Dr. A.P.J. Abdul Kalam University, Indore (M.P)

Scheme of Examination
B.Sc.
Semester-III
(w.e.f. July 2016Onwards)

(Non Grading)

Course Name	Subject	Theory Max. Marks				Practical Max Marks		Total
		Internal		External		Max Marks	Min Marks	
		Max	Min	Max	Min			
Foundation Courses	HINDI+ ENGLISH **FCS 301 HE**	10+05=15	05	50+35=85	28	-	-	100
	Environmental Science **FCS 302 EP**	15	05	35	12	-	-	50
B.Sc Mathematics	MATHEMATICS **BSM 301 T**	25	08	125	42	-	-	150
	CHEMISTRY **BSC302 T**	15	05	85	28	-	-	100
	CHEMISTRY **BSC302 P**	-	-	-	-	50	17	50
	PHYSICS **BSP303 T**	15	05	85	28	-	-	100
	PHYSICS **BSP303 P**	-	-	-	-	50	17	50
Total								**600**

B.Sc. Under Graduate Semester wise Syllabus

(w.e.f. session 2016 onwards)

Class: - B.Sc.

Semester: - III Semester

Subject: - Physics (BSP 303T)

Paper: - Optics

Marks 85+15 CCE

Unit-I

Geometrical Optics

Reflection and refraction: Fermat's Principle, Refraction at a spherical surface, Aplanatic points and its applications, Lens formula, Combination of thin lenses and equivalent focal length.

Optical instruments: Dispersion and dispersive power, chromatic aberration and achromatic combination, different types of aberration (qualitative) and their remedy. Need for multiple lenses in eyepieces, Ramsden and Huygens eye-piece.

Unit-II

Interference of light

The principle of superposition, two slit interference, coherence requirement for the sources, optical path retardations, Lateral shift of fringes, Rayleigh refractometer and other applications. Localised fringes, Young's double slip experiment, Fresnel Biprism, thin films, interference by a film with two non-parallel reflecting surfaces, Newton's rings.

Haidinger fringes (Fringes of equal inclination), Michelson interferometer, its application for precision determination of wavelength, wavelength difference and the width of spectral lines. Intensity distribution in multiple beam interference, Fabry-Perot interferometer and Etalon.

Unit-III

Diffraction: Introduction to Diffraction, Types of Diffraction, difference between Fresnel and Fraunhoffer diffraction.

Fresnel diffraction: Fresnel's theory of half period zone, diffraction at straight edge, rectilinear propagation.

Fraunhoffer diffraction: Diffraction at a slit, phasor diagram and integral calculus methods. Diffraction at a circular aperture and a circular disc, Rayleigh criterion of resolution of images. Resolving power of telescope and microscope. Outline of phase contrast microscopy.

Diffraction Grating: Diffraction at N-parallel slits, Intensity distribution, Plane diffraction grating, Concave grating and its mountings. Resolving power of a grating and comparison with resolving power of prism and of a Fabry Parot etalon.

Unit-IV

Polarisation

Concept of Polarized light, Brewster's Law. Transverse nature of light waves, Polarization of electromagnetic (em) waves, Plane polarised light – production and analysis, Description of Linear, circular and elliptical polarisation.

Propagation of em waves in anisotropic media, uniaxial and biaxial crystals, symmetric nature of dielectric tensor, Double refraction, Hygen's principle, Ordinary and extraordinary refractive indices, Fresnel's formula, light propagation in uniaxial crystal, Nicol prism, Production of circularly and elliptically polarized light, Babinet compensator and applications, Optical rotation, Optical rotation in liquids and its measurement through Polarimeter.

Unit-V

Lasers and Photo Sensors

A brief history of lasers, characteristics of laser light, Stimulated and spontaneous processes, Einstein prediction, Relationship between Einstein's coefficients (qualitative discussion only), Pumping schemes, Resonators, Three level and four level energy diagram , Principles and working of Ruby Lasers, He-Ne Laser with energy level Diagram, Ruby laser, He-Ne laser, Applications of lasers, Principle of Holography.

Light Sensors: Photodiodes, Phototransistors, and Photomultipliers.

