Lab 2

ICS423 - Internet of Things

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Question

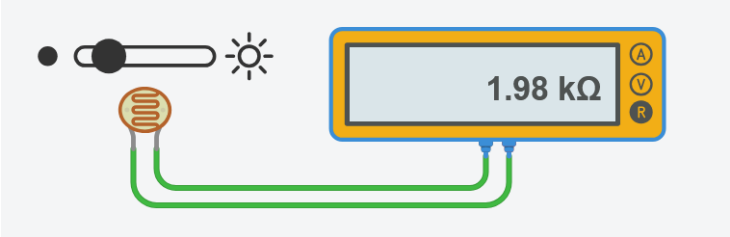
Task 1: Explore the application of sensors or actuators (atleast 4 from Tinkercad circuits)

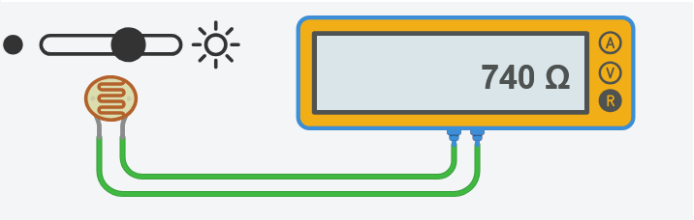
Task 2: Switch ON a bulb based on the light intensity using Tinkercad circuits.

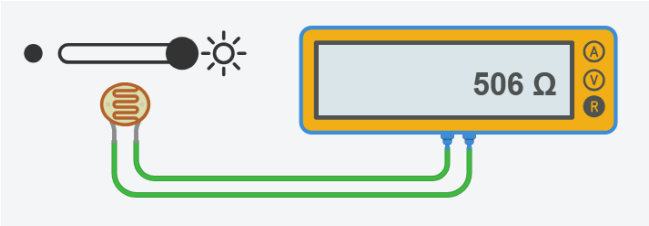
Task 1

1. Light Dependent Resistor (LDR) - Sensor

Description: The LDR detects light intensity and adjusts circuit behavior based on ambient lighting conditions. It is used for energy-saving devices like automatic streetlights.
Application: In this circuit, the LDR turns on a bulb when the light intensity falls below a threshold and turns it off when the intensity increases.

