

Lesson Plan

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Class - B.Sc 6th Sem.

Subject - Physics.

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Week-1! → Vector atom model, quantum numbers associated with vector atom model, penetrating and non penetrating orbits (qualitative description), spectral lines in different series of alkali spectra.

Week-2! → Spin orbit~~ed~~ interaction and doublet term separation, LS or Russell-Saunders coupling, JJ coupling (expression for interaction energies for LS & JJ coupling required).

Week-3! → Zeeman effect (normal and anomalous), Zeeman pattern of D_1 & D_2 lines of Na-atom, Paschen-Back effect of a single valence electron system. Weak field Stark effect of Hydrogen atom.

Week-4! → Discrete set of electronic energies of molecules, Quantisation of vibrational and rotational energies, Raman effect (quantitative description), Stokes' and anti-Stokes' lines.

Week-5:- Main features of a laser: Directionality, high intensity, high degree of coherence, spatial and temporal coherence, Einstein's coefficients and possibility of amplification, momentum transfer, life time of a level.

Week-6:- Kinetics of optical absorption. Threshold condition for Laser emission, Laser pumping, He-Ne Laser and Ruby Laser (Principle, construction and working) Application of Laser in the field of medicine and industry.

Week-7:- Nuclear mass and binding energy, Systematics of nuclear binding energy, nuclear stability, nuclear size, spin, parity, ~~statistics~~ Statistics, magnetic dipole moment, quadrupole moment (shape concept).

Week-8:- Determination of mass by Bain Bridge, Bain Bridge & Jordan mass spectrograph, Determination of charge by Mosley Law, Determination of size of nuclei by Rutherford back scattering.

Week-9:- Interaction of heavy charged particles (Alpha particles), Alpha disintegration and its theory, Energy loss of heavy charged particle (Idea of Bethe Formula, no derivation), Energetics of alpha decay, Range & straggling of alpha particles, Geiger Natta Law.

Week-10:- Introduction of light charged particles (Beta particle)
Origin of continuous beta spectrum (neutrino hypothesis)
Type of Beta decay and energetics of beta decay,
Energy loss of beta particles (ionisation), Range of e^- ,
absorption of beta particles.

Week-11 → Interaction of gamma ray, Nature of gamma rays,
Energetics of gamma rays, Passage of gamma radiations
through matter (photoelectric, Compton & pair production)
Electron positron annihilation. Absorption of gamma rays
(Mass attenuation coefficient) and its application.

Week-12 → Nuclear reactions, Elastic scattering, Inelastic scattering,
Nuclear disintegration, Photo nuclear reaction,
Radioactive capture, Direct reaction, Heavy ion reactions and spallation reactions,
Conservation Laws,
Q value and reaction threshold.

Week-13 → Nuclear Reactors - General aspects of reactor design.
Nuclear fission & fusion reactors (principles, construction, working & use), ~~Linear~~ Linear accelerator, Tandem accelerator.

Week-14 → Cyclotron & Betatron accelerators, Ionisation chamber,
Proportional counter, GM counter (detailed study), Scintillation counter and semiconductor detector.