References Books *(for Unit-I to Unit-IV)***:**

1. Fundamentals of Optics: F.A. Jenkins and H.E. White, 1976, McGraw-Hill.
2. Principles of Optics: B.K. Mathur, 1995, Gopal Printing.
3. Fundamentals of Optics: H.R. Gulati and D.R. Khanna, 1991, S.Chand Publication.
4. University Physics: F.W. Sears, M.W. Zemansky and H.D. Young, 13/e, 1986. Addison-Wesley.
5. Optics: Ajoy Ghatak, McGraw Hill Publications.
6. Principles of Optics: Max Born and Wolf, Pregmon Press.

References Books *(for Unit-V only)***:**

1. An introduction to Lasers – Theory and Applications: M. N. Avadhanalu, S. Chand and Co, Ltd.
2. Solid State Physics: P.K. Palanisamy, Scitech Publications (India) Pvt. Ltd.
3. Principles of Laser : Orazio Svelto, Plenum Press, NewYork
4. Instrument measurement and Analysis: B.C. Narka and K.K. Chaudhary, Tata McGraw Hill Publishing Company 16th reprint Chapter-1.

B.Sc. Under Graduate Semester wise Syllabus

(w.e.f. session 2016 onwards)

Class: - B.Sc.

Semester: - III Semester

Subject: - Mathematics (BSM 301T)

Paper: - Real Analysis, Differential Equation Abstract Algebra

Marks 85+15 CCE

UNIT-I

Definition of a sequence, Theorems on limits of sequences, Bounded and monotonic sequences, Cauchy's convergence criterion, Series of non-negative terms, Comparison test, Cauchy's integral test, Ratio test, Raabe's test, logarithmic test, Leibnitz's theorem, Absolute and conditional convergence.

UNIT-II

Series Solution of Differential Equations-Power series Method, Bessel' Equation ,Bessel's function and its properties, recurrence and generating relations, Legendre's Equation, Legendre's function and its properties, recurrence generating relations

UNIT-III

Laplace transformations, Linearity of the Laplace transformation, Existence theorem of Laplace transforms, Laplace transforms of derivatives and integrals, Shifting theorem, Differentiation and integration of transforms, Inverse Laplace transforms, Convolution theorem, Applications of Laplace transformation in solving linear differential equations with constant coefficients. Properties of Laplace Transform i.e I & II shifting Theorem, Change of Change , Modulation.

UNIT-IV

Definition and basic properties of group, Order of an element of a group, Subgroups, Algebra of subgroups, Cyclic groups and their simple properties, Coset decomposition and related theorems, Lagrange's theorem and its consequences.

UNIT-V

Normal sub group, Quotient groups, homomorphism and isomorphism of groups, Kernel of homomorphism of groups, fundamental theorem of homomorphism of groups, Permutation groups (even and odd permutations), Alternating groups A_n, Cayley's theorem.

Text Books :

1. R.R. Goldberg, Real Analysis, I.B.H. Publishing Co. New Delhi, 1970.
2. Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd. Allahabad.
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & sons, 1999.
4. I. N. Herstein – Topics in Algebra, Wiley Eastern Ltd. New Delhi 1977.
5. Sharma and Gupta-Integral Transform, Pragati Prakashan Meerut
6. e-iz fgUnh xazFk vdkneh dh iqLrdsa

Reference Books:

1. T.M. Apostol Mathematical Analysis Narosa Publishing House New Delhi 1985.
2. Murray R.Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Co. New York.
3. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow.
4. S.C. Malik, Mathematical Analysis, Wiley Eastern Ltd. New Delhi.
5. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Wiley Eastern, New Delhi, 1997.
6. I. S. L.uther and I.B. S. Passi, Alegebra Vol- I , II, Narosa Publishing Hous

B.Sc. Under Graduate Semester wise Syllabus
(w.e.f. session 2016 onwards)

Class: - B.Sc.
Semester: - III Semester
Subject: - Chemistry (BSC302T)
Marks 85+15 CCE

UNIT-I A. Arenes and Aromaticity: Structure of benzene, molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure. MO picture. Aromaticity, the Huckel rule. Aromatic electrophilic substitution, General pattern of the mechanism- Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction and energy profile diagram

B. Aryl Halides: Methods of formation and reactions of aryl halides, Mechanism of nucleophilic aromatic substitution, synthesis and uses of DDT, BHC and Freon.

