

Government College, Hisar

Unit wise Lesson Plan for Odd Semester (July 2023 to Dec 2023)

Department: Chemistry

CLASS: B.Sc. I Semester 1st Paper: Inorganic Chemistry -I Code: CCL 104

Name : Savita Rani, Mrs. Suman, Mr. Amit

Week	Contents
Week 1	Atomic Structure-I Review of: Bohr's theory and its limitations
Week 2	Dual behaviour of matter and radiation, de Broglie's relation. Heisenberg Uncertainty principle.
Week 3	Hydrogen atom spectra. Need of a new approach to Atomic structure.
Week 4	What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2 , Schrödinger equation for hydrogen atom.
Week 5	Radial and angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for $1s$, $2s$, $2p$, $3s$, $3p$ and $3d$ orbitals (Only graphical representation).
Week 6	Atomic Structure-II Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to $1s$ and $2s$ atomic orbitals.
Week 7	Significance of quantum numbers, orbital angular momentum and quantum numbers ml and ms .
Week 8	Shapes of s , p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (ms).
Week 9	Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Relative energies of atomic orbitals, Anomalous electronic configurations. Stability of half-filled and completely filled orbitals, concept of exchange energy.
Week 10	Chemical Bonding <i>Ionic Bonding</i> : General characteristics of ionic bonding. Energy considerations in ionic bonding.
Week 11	lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy
Week 12	Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.
Week 13	<i>Covalent bonding</i> : VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.
Week 14	Concept of resonance and resonating structures in various inorganic and organic compounds.
Week 15	Molecular Structure MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for $s-s$, $s-p$ and $p-p$ combinations of atomic orbitals, nonbonding combination of orbitals, and
Week 16	MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of $s-p$ mixing)
Week 17	MO treatment of heteronuclear diatomic molecules such as CO, NO and NO ⁺ . Comparison of VB and MO approaches.
Week 18	Revision

LESSON PLAN (FROM JULY 2023 TO DECEMBER 2023)

NAME: Dr. Sonal Vishnoi, Dr. Sunil Kumar, Mrs. Sarita

Paper Code: CCL-105

CLASS: B.Sc. I -1st Sem (Organic Chemistry)

Dates	Contents
Week 1	Fundamentals of Organic Chemistry Physical Effects, Electronic Displacements: Inductive and Electromeric Effect
Week 2	Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules:
Week 3	Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Strength of organic acids and bases:
Week 4	Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.
Week 5	Stereochemistry Conformations with respect to ethane, butane and cyclohexane.
Week 6	Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. \
Week 7	Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds).
Week 8	Threo and erythro; D and L; cis - trans nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms)
Week 8	E / Z Nomenclature (for upto two C=C systems).
Week 9	Aliphatic Hydrocarbons-I Alkanes: Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent.
Week 10	Reactions: Free radical Substitution: Halogenation. Alkenes: (Upto 5 Carbons) Preparation:
Week 10	Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule);
Week 11	cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction).
Week 12	Reactions: cis-addition (alk. KMnO ₄) and trans-addition (bromine),
Week 13	Addition of HX (Markownikoff's and anti-Markownikoff's addition)
Week 14	Hydration, Ozonolysis, oxymercuration-demercuration, Hydroboration-oxidation.
Week 15	Aliphatic Hydrocarbons-II Alkynes: Preparation: Acetylene from CaC ₂ and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.
Week 16	Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO ₄ , ozonolysis and oxidation with hot alkaline KMnO ₄
Week 17	Revision of Topics

LESSON PLAN (From July 2023 to December 2023)

