Tolani College of Arts and Science, Adipur

Managed by: Gandhidham Collegiate Board, Adipur

Affiliated to: KSKV Kachchh University, Bhuj

Detailed Syllabus for Lab Assistant (Specific Subject: Physics)

1. Atomic & Molecular Spectroscopy: Basic spectroscopy, electromagnetic spectrum, Sources of radiation; their utility and limitations- conventional sources for UV, visible and infrared rays, sources for shorter wavelength radiations (X-ray tubes) radioactivity, x-rays and x-rays Laser (He, Ne, Argon ion, dye lasers, semiconductor lasers).

2. Radiation: Interaction of radiation with matter: reflection, absorption, transmission, fluorescence, phosphorescence and their forensic applications, radiation filters; Detection of radiations; photographic detectors, thermal detectors, photoelectric detectors etc., Atomic spectra, energy levels, quantum numbers and designation of states, selection rules, qualitative discussions of atomic spectra, Elements of X- ray spectrometry- fluorescence, energy Dispersive X-ray analysis (EDX), wavelength Dispersive X-ray analysis (WDX), X-ray diffraction, Augur effect.

3. Static Electricity: Friction electricity, Charges and their conservation, Coulomb's law-forces acting between two point charges, forces acting among many charge, principle of superposition and continuous charge distribution.

4. Conductors and insulators: presence of free and bound charges, Dielectric and electric polarization, General idea of capacitor and capacitance, Series and parallel connection of capacitors, Energy stored in capacitors, Capacitance of a parallel plate capacitor in absence and presence of dielectric, Van de Graff generator.

5. Electric field and its physical interpretation: Electric field of a point charge, electric lines of force, electric dipole, Electric field of dipole and its behaviour in a uniform electric field.

6. Electric potential: Physical meaning, Electric potential due to a dipole and system of charges, Equipotential surfaces, Electric potential energy of system of two point charges and electric potential energy of an electric dipole in a static electric field.

7. Statement of Gauss's Theorem: About electric flux and to find electric field in case of (1) linear, charge distribution of infinite length (2) uniformly charged infinite plane (3) uniformly charged spherical shell (inside and outside the shell).

8. Kirchhoff s laws: Explanation with an illustration, Whetstone's bridge and its use for the measurement of temperature, meter bridge- a special case of Whetstone's_bridge, Potentiometer-principle and its use to measure potential difference and to compare e.m.fs. of two cells.

9. Electric power: Thermal effect of electric current and Joule's law, chemical effects of electric current- Faraday's laws of electrolysis, charging of a lead storage cell, solid state cells.

10. Thermo electricity: Origin, basic ideas of Seeback, Thomson and Peltier effect, thermo couple, thermo e.m.f., neutral and inversion temperatures, A coil carrying current as a magnetic dipole and its dipole moment, dipole moment of an electron performing circular motion, magnetic field due to a magnetic dipole (bar magnet)- on its axial and equatorial lines, lines of force of uniform magnetic field, Earth's magnetic field and magnetic elements; para, dia and ferromagnetic substances with examples and permanent magnets.

11. A.C. currents: Peak and r.m.s. values of alternating current and voltage, reactance, impedance, LC oscillations, LCR series circuit(phasor) - resonance circuits, Q factor, power in AC circuits, watt-less current, A.C. generator and transformer.

12. Optical devices: Compound microscope, astronomical telescope and their magnification power, Wave front and Huygene's principle, reflection and refraction of plane waves from plane surfaces using wave front (qualitative idea), interference- young's double slit experiment and equation of width of fringes, coherent sources and stationary interference, diffraction- diffraction by a single slit, width of central maximum, difference between interference and diffraction, resolving power of microscope and telescope, polarization- plane polarized light, Nicole prism, Brewster's law, Uses of plane polarized light and Polaroid.

13. Photoelectric effect: Einstein's equation of photoelectric effect, particle nature of light, photocell and its uses; Matter waves, wave nature of particles, De Broglie's equation, De Broglie wavelength of electron, Division Germer's experiment, Primary concept of electron microscope.

14. Radioactivity: A, P and y radiations and their properties, law of radioactive disintegration, half-life and decay constant, simple explanation of (X, 0 and y decay, nuclear reactions-nuclear fission and fusion, energy sources of stars)

15. Communication System: Primary concepts of Analogue and digital communication, Necessity of modulation, Simple amplitude modulation and detection, quality of digital communication, Data transmission and reception, Principle of fax and modem, Space communication- sky and space wave propagation, Satellite communication, Use in remote sensing. Line communication, Two wire lines, Cables, Telephone links, Optical communication (Optical fiber, use of laser), basic principle of light modulation.

16. Semiconductor Device: Zener diode, Logic gates (OR, AND, NOT, NAND and NOR), Primary concept of I.C., PN junction, Semiconductors, Photo diode.

17. Farmat's principle and its applications: Farmat's principle of least time, laws at reflection, laws of refraction.

18. LASERS: Introduction, Attenuation of light in an optical medium, Thermal equilibrium, Interaction of light with matter, Einstein coefficients and their relations, Light amplification, Meeting the three requirements, Components of Laser, Lasing action, Principal pumping schemes, Type of lasers, Semiconductor laser, Laser beam characteristics, Applications.

19. Interference in thin films: Thin film, Plane parallel film, Interference due to transmitted light, Haidinger fringes, variable thickness (wedge-shaped) film, Newton's ring.

20. DC Circuits: RL circuits (Growth and decay of current), RC circuit (Charging and discharging of capacitor), L-C-R circuit in series with DC source.

21. AC Bridges: Condition for bridge balance, Maxwell bridge, Hay bridge, Schering bridge, Wein bridge.

22. Current Trends and Recent Advancements in the Above Fields.