UNIT-II A. Alcohols: Classification and nomenclature.
1. Monohydric alcohols: nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acid, and esters, acidic nature, reactions of alcohols.
2. Dihydric Alcohols:
Nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [Pb(OAc)4, and HIO4] and pinacol-pinacolone rearrangement.
3.Trihydric alcohols - nomenclature and methods of formation, chemical reaction of glycerol.

B. Phenols:
Nomenclature, structure and methods of formation, acidic character. Comparative acidic strength of alcohols and phenols, stabilization of phenoxide ion by resonance, acylation and carboxylation Mechanisms of Fries rearrangements, Gatterman synthesis, Hauben-Hoesch reaction, Lederer-Manasse reaction and Riemer-Tiemann reaction.

UNIT III

A. Chemistry of elements of I transition series: Characteristics properties of d-block elements. Properties of the elements of the first transition series, their binary compounds such as carbides, oxides and sulphides. Complexes illustrating relative stability of their oxidation states, coordination number and geometry.

B. Chemistry of elements of II and III transition series: General characteristics comparative study of **II and III transition series** with 3d-analogues respect to ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry.

UNIT IV

A. Coordination Compounds: IUPAC Nomenclature, Isomerism EAN Concept, Chelates, VBT of transition metal complexes, its limitations. Crystal field theory, Crystal Field Stabilization Energy, spectro chemical series, limitations of CFT.

B. Thermochemistry: Standard state, standard enthalpy of formation: Hess's Law of heat summation and its vapplication. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization.

Second Law of Thermodynamics: Need for the law, Different statements of the law, Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature. Lectures

UNIT V

A. **Thermodynamics: Concept of entropy:** entropy as a state function, entropy as a function of P & T, entropy change in physical change, Clausius inequality, entropy as criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

B. **Third Law of Thermodynamics:** Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data, Gibbs and Helmholtz functions, Gibbs function (G) and Helmholtz function (A) as a thermodynamic quantities, A and G as a criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change, relative variation of G & A with P, V & T.

C. **Buffers:** Mechanism of buffer action, Henderson-Hazel equation, Hydrolysis of salts

Class : B.Sc. Semester III

Subject : **Chemistry (BSC302P)**

Paper : Practical

Inorgnic Chemistry **18 marks**

1. Calibration of the fractional weights, pipettes and burettes.
2. Preparation of standard solutions. Dilution of 0.1 M to 0.01 M Solutions.

(a) Determination of acetic acid in commercial vinegar using NaOH.
(b) Determination of alkali content- antacid tablet using HCl.
(c) Estimation of calcium content in chalk as calcium oxalate by permagnatometry. (d) Estimation of hardness of water by EDTA.

Complex Compound Preparation:

1. Diaquabis(methyl acetoacetato) nickel(II)
2. Diaquabis (nethyl acetoacetato) cobalt (II)
3. Bis(methl acetoacetato) copper (II) monohydrate
4. Potassium chlorochromate (IV)
5. Tetraamminecopper(II) sulphate monohydrate
6. Hexaamminenickel(II) chloride

Organic Chemistry Laboratory Techniques **18 marks**

A. Thin layer chromatography

Determination of R_f values and identification of organic compounds.

(a) Separation of green leaf pigments (spinach leaves may be used)
(b) Preparation and separation of 2, 4- dinitrophenylhydrazones of acetone, 2-butanone, hexane-2 and 3-one using toluene and light petroleum (40:6).
(c) Separation of a mixture of dyes using cyclohexane and ethylacetate.(8:5:1.5).

B. Paper chromatography : Ascending and Circular

Determination of R_f values and identification of organic compounds.

(a) Separation of a mixture of phenylalanine and glycine, alanine and aspartic acid. Spray reagent ninhydrin.
(b) Separation of mixture of DL-alanine, glycine and L-lucine using n-butanol: acetic acid : water (4:1:5). Spray reagent ninydrin.
(c) Separation of monosaccharides- a mixture of D-galactose and D-

fructose using n-butanol : acetone : water (4:1:5). Spray reagent- aniline hyddrogen pthalate.

Viva **6 marks**

Sessional **8 marks**