Name: Dr. Poonam Sangwan

Class: B.Sc. I (Maths Hons.) 1stSem BCL-101

Subject: Chemistry

	Contents
Week 1	Chemical Thermodynamics: Objectives and limitations of Chemical thermodynamics, State Functions, thermodynamic Equilibrium, Work, heat, internal energy, enthalpy. First the Laws of Thermodynamics for open, close and isolated systems.
Week 2	Reversible isothermal and adiabatic expansion/ compression of an ideal gas. Irreversible isothermal and adiabatic expansion. Enthalpy change and its measurement, Concept of standard state and standard heat of formation and absolute enthalpies. Variation of enthalpy of a reaction with temperature – Kirchoff's equation.
Week 3	Second and third law: various statements of second law of thermodynamics, efficiency of cyclic process (Carnot's cycle). Entropy changes of an ideal gas with changes in P, V and T. Free energy and work functions. Gibbs Helmholtz equation. Criteria of spontaneity in terms of changes in free energy. Introduction of Third Law of thermodynamics. Back log of chapter if any, discussion and problems taken
Week 4	Conductance and Electrochemistry: Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Molar Conductivity at Infinite Dilution, Kohlrausch law of independent migration of ions. Transference number and its experimental determination using Hittorf and Moving boundary methods.
Week 5	Ionic mobilities, determination of Transference number and its experimental determination using Hittorf and Moving boundary methods. Applications of Conductance to measure degree of dissociation of weak electrolytes.
Week 6	Quantitative aspects of Faraday's laws of electrolysis, rules of oxidation/ reduction of ions based on half cell potentials, application of electrolysis in metallurgy and industry. Chemical cell with examples, standard electrode (reduction) potential.
Week 7	Fundamentals of Organic Chemistry Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect
Week 8	Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules:
Week 9	Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Strength of organic acids and bases:
Week 10	Stereochemistry Conformations with respect to ethane, butane and cyclohexane.
Week 11	Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations.
Week 12	Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds).
Week 13	Threo and erythro, D and L, cis - trans nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms). E / Z Nomenclature (for upto two C=C systems).
Week 14	Chemistry of Biomolecules: occurrence, Classification of Carbohydrates, Amino Acids, Peptides and their Classification.
Week 15	Alpha Amino acids, Zwitterions, pKa, Isoelectric point, Components of Nucleic Acids.
Week 16	Nucleosides and Nucleotides. Discussion and problems taken.
Week 17	Problems taken Discussion and Seminars. Revision and class test.

Government College, Hisar

Department of Chemistry

LESSON PLAN (From July 2023 to December 2023)

CLASS: B.Sc. II (Sem III)

Paper: Physical Chemistry

Code: CCL-304

Name: Dr. Meenakshi

Weeks	Contents
Week 1	Thermodynamics of ideal solution: Ideal solutions and Raoult's Law, deviations from Raoult's law-non ideal solution, Vapour pressure-composition and temperature composition curves of ideal and non-ideal solutions. Distillation of solutions, Azeotropes
Week 2	Colligative properties of solutions, thermodynamic derivations of relation between amount of solute and elevation in boiling point and depression in freezing point.
Week 3	Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids. Immiscibility of liquids-Principle of steam distillation.
Week 4	Phase, components and degree of freedom of a system, criteria of phase equilibrium, Gibbs phase rule and its thermodynamic derivation.
Week 5	Derivation of Clausius-Clapeyron equation and its importance in phase equilibria, phase diagrams of one component systems (water and sulphur)
Week 6	Phase diagrams of two component systems involving eutectics, congruent and incongruent melting points (lead-silver and Na-K)
Week 7	Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions
Week 8	Transference number, ionic mobility, Application of conductance measurements: derivation of degree of ionization of weak electrolyte,
Week 9	Solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt.
Week 10	Conductometric titrations (only acid-base), Concept of pH and pKa, buffer solution, Handerson Hazel Blac equation
Week 11	Reversible and irreversible cells, Concept of EMF of a cell, Measurement of EMF of a cell
Week 12	Nernst equation and its importance, types of electrodes
Week 13	Standard electrode potential, Electrochemical series , thermodynamics of reversible cell
Week 14	Calculation of thermodynamic properties: $\Delta G, \Delta H$ and ΔS from EMF data, calculation of equilibrium constant from EMF data
Week 15	Concentration cells with transference and without transference, Liquid junction potential and salt bridge
Week 16	pH determination using hydrogen electrode and quinhydrone electrode, potentiometric titrations-qualitative treatment(acid-base and oxidation-reduction only)
Week 17	Revision and discussion on problems

LESSON PLAN (From July 2023 To November 2023)

