NORTH MAHARASHTRA UNIVERSITY, JALGAON

F.Y.B.SC. :- CHEMISTRY (SYLLABUS)

Skeleton

A) There will be two papers. Paper I and Paper II. For each paper there will be three lectures per week.

Section-I- Physical Chemistry.... 2 lectures per week.

Section-II-Inorganic Chemistry... 1 lecture per week.

Paper-II- Section I -Organic Chemistry.. 2 lectures per week.

Paper-II- Section-II-Inorganic Chemistry.1 lecture per week.

Each section will consist of two parts.

Part- A-Ist term portion; Part-B : IInd term portion.

B) Marks Distribution :-

Term End Examination :-

1. Paper-I, Part-A Section I Phy.Chemistry. ..   .   40 marks.

                   Section II Inorg.Chemistry..   .. 20 marks.

                           Total ... 60 marks.

2. Paper-II, Part-A Section I Organic Chemistry.   .. 40 marks.

                   Section-II Inorg. Chemistry.   .. 20 marks.

                           Total... 60 marks.

Annual Examination :- Part- A + Part- B =

1. Paper-I, Part- A & B Sec. I Phy.Chem. 20 + 34 = 54

                       Sec.II Inorg.Chem. 10 + 16= 26

                            Total. 80 marks.

2. Paper-II,Part-A & B Sec-I Org.Chem.Part- A + Part-B =

                           20 + 34 = 54

                   Sec.II Inorg.Chem. 10 + 16 = 26

                         Total   80 marks.

F.Y.B.Sc. - PHYSICAL CHEMISTRY PAPER-I (Section-I)

PART- B (Second Term)

4. DISTRIBUTION LAW :-

Statement and explanation of vernet's distribution law(thermodynamic derivation is not expected), applicability and limitations of distribution law, modification of distribution law with reference to association and dissocia- tion of solute, Applications of distribution law and theory of extraction.

Lectures (6)

Ref-I :- Chapter 8, Pages 298-302.

Ref-II:- Chapter 18, Pages 531-538, 542-552.

5. Transference and transference numbers, Hittorf's rule and determination of tramference numbers by Hittorf's method using unattackable electrodes.

Electrolytic conductance, determination of conduc- tance, variation of conductance with concentrations, Equiva- lent conductances at infinite dilution, Kohlrausch's law and its applications, Effect of other factors on conductance, Application of conductance measurements:(a)solubility of difficultly soluble salts (b)Determination of degree of ionisation (c) Conductometric titrations and their advantages.

Lectures-(8)

Ref-I:- Chapter 18-405-411, 414-424, 431-434.

Ref-II-Chapter 24- 704-710.

Chapter-25- 716-722, 725-733.

6. Mathematical Preparations

(i) Logarithm - rules of logariths (Without proof) characteristics an d mentissa, negative logarithms, application to pH calculations and solving numberical problems involving change of base of logarithm.

Ref. 3 chapter 2 pages 7-16

(ii) Graphical representation- Graph papers, co-ordinates of a point. equation of a st.line, slope and intercepts. Characteristics of st.line. Ploting of graphs based on experimental data of chemical origin.

Ref.3 - Chapter 4 pages 23-30.

(iii) Differential calculus - rules of differentiation.

.... 3 ...

PART- A (First Term)

1. ATOMIC STRUCTURE :-

Rutherford's x- particle scattering experiment, Rutherford's atomic model and its drawbacks, Moseley's work and its importance (no numberical problems), Discovery of neutron, Line spectra of atoms, Balmer's formula, Hydrogen spectrum, Ritz combination principle,

Bohr's atomic model, Derivation of radius of orbit, Derivation of energy of an electron, origin of hydrogen spectrum and explaination, failures of Bohr's model, Sommerfield's modification of Bohr's model, quantum numbers, assigning quantum numbers to electrons upto atomic number 18.
Ref.1 Chap.14- Pages- 608-610,613-622

Ref.2 Chap.1 - Pages- 9-14,15-32,50-57   · Lectures- (8)

2. THE GASEOUS STATE :-

Gas coustant R and its values in different units, kinetic theory of gases, Assumptions of kinatic theory, RMS velocity, Derivation of kinetic gas equation, Deduction of Boyle's Charles, Avogadro's, Dalton's and Graham's law from kinatic gas equation, velocities of gas molecules (only definations and inter-relationship), The kinetic energy of translation, Applicability of the ideal gas laws, compressibility factor, vander waal's equation of state, critical phanomane in l quids, The P-V-T relations of gases and liquids, The principle of continuity of states, Application of vander waal's equation to isothermals of CO_2 , Determination of vander waal's constants , law of corresponding states.

Lectures-12

Ref. 1:- Chapter 1, Pages 10-12. 15-31. 47-55.
Ref. 2:- Chapter 2, Pages 301-302, 306-317, 322-336.

