv. Aromatic or not aromatic	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E
3	Calculations & Result	6	i. 4 correct tests ii. 3 tests correct iii.2 correct tests iv.1 correct test v. 0 correct test	A B C D E
4	Lab Course Record Book	3	i. Required No: of Experiments done ii. Data and experimental details sufficient iii. Correctness of results reported iv. Neatness of presentation and absence of errors/mistakes in the Record Book	All 4 subcomponents : A Only three : B Only two : C Only one : D None : E

If necessary this table may be modified by the Board of Examiners

Total weightage for ESE is 30 and for CE is 4.

CE for each half practical course(volumetric , cations, organic)

Components of CE For Lab Courses			
No	*Component*	*Weightage*	*Grades*
1	Attendance	1	≥90% - A <90 - ≥85% - B <85 - ≥80% - C <80 - ≥75% - D <75% - E
2	Experiment (Lab) Report	1	A-E
3	Laboratory Skill	1	A-E
4	Quiz / Test	1	A-E

If necessary this table may be modified by the Board of Examiners