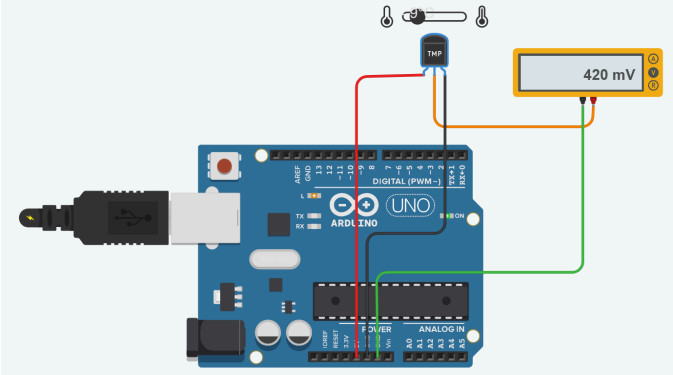


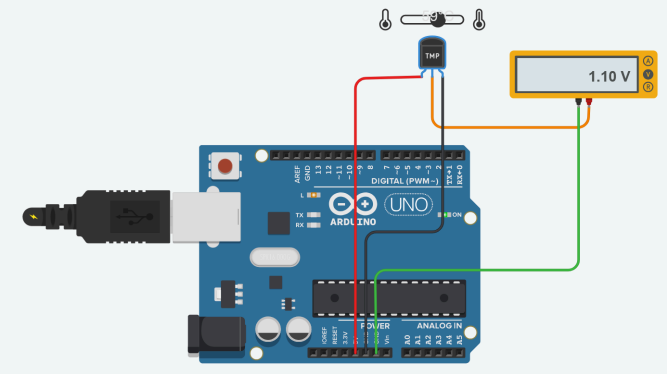


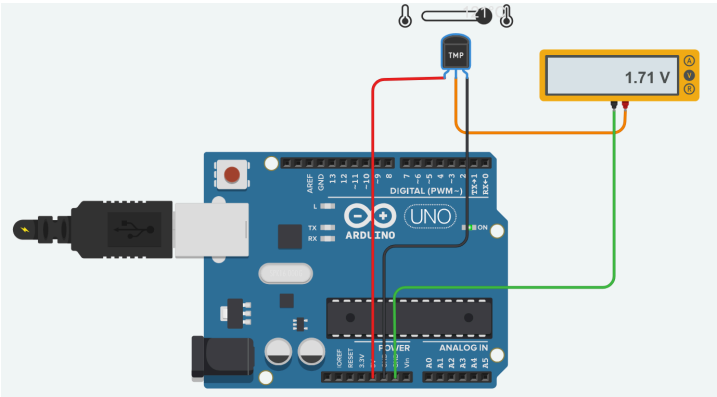


2. Temperature Sensor - Sensor

Description: A temperature sensor detects the surrounding temperature and converts it into a readable analog signal. It's useful in thermostats and weather monitoring systems.
Application: In this circuit, the temperature sensor provides analog readings to indicate environmental temperature, which can control heating or cooling devices.

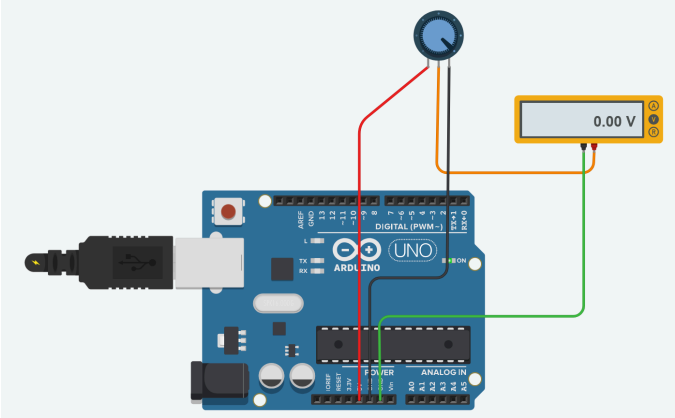


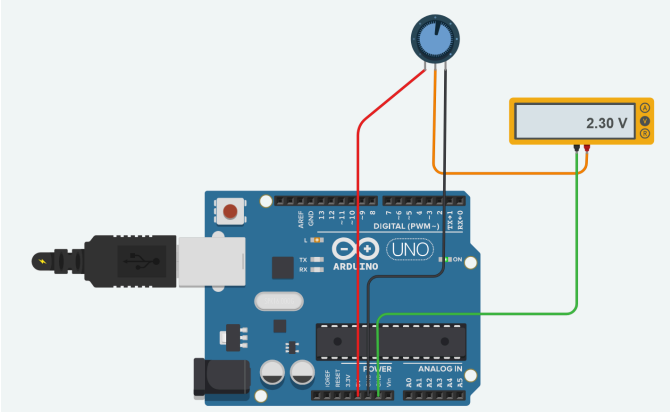


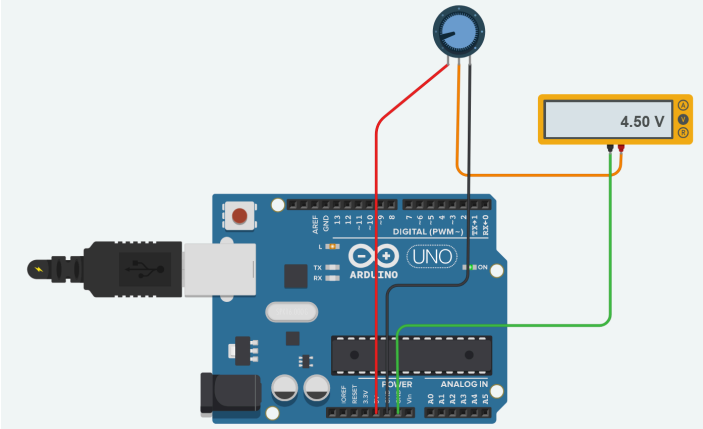


3. Potentiometer - Sensor/Controller

Description: A potentiometer is a variable resistor used to manually adjust the resistance in a circuit, providing control over voltage or current. It's commonly used in devices like volume knobs or brightness controls.
Application: In this setup, the potentiometer simulates an adjustable analog input, which can control the brightness of an LED.







