Shree H.N.Shukla group of colleges

PHYSICS

T.Y.B.Sc. (Sem. VI) (CBCS)

Syllabus

B.Sc. (Physics)

Semester -6

Paper: Physics-601

(Nuclear & Particle Physics)

UNIT -1: (12 hour: 14 Mark)

General Properties of Nuclei & Nuclear Models: Rutherford's alpha Scattering Experiment, Rutherford's Atom Model, Constitute of nucleus and their intrinsic properties, qualitative facts about size, mass, Charge, density, Classification of Nuclei, Nuclear Stability, binding energy, main features of binding energy versus mass number curve, Nuclear Models: liquid drop model, Shell model: Evidence of Shell Model, Semi empirical mass formula and significance of various terms. Numerical Problems.

UNIT -2: (12 hour: 14 Mark)

Radioactivity: Natural Radioactivity, Properties of alpha, beta and gamma ray, The Law of Radioactive Decay, Half Life , Mean Life, Radioactive Series, Units of Activity, General Rule of Alpha and Beta Decay, Theory of alpha decay- Barrier Penetration, Beta Decay-Continuous beta ray spectrum- Difficulties in understanding it, Neutrino hypothesis and Fermi theory of Beta Decay, Gamma Decay – Gamma Ray emission, Nuclear isomerism, Internal Conversion, Application of Radio isotopes, Determination of the Age of Earth, Carbon Dating, Numerical Problems.

UNIT -3: (12 hour: 14 Mark)

Interaction of Nuclear Radiation with matter And Detector: Interaction between Energetic Particle and matter, Principle construction and working of - Ionization Chamber; Solid state Detector; Scintillation Counters, GM Counter, Plateau Curve.

Nuclear Reaction: Rutherford experiment for artificial transmutation, Q-value of Nuclear reaction, Type of Nuclear reactions, Energy balance in Nuclear reaction, Threshold energy of Endoergic reaction, Nuclear Transmutation, Numerical Problems.

UNIT -4: (12 hour: 14 Mark)

Particle Accelerator: Construction and working of – Linear Accelerator; Cyclotron, Formula of Cyclotron Frequency, Limitation of Cyclotron, Principle of Phase Stability, Synchrocyclotron, Synchrotron - Proton Synchrotron; electron Synchrotron(Betatron).

Nuclear Fission: Discovery of Nuclear fission, Energy released in fission, Bohr & Wheeler's theory of fission, Chain reaction, Multiplication Factor, Critical Size, Atom bomb, Nuclear reactors, Use of Nuclear Reactor Power Reactor, Breeder Reactor, Numerical Problems.

UNIT -5: (12 hour: 14 Mark)

Nuclear fusion: Nuclear fusion, Source of stellar energy, Thermonuclear reactions, Hydrogen Bomb, Controlled Thermo Nuclear Reaction, Fusion Reactor, Plasma Confinement – Gravitation Confinement, Magnetic Bottle, Tokamak, Internal Confinement, Numerical Problems.

Elementary Particles: Introduction, Classification of Elementary Particles, Particles & Antiparticles, Antimatter, The fundamental Interactions, Elementary particle Quantum numbers, Conservation laws and symmetry, Quark model.

Reference Books:

1. Modern Physics By R.Murugeshan & Kiruthinga Sivaprasatha, Publication: S.Chand & Company Ltd.
2. Nuclear Physics: An Introduction By S.B. Patel Publisher: New Age International (P) Limited.