CLASS: B.Sc. II; Semester IIIrd Paper: Organic Chemistry Code: 305

Name : Dr. Meera and Dr. Savita

Week	Contents
Week 1	Diazonium salts: Structure and <i>Preparation:</i> from aromatic amines.
Week 2	<i>Reactions:</i> C conversion to benzene, phenol, dyes
Week 3	Amines (Aliphatic and Aromatic): (Upto 5 carbons): <i>Preparation:</i> from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide reaction
Week 4	<i>Reactions:</i> Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO ₂
Week 5	Schotten-Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation.
Week 6	Carboxylic acids (aliphatic and aromatic): <i>Preparation:</i> Acidic and Alkaline hydrolysis of esters. <i>Reactions:</i> Hell-Vohlard-Zelinsky Reaction.
Week 7	Carboxylic acid derivatives (aliphatic): (Upto 5 carbons) <i>Preparation:</i> Acid chlorides, Anhydrides, Esters and Amides from acids and their interconversion.
Week 8	<i>Reactions:</i> Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation.
Week 9	Amino acids and Proteins: <i>Preparation of Amino Acids:</i> Strecker synthesis using Gabriel's phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis.
Week 10	<i>Reactions of Amino acids:</i> ester of -COOH group, acetylation of -NH ₂ group, complexation with Cu ²⁺ ions, ninhydrin test.
Week 11	Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins.
Week 12	Determination of Primary structure of Peptides by degradation Edmann degradation (N-terminal) and C-terminal (thiohydantoin and with carboxypeptidase enzyme).
Week 13	Synthesis of simple peptides (upto dipeptides) by N-protection (t-butyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid-phase synthesis.
Week 14	Carbohydrates: Classification, and General Properties, Glucose and Fructose (open chain and cyclic structure), Determination of configuration of monosaccharides
Week 15	absolute configuration of Glucose and Fructose, Mutarotation Ascending and descending in monosaccharides.
Week 16	Structure of disacharrides (sucrose, cellobiose, maltose, lactose) Polysacharrides (starch and cellulose) excluding their structure elucidation.
Week 17	Revision of topics

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LESSON PLAN (From July 2023 To November 2023)

CLASS: B.Sc. II; Semester IIIrd Paper: Physical Chemistry Code: 304

Name : Dr. Sweety Monga

Weeks	Contents
Week 1	Solutions: Thermodynamics of ideal solution: Ideal solutions and Raoult's Law, ,
Week 2	deviations from Raoult's law-non ideal solution, Vapour pressure-composition curves of ideal and non-ideal solutions
Week 3	Temperature composition curves of ideal and non-ideal solutions.
Week 4	Distillation of solutions, Azeotropes, Colligative properties of solutions
Week 5	thermodynamic derivations of relation between amount of solute and elevation in boiling point and depression in freezing point.
Week 6	Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids.
Week 7	Immiscibility of liquids-Principle of steam distillation.
Week 8	Phase Equilibrium: Phase, components and degree of freedom of a system, criteria of phase equilibrium, Gibbs phase rule and its thermodynamic derivation.
Week 9	Derivation of Clausius-Clapeyron equation and its importance in phase equilibria, phase diagrams of one component systems (water and sulphur)
Week 10	phase diagrams of two component systems involving eutectics, congruent and incongruent melting points (lead-silver and Na-K)
Week 11	Conductance: Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions. Transference number, ionic mobility, Application of conductance measurements: derivation of degree of ionization of weak electrolyte,
Week 12	Solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid-base), Concept of pH and pKa, buffer solution, Handerson Hazel Blac equation
Week 13	Electrochemistry: Reversible and irreversible cells, Concept of EMF of a cell, Measurement of EMF of a cell. Nernst equation and its importance, types of electrodes. Standard electrode potential, Electrochemical series , thermodynamics of reversible cell
Week 14	Calculation of thermodynamic properties: $\Delta G, \Delta H$ and ΔS from EMF data, calculation of equilibrium constant from EMF data
Week 15	Concentration cells with transference and without transference, Liquid junction potential and salt bridge
Week 16	pH determination using hydrogen electrode and quinhydrone electrode, potentiometric titrations-qualitative treatment(acid-base and oxidation-reduction only)
Week 17	Revision of topics

Government College, Hisar
Unit wise Lesson Plan for Odd Semester (July 2023 to Dec 2023)
Department: Chemistry

CLASS: B.Sc. III Semester 5th Paper: Inorganic Chemistry -I Code: CCL 503(ii)
Name : Suman and Dr Karuna Gupta