3. ADSORPTION :-

Adsorption of gases by solids, Types of adsorption, Adsorption isotherms, Freundlich's equation, Langmuir's adsorption isotherm and its derivation, Applications of adsorption with reference to chromatography.

Lecturer- 4

Ref. 1:- Chapter 20, pages 810-817.
Ref. 2:- Chapter 23, Pages 686-695.

(withour proof), partial differentiation (withour proof)
pertaining to algebra, exponential and logarithmic functions
examples relatech to chemistry.

Ref.3 Chapter 7 pages 72-82

8 pages 83-90.

iV) Integral calculus - Rules of integration (Withour proof)
pertaining to algebra. and exponential function. Intugration betweer
between limits. Examples related to chemistry.

Ref.3 Chapter - 11 pages - 115 - 125.

V) Significanle of c - application to the compound interest law to
physical chemistry. Exponential equations. Examples related to
chemistry.

Ref. 3 Chapter - 12 pages 132 -140

Lectures - (10)

Ref.I Principles of physical chemistry by S.H. Maron and prut
IVth Edition.

II Essentials of physical chemistry by B.S. Bahl and G.D. Tuli.

III Mathematical preparation of physical chemistry

by F. Daniels.

Magrow Hill book Company.

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

F.Y.B.Sc. CHEMISTRY SYLLABUS

INORGANIC CHEMISTRY   PAPER - I
    SECTION - II   Part - A (First Term)

(1) Volumetric Analysis :-   (3)
    I-21 Volumetric Analysis
    I-22 Classification of reactions in volumetric Analysis.
    I-23 Equivalent weights. Normal solutions.
    I-24 Advantages of the use of the equivalent system for the
         preparation of standard solutions.
    I-25 Preparation of standard solutions   .
    I-26 Primary standard substances
         Ref.-1 pages 38 to 50.

(2) Technique of volumetric (titrimetric Analysis)   (3)
    II-17 Unit of volume
    II-19 Volumetric Apparatus
    II-20 Volumetric flasks
    II-21 Pipettes
    II-22 Burettes
    II-25 Storage acid pres rvation of solutions for valumetric
          Analysis.
         Ref.-1 pages 191 to 207.

(3) Experimental technique Inorganic Analysis   (3)

    II-1 Balance, weights and weighting
    II-2 Description of typical Analytical balance
    II-3 Requirements of good balance
    II-5 Care and use of balance
    II-5 Methods of weighing
    II-7 Errors In weighing
    II-8 Calabration of weights

   Ref. 1 pages 140 to 159

Ref.-1 Quantitative Inorganic Analysis
                    by- A. I. Vogel (Third Edn)

(4) Symclary oloments and Symclary operations   (3)

Ref.- (2) Concepts and Models of Inorganic Chemistry
              by Douglas and Mc Dariel
              Pages 476 to479
    (3) Chemical applications of group theory
                  by F.A. Cotton.

F.Y.B.Sc. Chemistry Syllabus

INORGANIC CHEMISTRY

Paper - I   Section - II   Part - B   (Second Term)

I) Bonding in molecules and structure   (7)

   i) Attainment of stable configuration.

  ii) Types of bond (a) Ionic (b) Covalent (c) Coordinate
       (d) metallic (only introduction and definations.)

 iii) Valence bond theory.

     a) Heitler london theory (assumption)

     b) Pauling slater theory

     c) Concept of atomic orbital overlap and bond formation
         sigma and pi bonds

     d) Non-polar and polar covalent bonds

   iv) Bonding in the following molecules using pure S & P
       orbitals H_2, F_2, HF, O_2 , N_2

    V) Hybridization :- (a) Need of concept of Hybridization to
       explain the observed covalency and to explain the shapes
       of some molecules.

       (b) Defination of Hybridization.

       (c) Shapes of molecules involving SP, SP^2, SP^3, dSP^2,

          or SP^3d, d^2SP^3 or $SP^3 d^2$, d^3SP^3 hybrid orbitals.

       (d) Bonding and shapes of the following molecules
           $P\cdot F_2$, BF_3, CH_4, PCL_5, SF_6, IF_7; $(Ni(CCN)_4)^{-2}$

II VI) Co-ordination chemistry :- Co-ordination numbers and
        geometries Types of ligands, Isomerism in

       Co-ordination compounds, Nomenclature for Co-ordination
       complexes.   (5)

       Ref.-1-A New concise Inorganic chemistry-
       by- J.D. L _ Third Ed^n.

               Pages 24 to 31,49 to 58,59 to 61

         2- A New guide to Modern Valency Theory.
             by - G.I. Brown Thrid Ed^n

             Pages - 106 to 114,162 to 164.

