### **SUMMARY EXP-1**

In this experiment, we aimed to determine the gravitational acceleration and the coefficient of restitution using a rubber ball. By dropping the ball from a known height and measuring the rebound heights, we were able to calculate the gravitational acceleration and observe the energy loss during each bounce.

Using the measuring scale and the 'phyphox' app on a smartphone, we recorded the drop height and subsequent rebound heights of the rubber ball. The gravitational acceleration was calculated using the formula g=2h/t^2​, where h is the height and t is the time taken for the ball to fall. Additionally, the coefficient of restitution was determined by the ratio of the rebound height to the original drop height, providing insight into the energy conservation and loss during the collision.

The results showed that the calculated value of gravitational acceleration was close to the standard value of 9.81m/s2, indicating the accuracy of the experimental setup. The coefficient of restitution, less than 1, highlighted the energy lost to factors like air resistance and internal friction within the ball. Overall, the experiment successfully demonstrated the principles of gravitational acceleration and energy dissipation through practical observation and measurement.

### **SUMMARY EXP-2**

The experiment aimed to determine the mean wavelength of sodium D lines using Newton's Rings interference patterns. By setting up a traveling microscope, a sodium vapor lamp, and a plano-convex lens, we observed concentric rings formed due to the interference of light waves. Measuring the diameters of these rings allowed us to calculate the mean wavelength of the sodium D lines. The results showed a wavelength consistent with the known values for sodium, confirming the accuracy of the Newton's Rings method for determining wavelengths of monochromatic light sources.

### **SUMMARY EXP-3.1**

The experiment aimed to measure the magnetic field strength around a current-carrying wire using the Biot-Savart Law. By setting up a circuit with a current source, a compass, and measuring tools, we observed the deflection of the compass needle caused by the magnetic field. Using the Biot-Savart Law, we calculated the magnetic field strength at various distances from the wire. The results were consistent with theoretical predictions, confirming the law's accuracy in describing the magnetic effects of electric currents.

### **SUMMARY EXP-3.2**

This experiment aimed to measure the magnetic field strength of an ALNICO bar magnet along its axis and determine the magnetic dipole moment. Using a compass and a wooden meter scale, we measured the field strength at various points along the magnet's axis. The magnetic dipole moment was calculated from these measurements. The results provided a clear demonstration of the inverse cube law governing the magnetic field around a dipole, confirming the magnet's properties as predicted by theory.

### **SUMMARY EXP-4**

In this experiment, we measured the wavelengths of the visible spectral lines in the Balmer series of atomic hydrogen and determined the value of Rydberg's constant. Using a spectrometer and a grating, we observed the spectral lines produced by a hydrogen source. By measuring these wavelengths and applying the Balmer formula, we calculated Rydberg's constant. The results were consistent with the known theoretical value, validating the experiment and demonstrating the quantized nature of atomic energy levels.

### **SUMMARY EXP-5.1**

This experiment demonstrated how the impedance of a coil with resistance RL​ and self-inductance L varies with frequency. Using a signal generator and R-L-C box, we observed that the impedance changes in relation to the coil's resistance and inductance. By measuring the coil's impedance at various frequencies, we calculated its self-inductance and resistance. The results confirmed the theoretical relationship between impedance and frequency, accurately determining the coil's self-inductance and resistance.

### **SUMMARY EXP-5.2**

In this experiment, we verified that the impedance of a capacitor varies inversely with both frequency and capacitance, following the equation ZC​=1/(2πfC). Using a signal generator and a digital multimeter, we measured the impedance at various frequencies. The findings confirmed the theoretical relationship, as impedance decreased when the frequency increased. We also calculated the capacitance value, which was in agreement with the known value.

### **SUMMARY EXP-5.3**

This experiment aimed to demonstrate the impedance characteristics of series and parallel resonant circuits containing an inductor and capacitor. For the series circuit, we observed that the impedance was at a minimum at the resonance frequency (fres​), confirming theoretical predictions. Conversely, for the parallel circuit, the impedance was at a maximum at fres​. Using a signal generator and a digital multimeter, the resonance effects on impedance in both configurations were clearly shown, validating the expected behavior of resonant circuits.

### **AMS 203**

# **Lab Report: Physics Experiments**

### ***Submitted by*:**

Jayesh Pandit  
IMT2023111