EXP-1  
In this study, we set out to determine the gravitational acceleration and the coefficient of restitution using a rubber ball. The experiment involved dropping a rubber ball from a known height and measuring its subsequent rebound heights, allowing us to explore the dynamics of free fall and energy conservation.

With the use of a measuring scale and the 'phyphox' app on a smartphone, the heights and times of descent were recorded. From these data, we calculated the gravitational acceleration using the relationship g=2h/t^2​. The coefficient of restitution was obtained by comparing the height of each bounce to the initial drop height, revealing the fraction of kinetic energy preserved after each impact.

The findings confirmed that the gravitational acceleration value derived from our measurements was consistent with the accepted standard of 9.81m/s2. The coefficient of restitution, less than unity, indicated that the ball lost energy on each bounce, likely due to air resistance and internal energy dissipation within the ball. This experiment effectively demonstrated the principles of gravitational acceleration and energy loss in an elastic collision.

EXP-2  
We aimed to determine the mean wavelength of sodium D lines by analyzing Newton's Rings interference patterns. The experimental setup included a traveling microscope, a sodium vapor lamp, and a plano-convex lens. By observing the interference pattern of concentric rings, we measured the diameters of multiple rings to calculate the wavelength. The results were consistent with the known values for sodium D lines, demonstrating the effectiveness of Newton's Rings in determining wavelengths with high precision.

### **EXP-3.1**

The purpose of this experiment was to measure the magnetic field strength generated by a current-carrying wire using the Biot-Savart Law. We constructed a simple circuit with a current source and used a compass to observe the magnetic field. By varying the current and distance from the wire, we used the Biot-Savart Law to calculate the magnetic field strength. The experimental findings closely aligned with theoretical expectations, confirming the direct relationship between current, distance, and magnetic field intensity.

### **EXP-3.2**

The experiment's goal was to measure the magnetic field strength along the axis of an ALNICO bar magnet and find its magnetic dipole moment. We used a compass and a wooden meter scale to observe the field strength at various distances. By plotting these values, we determined the magnetic dipole moment of the magnet. The findings confirmed the theoretical model of a magnetic dipole, showing how field strength diminishes with distance.

### **EXP-4**

This experiment focused on measuring the wavelengths of the Balmer series in the hydrogen emission spectrum to determine Rydberg's constant. By utilizing a spectrometer and grating, we observed and recorded the visible spectral lines of hydrogen. From these measurements, we calculated the value of Rydberg's constant. The experimentally derived constant was in close agreement with the theoretical value, highlighting the precision of the spectroscopic method used.

### **EXP-5.1**

In this experiment, we aimed to verify how the impedance of a coil with resistance RL​ and self-inductance L varies with frequency and to measure these quantities. We used a signal generator and R-L-C box to record impedance at different frequencies, finding that impedance increases with frequency. From these measurements, we accurately calculated the coil's self-inductance and resistance, confirming the theoretical frequency dependence of impedance.

### **EXP-5.2**

The goal of this experiment was to confirm the theoretical relationship ZC​=1/(2πfC) for the impedance of a capacitor and to measure its capacitance. Using a signal generator and R-L-C box, we recorded impedance at different frequencies. The results showed a clear inverse relationship between impedance and frequency, validating the theoretical model. The calculated capacitance value was accurate and matched the expected result.

### **EXP-5.3**

The experiment demonstrated how impedance varies with resonance frequency in both series and parallel circuits containing an inductor and capacitor. We found that in the series circuit, impedance was minimized at the resonance frequency (fres​), while in the parallel circuit, impedance was maximized at this frequency. These findings, measured with a signal generator and digital multimeter, validated the theoretical principles of resonance in reactive circuits.