Week	Contents
Week 1	Acids and bases : Bronsted- Lowry concepts, conjugate acids and bases, relative strengths of acids and bases, Effects of substituent and solvent on relative strength of acids and bases.
Week 2	Differentiating and levelling solvents, Lewis acid–base concept, classification of Lewis acids and bases
Week 3	Lux-Flood concept and solvent system concept, hard and soft acids and bases concept and application of HSAB process
Week 4	General principles and metallurgy : Chief modes of occurrence of metals based on standard electrode potentials, Ellingham diagrams for reduction of metal oxides using carbon monoxide as reducing agents
Week 5	Hydrometallurgy with reference to cyanide process for gold and silver, methods of purification of metals like (Al, Pb, Ti, Fe)
Week 6	Methods of purification of metals like (Cu, Ni, Zn, Au), electrolytic refining, zone refining, van Arkel-de Boer process
Week 7	ShapeParting, Mond's and Kroll process
Week 8	s and p block elements : Periodicity with respect to electronic configuration, atomic and ionic size, ionization enthalpy, electron gain enthalpy
Week 9	Periodicity of s and p block elements with respect to electro negativity (Pauling scale). General characteristics of s block elements like density, melting and boiling point, flame colour and reducing nature
Week 10	Oxidation states of s and p block element, inert pair effects, diagonal relationship
Week 11	Anomalous behaviour of first member of s and p block groups, allotropy in C, P and S
Week 12	Complex forming tendency of s block elements and preliminary idea of crown ethers and cryptates
Week 13	Structure of basic beryllium acetate, salicylaldehyde/ acetylacetonate complexes of group 1 metals
Week 14	Solutions of alkali metals in liquid ammonia and their properties
Week 15	Common features such as ease of formation, solubility and stability of oxides, peroxides, superoxides of s block elements
Week 16	Common features such as ease of formation, solubility and stability of sulphate and carbonates of s block elements
Week 17	Revision and discussion on problems

LESSON PLAN (From July 2023 To November 2023)

CLASS: B.Sc. III; Semester 5th

Paper: Chemistry of main group Elements - II, Code: CCL - 504 (ii)

Name : Dr. Malvika Kadian

Weeks	Contents
Week 1	Noble gases: Rationalization of inertness of noble gases, clathrates
Week 2	Preparation and properties of XeF ₂ , XeF ₄ , XeF ₆
Week 3	Bonding in these compounds using VBT shapes of noble gas compounds using VSEPR Theory and related problems
Week 4	Halides and oxohalides of P (PCl ₃ and PCl ₅)
Week 5	Halides and oxohalides of S (SOCl ₂ and SO ₂ Cl ₂)
Week 6	Interhalogen compounds, A brief idea of pseudohalides
Week 7	Structure, bonding and properties (acidic/ basic nature, oxidizing/ reducing nature and hydrolysis and their applications in industrial and environmental chemistry wherever applicable: Diborane and concept of multicentre bonding
Week 8	Structure, bonding and properties of hydrides of Groups 13 and 14
Week 9	Structure, bonding and properties of hydrides of Groups 15 and 16
Week 10	Structure, bonding and properties of hydrides of Groups 17, Structure, bonding and properties of Oxides of N and P
Week 11	Oxoacids of P, S and Cl and related problems of the unit
Week 12	Inorganic Polymers: Types of inorganic polymers and comparison with organic polymers, structural features,.
Week 13	Classification and important applications of silicates
Week 14	Synthesis, structural features and applications of silicones
Week 15	Borazines – preparation, properties and reactions.
Week 16	Cyclophosphazenes – preparation, properties and reactions., Bonding in (NPCl ₂) ₃ , Revision and discussion on problems
Week 17	Revision and discussion on problems

Government College, Hisar
Unit wise Lesson Plan for Odd Semester (July 2023 to Dec 2023)
Department: Chemistry

CLASS: B.Sc. III Semester 5th Paper: Polymer Chemistry -I Code: CCL 503(i)
Name : Mr Amit Saini