         3- Basic Inorganic chemistry cotton & Wilkingon
                         (Third Edition)

               Pages- 125 to 138

         4- Concept and Models of Inorganic chrmistry
             by - Donglas and Daniel Third Edition 1976 .
                   Pages- 52 to 56

(First Term)

1) Structure and properties of Organic compounds
    1.1 Atomic orbitals (Ref. 1.5)   (12 Lectures)
    1.2 Electronic configuration and pauli. Exclusion
        principle. (Ref. 1- 1.6)
    1.3 Molecular orbitals (Ref. 1- 1.7)
    1.4 Co-valent bond (Ref.1- 1.8)
    1.5 Hybridization with examples of M than ,Ethane,Ehtene,
        and Ethyn (Ref. 1:-1.9,1.10,1.11, Ref.2:-3.3)
    1.6 Bond length.Bond Energy, bond angle (Ref.2:-3.4,3.5)
        Bond Polarity and Polarity of molecules.
        Ref. 1:-1.15,1.16)
    1.7 Quantitative analysis of Carbon, Hydrogen,,Nitrogen,
        Sulphur,and Halogen (Mention the names only for
        different methods of estimation) Ref.1:-2.27,13.12.
    1.8 Problems related to empirical, molecular and structural
        formula of Organic Compounds (Ref.1:-2.28,2.29)

2) Nomenclature of Organic Compounds.   (4 Lectures)
    2.1 Trivial System.
    2.2 IUPAC System (Students should only be able to know
        the name and structural formula of Organic Compounds:-
        Alkanes, Alkenes, Alkynes,Alkyl, Halides. Alcohols
        Aldehydes, Ketones, Acids, Ester Ethers & Amines)
        Ref. 2:-1,2.2)

3) Hydrocarbons..   (8 Lectures)
    3.1 Industrial Source of alkenes. (Ref.1-3.13)
    3.2 Industrial source VS Laboratory preparation
        (Ref. 1- 3.14, 3.15)
    3.3 Reaction of alkanes (Ref.1- 3.16)
    3.4 Alkanes Preparation and Reactions
        (Ref. 1-7.11, 8.1, 8.2)
    3.5 Alkynes Preparation and Reactions.
        (Ref.- 1-11.6, 11.7)

ORGANIC CHEMISTRY PART:- B (Second Term)

4) Synthesis and Reactions   (10 Lectures)

   4.1 Alkyl halides (Ref. 1-5, 3, 5.7, 5.8)

   4.2 Alcohols. (Ref. 1-17, 1, 17.2, 17.3, 17.8, 18.2)

   4.3 Aldehydes and ketones (Ref. 1-21.4, 21.7)

   4.4 Carboxylic acid and their derivative.

        (Ref. 1-23.6, 23.9, 24.6, 24.7, 24.9, 24.10, 24.11, 24.12,

        24.15, & 24.16)

   4.5   Amines ((Ref.1.-26.8, 27.1)

5) Aromatic Compounds   (6 Lectures)

   5.1 Structure of Benzen (Ref. 1-13.2, 13.3)

   5.2 Reactions of Benzen   (Ref. 1-13.4)

   5.3 Nomenclature of benzen derivative (Ref. 1-13.11)

   5.4 Phenol-Preparation and Reactions (Ref.1-28.5, 28.6)

6) Structure and Reactivity   (8 Lectures)

   6.1 Inductive Effect.

   6.2 Electromeric Effect,

   6.3 Resonance effect-

   6.4 Hyper conjugation

   6.5 Tautomerism

   6.6 Hydrogen bonding.

   6.7 Steric effect.

        (ref.3 & 4- Relevant Pages).

Ref.1:- Organic Chemistry by Morrison & Boyd (Edition 5th)

Ref.2 :- Organic Chemistry by Pine, Nendrickson, cram and Hammond

Ref.3 :- Organic Chemistry by I.L.Finar Vo.-I Edition.

Ref.4 :- A Guide book of reaction mechanism by peter Sykes.

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

F.Y.B.Sc. Chemistry Syllabus

(INORGANIC CHEMISTRY) PAPER II (SECTION — II)

Part —A   (FIRST TERM)

1) Electronic configuration of elements —
    (i) Aufbau Principle
    (ii) Hund's rule of Maximum multiplicity
    (iii) Shapes of S, P, d orbitals   (3)

2) Long form of the Periodic table and periodic properties—
    i) Out line of long form of periodic table.
    ii) Classification of elements in terms of S,P,d F block
        elements. inert gas elements, representative elements,
        transition elements and inner transition elements.
    iv) Periodic law, periodve in properties throughout the
        periodic table (only general trends in each blocks are
        expected, trend in any perticular group or any perticular
        period is not expected.
        (a) Size of atom and ions
        (b) Ionization energy
        (c) Electron affinity
        (d) Electronegativity
        (e) Metallic character
        (f) Reactivity.   (9)

Ref. (1) Concise Inorganic chemistry — by J.D.Lee
         Pages — 92 to 103. Page No.16 IIIrd Ed.
     (2) A new guide to Modern Valency Theory by-
                    by— G.I. Brown (Third Ed.)
                    Pages — 25 to 31.
     93) Basic Inorganic chemistry by Cotton-Wilkinson
                    Pages 43 to 46

F.Y.B.Sc. Chemistry Syllabus.

