

# Developing an Automated Spectrophotometer with RGB LED and LDR Sensor Using Arduino Microcontroller

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## Abstract

This research used RGB led, LDR sensors, 3D printed sampling cartridge, and Arduino Mega to create a spectrophotometer with automation software to select wavelength, calculate calibration parameters, and report the concentration of the materials being studied. Spectrophotometers are finding applications across many fields, including clinical laboratories, pharmaceuticals, molecular biology, biochemistry, and even the medical realm. This study assembled an Arduino mega system coupled with software for the automatic selection of best-fit color light, calibration curve, and actual concentration interpolation processes. Dilution solutions from multiple chemical materials were evaluated to examine their linearity of calibration curves. Our study demonstrated that the tested chemical samples revealed a significant regression coefficient of up to 0.9945 for serial dilution solutions. Relative concentrations were measured with remarkable precision, exhibiting less than 5.0 % error compared to a commercial spectrophotometer. These findings highlight the viability of the RGB spectrophotometer and emphasize its potential with the promise of further refinement in development.