EXP-1  
This experiment aimed to determine the gravitational acceleration and the coefficient of restitution using a rubber ball. By utilizing simple tools—a measuring scale, a rubber ball, and the 'phyphox' app on a smartphone—we were able to carry out an effective investigation into the effects of gravity and elasticity.

We dropped the rubber ball from a measured height and recorded its rebound heights using the smartphone app. The gravitational acceleration was derived using the formula g=t22h​. The coefficient of restitution was computed as the ratio of the rebound height to the drop height, giving a measure of how much kinetic energy is retained after the ball's impact with the surface.

The experimentally determined gravitational acceleration closely matched the theoretical value, verifying the reliability of our method. The coefficient of restitution values indicated that some kinetic energy was converted into other forms, such as heat and sound, during the impact. This experiment provided a hands-on approach to understanding fundamental concepts in physics, such as gravitational acceleration and energy transformation.

EXP-2  
The objective of this experiment was to find the mean wavelength of sodium D lines through Newton's Rings interference. Utilizing a traveling microscope, sodium vapor lamp, and plano-convex lens, we observed and measured the diameters of the concentric rings formed by interference. These measurements allowed us to calculate the mean wavelength of the sodium light. The experimentally obtained wavelength was in close agreement with standard values, verifying the reliability of using Newton's Rings for precise wavelength determination of monochromatic light sources.

### **EXP-3.1**

In this experiment, we used the Biot-Savart Law to determine the magnetic field strength around a current-carrying wire. A compass and a current source were set up to measure the deflection of the magnetic field at different distances. By applying the law's formula, we calculated the magnetic field produced by the wire. The measured values matched the expected results, demonstrating how the magnetic field strength varies with distance and current intensity.

### **EXP-3.2**

In this experiment, we measured the magnetic field strength of an ALNICO bar magnet along its axis to determine its magnetic dipole moment. Using a compass and meter scale, we recorded the field strength at different distances from the magnet's center. The data allowed us to calculate the magnetic dipole moment, which was consistent with theoretical expectations. This experiment effectively illustrated the relationship between magnetic field strength and the dipole moment of a bar magnet.

### **EXP-4**

The aim of this experiment was to observe the emission spectra of hydrogen in the Balmer series and calculate Rydberg's constant. Using a spectrometer and a diffraction grating, we measured the wavelengths of the visible lines emitted by a hydrogen source. These measurements were then used to determine Rydberg's constant, which matched the accepted value. The experiment confirmed the Balmer series' predictions and illustrated the atomic transitions in hydrogen.

### **EXP-5.1**

The aim of this experiment was to show the variation of impedance of a coil with frequency and to measure its self-inductance and resistance. Using a signal generator and a digital multimeter, we measured the impedance at different frequencies, observing the expected increase with frequency. The self-inductance and resistance of the coil were determined from these measurements, aligning well with the theoretical values, showcasing the frequency-dependent nature of the coil's impedance.

### **EXP-5.2**

This experiment aimed to verify the relationship between the impedance of a capacitor and its capacitance, expressed as ZC​=1/(2πfC). Using a signal generator and R-L-C box, we measured the impedance at different frequencies. The results showed that the impedance decreased with increasing frequency, consistent with the theoretical formula. By analyzing the data, we determined the value of the capacitance, which closely matched the expected value.

### **EXP-5.3**

In this experiment, we investigated the impedance behavior of series and parallel resonant circuits. For the series circuit, the impedance was found to be minimal at the resonance frequency (fres​), which matched theoretical expectations. In the parallel circuit, the impedance reached its maximum at the same resonance frequency. The results, obtained using a signal generator and digital multimeter, confirmed the characteristic impedance variations of resonant circuits in both configurations.