EXP-1  
The objective of this experiment was to measure gravitational acceleration and the coefficient of restitution using a rubber ball. By observing the behavior of the ball during free fall and rebound, we gained insights into gravitational effects and energy dissipation mechanisms.

Using a measuring scale and a smartphone with the 'phyphox' app, we recorded the heights from which the rubber ball was dropped and its rebound heights. The gravitational acceleration was calculated using the formula g=2h​/t^2. The coefficient of restitution was determined as the ratio of the bounce height to the original drop height, which reflects the ball's ability to conserve kinetic energy after impact.

The experimentally derived value of gravitational acceleration was in close agreement with the standard value of 9.81m/s2. The coefficient of restitution values indicated that not all kinetic energy was retained, demonstrating energy loss due to factors such as internal friction and air resistance. This experiment provided a practical demonstration of fundamental physical principles, reinforcing our understanding of gravitational acceleration and the nature of elastic collisions.

EXP-2  
This experiment utilized Newton's Rings interference patterns to measure the mean wavelength of sodium D lines. Using a traveling microscope and a sodium vapor lamp, we observed the formation of circular rings caused by the interference of light waves reflected between the plano-convex lens and a plane glass plate. By measuring the diameters of these rings, we were able to calculate the mean wavelength of the sodium light. The experimental results closely matched the known values for sodium D lines, validating the use of this technique for wavelength determination.

### **EXP-3.1**

This experiment explored the application of the Biot-Savart Law in measuring the magnetic field strength around a current-carrying wire. With a compass and a calibrated current source, we observed the magnetic field's influence on the compass needle. By measuring the deflection at different distances, we calculated the magnetic field strength using the Biot-Savart Law. The experiment's results were in agreement with theoretical predictions, validating the law's description of the magnetic field generated by an electric current.

### **EXP-3.2**

This experiment investigated the magnetic field strength along the axis of an ALNICO bar magnet and calculated its magnetic dipole moment. Utilizing a compass and meter scale, we measured the field at several points. The magnetic dipole moment was derived from these observations, and the results aligned well with theoretical predictions. This exercise demonstrated the principles of magnetic dipoles and how they generate fields that decrease with increasing distance.

### **EXP-4**

The experiment aimed to measure the wavelengths of the Balmer series' visible lines in the hydrogen spectrum and to find Rydberg's constant. A spectrometer and grating were used to view the hydrogen emission lines, and their wavelengths were recorded. These values were then used to calculate Rydberg's constant. The results were consistent with the standard value, reinforcing our understanding of atomic structure and the quantization of energy levels in hydrogen atoms.

### **EXP-5.1**

The experiment was conducted to explore the frequency dependence of the impedance of a coil and to measure its self-inductance and resistance. By using a signal generator and a digital multimeter, we measured the coil's impedance across a range of frequencies, noting how it changes in relation to the inductance and resistance of the coil. These observations allowed us to determine the coil's self-inductance and resistance, which matched the theoretical predictions, illustrating how impedance changes with frequency in inductive circuits.

### **EXP-5.2**

This experiment explored the impedance of a capacitor and its variation with frequency. By using a signal generator and a digital multimeter, we verified the relationship ZC​=1/(2πfC). As expected, the impedance decreased with an increase in frequency, confirming the inverse proportionality. From the impedance measurements, we calculated the capacitance, which was found to be in close agreement with the theoretical value.

### **EXP-5.3**

This experiment aimed to explore the impedance behavior of series and parallel LC circuits at resonance. In the series configuration, the impedance was at its lowest at the resonance frequency (fres​), confirming theoretical expectations. For the parallel circuit, the impedance peaked at fres​. These observations, made using a signal generator and a digital multimeter, demonstrated the expected resonance effects on impedance in both types of resonant circuits.

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