Week	Contents
Week 1	Introduction of polymers and different schemes of classification of polymers
Week 2	Polymer Nomenclature , Molecular forces and Chemical bonding in polymers
Week 3	Texture of Polymers and Structure property relationships
Week 4	Criteria for synthetic Polymer formation and Classification of Polymerization Process
Week 5	Relationship between functionality, extent of reaction and degree of Polymerization bi-functional system
Week 6	Degree of Polymerization of polyfunctional system
Week 7	Properties of Polymer:- Physical, thermal, flow and mechanical properties
Week 8	Preparation, structure, properties and application of Polyolefines, Polystyrene and styrene copolymers
Week 9	preparation, structure, properties and application of Poly Vinyl chloride (P.V.C)and related polymer, Polyvinyl acetate and related polymer
Week 10	Preparation, structure, properties and application of Acrylic polymers and fluropolymers
Week 11	Preparation, structure, properties and application of polyamides and related polymers
Week 12	Preparation, structure, properties and application of polycarbonates and phenol formaldehyde resins (Bakelite and Novalac)
Week 13	Preparation, structure, properties and application of polyurethanes, polydienes and silicone polymers
Week 14	Preparation, structure, properties and application of Conducting polymer:- polyacetylene, polyaniline.
Week 15	Preparation, structure, properties and application of Conducting polymer:- poly(p-pehnylene sulphide polypyrole, polythiophene)
Week 16	Revision and discussion of problems of polymer-1

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Unit wise Lesson Plan for Odd Semester (Session 2023-2024)

Department : Chemistry

Class: B.Sc. III Sem-V

Paper: Polymer Chemistry-II

Code: CCL-504(i)

Teacher's Name: Ms. Sarita

Week	Contents
Week 1	Kinetics of Polymerization: Basic concept of polymers and polymerization with examples , types of polymerization
Week 2	Kinetics and Mechanism of Free radical chain growth polymerization
Week 3	Kinetics and mechanism of ionic chain growth polymerization (both cationic and anionic chain growth polymerisation)
Week 4	Mechanism and kinetics of step growth polymerization
Week 5	copolymerization, mechanism and kinetics of copolymerization
Week 6	Coordination polymerization, mechanism and kinetics of coordination polymerization
Week 7	Crystallization and Crystallinity: Introduction of crystallization, degree of crystallinity, factors affecting the crystallinity of a polymer, crystallisability
Week 8	Determination of crystalline melting point and factors affecting the crystalline melting point, morphology of crystalline polymers
Week 9	Glass transition temperature , factors affecting the glass transition temperature and determination of glass transition temperature, Free volume theory, WLF equation
Week 10	Determination of molecular weight of polymers: number average molecular weight and weight average molecular weight of polymer by viscometry, osmotic pressure.
Week 11	Determination of molecular weight of polymer by light scattering , end group analysis
Week 12	Molecular weight distribution and its significance , polydispersity index
Week 13	Polymer Solution: Criteria for polymer solubilty , solubility parameters
Week 14	Thermodynamics of polymer solutions
Week 15	entropy, enthalpy, and free energy change of mixing of polymer solutions
Week 16	Flory-Huggins Theory, lower and upper critical solution temperature
Week 17	Diwali Vacations
Week 18	Revision and discussion of problems related to polymer chemistry-II

LESSON PLAN (From July 2023 to December 2023)

B.Sc. III 5th Sem

Paper: Fuel Chemistry

Code: CCS: 505 (ii)

Name- Dr. Poonam Sangwan and Dr. Dushyant

Weeks	Contents
Week 1	Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value.
Week 2	Coal: Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas—composition and uses
Week 3	Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke
Week 4	Coal gasification, Coal liquefaction and Solvent Refining.
Week 5	Petroleum and Petrochemical Industry: Composition of crude petroleum
Week 6	Refining and different types of petroleum products and their applications.
Week 7	Fractional Distillation (Principle and process),
Week 8	Cracking (Thermal and catalytic cracking), Reforming Petroleum and non-petroleum fuels
Week 9	fuel from waste, synthetic fuels (gaseous and liquids)
Week 10	clean fuels. Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene,
Week 11	Butadiene, Toluene and its derivatives Xylene.
Week 12	Classification of lubricants,
Week 13	lubricating oils (conducting and non conducting), Solid and semisolid lubricants
Week 14	synthetic lubricants
Week 15	Properties of lubricants (viscosity index, cloud point, pour point)
Week 16	Determination of lubricants (viscosity index, cloud point, pour point)
Week 17	Revision and discussion on problems