Chemistry Paper II Section II.

(Inorganic Chemistry) Part-B (Second Term)

1. III) Chemistry of Hydrogen :- Position in the periodic table,
        Isotopes of Hydrogen, Ortho and Para Hydrogen;
        properties of Molecular Hydrogen;
        The bonding of Hydrogen Hydrogen bond; Hydrides.
        Acids and B ses Arrhenius Bronsted and Lewis theory
    Ref:- 1) A new concise Inorganic Chemistry by J.D. Lee
            (Third Edition)
            (Pages. 117-122)
         2) Basic Inorganic Chemistry by Cotton and Wilkineson
            (Third Edition) (Pages.200-215) (191-92)   (5)

2. IV) S-Block Elements:-

        Alkali-metals :- Electronic shucture. General properties;
        Chemical properties; solubility and Hydration solutions
        of metals in liquid ammonia; stability of oxy-salts;
        Halides; extraction of metals; compounds with carbon;
        Organic compounds comples. Anomalous- behaviourof lithium
        and its diagonal relationship.

        Alkaline Earth Metals;- Electronic structure; General
        properties Anomalous behaviour of Beryllinm; Solubility
        and Lattice energy, Chemical properties,Organometallic
        c.mpounds; complexes; extraction of metals; Difference
        between E ryllium and other group li elements.   (7)

        Ref.-1- Concise Inorganic chemistry by J.D. Lee
                (Third Edition)
                (Pages 129 to 151)
             2- Basic Inorganic chemistry by Cotton and
                Wilkinson (Third Edition) (Pages 217 to 229)
        Ref.:- Basic Inorganic chemistry by cotton and Wilkinson
                    .(192 to 197)

F.Y.B.Sc. Chemistry Practical Syllabus

(a) Physical Experiments:- (Any Five)
1) Determination of Molecular Weight by victor Mayer's method.
2) Determination of heat of neutralisation of Weak acid & hence its heat of ionisation.
3) Heat of solution of KNO_3/ NH_4CL
4) To study the adsorption of acetic acid on activated charcoal and to verity Langmuirie adsorption isotherm.
5) Determination of dissociation constant of acetic acid by conductometric measurements.
6) Determination of equivalent weight of Mg/Al by eudiometex.
7) Parlition coefficient of benzoic acid between benzene & Water.

OR

I_2 in CCL_4 and Water.

(B) ORGANIC CHEMISTRY:-

1) Organic estimations (Any Two)
(a) Aniline (B) Phenol (C) Acetone
2) Determine Physical consrents MP/HP of given compound. Determine the type of organic compounds (Acid, base, neutral) Identification of groups such as - COOH,-OH (alcohol),-OH(Phenol)-COOR (ester), -C=0, -CHO (aldehyde), Amines, $-N_{O_2}$

At least nine organic compounds to be studied.

(C) INORGANIC CHEMISTRY.

1) Qualitative Analysis:- Powders containing one cation and one qnion (excluding Phosphates and borates) Minimum 10 powders.
2) Volumetric Analysis
i) Preparation of sta-ndered $Na_2 CO_3$ solution and stain-derisation of given Hcl solution.
ii) Preparation of standered oxalic acid solution. standerisation of $KMnC_4$ solution and estimation of Iron.
iii) Preparation of standard $K_2 Cr_2O_7$ solution. Stander-isation of $Na_2 S_2 O_3$ and estimation of copper iodome-trically.
iv) Preparation of standard $ZnSO_4$ solution. Standarisation of EDTA. Total hardness of Water.
3) Gravemetric Analysis:-
1) Use of balance. Determine the loss per gram of $NaHCO_3$ and hence percentage purity.
2) Determine loss per gram and percentage composgtion of $Na2CO_3$ and $NaHCO_3$ in the mixture Na_2CO_3 + $NaHCO_3$

SCHEME FOR PRACTICAL EXAMINATION :– Examination will be of six hr.duration

The distribution of marks for various experimentes will be as:–

1) Physical chemistry experiment – 30
2) Organic compound –10
3) Volumetric analysis/Gravametric/organic estimation – 25
4) Inorganic Qualitative – 15
5) Oral – 10
6) Journal – 10