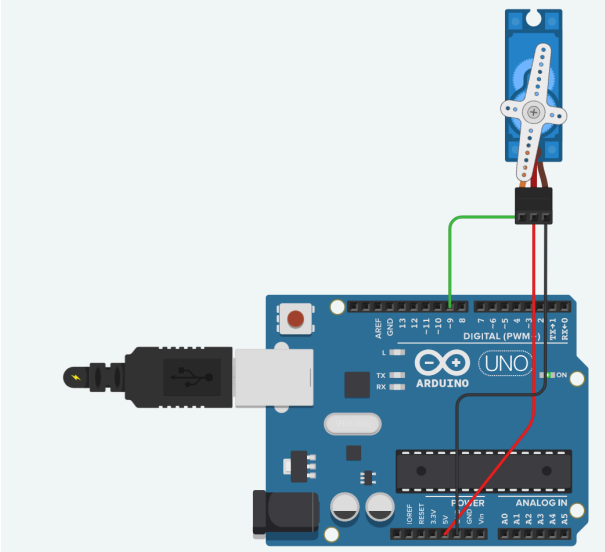
4. Servo Motor - Actuator

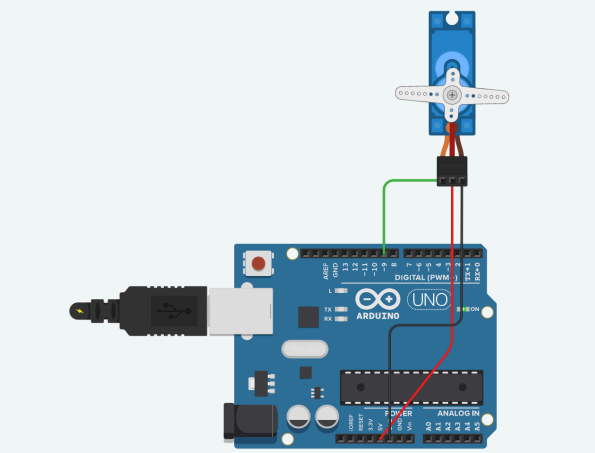
Description: A servo motor is an actuator capable of precise angular movement. It's widely used in robotics, home automation, and control systems.
Application: The servo motor rotates to specific angles (0°, 90°, and 180°) to demonstrate control and movement capabilities. This can simulate turning dials or opening/closing mechanisms.

Code

```
#include <Servo.h>
Servo myServo;

void setup() {
  myServo.attach(9); // Attach servo to pin 9
}

void loop() {
  myServo.write(0);   // Rotate to 0 degrees
  delay(1000);
  myServo.write(90);  // Rotate to 90 degrees
```

```
  delay(1000);
  myServo.write(180); // Rotate to 180 degrees
  delay(1000);
}
```





Task 2

In this lab, we will simulate an **Arduino-based light intensity lamp** using Tinkercad Circuits. The objective is to turn on a light bulb when the light intensity is low and turn it off when the light intensity is high, helping conserve energy.

Overview

The system uses an **LDR (Light Dependent Resistor)** to detect light intensity and control a light bulb accordingly. A relay is employed to handle the power difference between the bulb (120V) and the Arduino (5V).

Required Components

1. **LDR** (Light Dependent Resistor): To detect light and dark conditions.
2. **Arduino Microcontroller**: To process the input from the LDR and control the output.
3. **Light Bulb**: The output device that turns ON or OFF based on light intensity.
4. **Relay**: To switch the light bulb since it operates at a higher voltage.
5. **Power Source**: To supply power to the circuit.
6. **Breadboard** (Optional but recommended): For easier and cleaner wiring.

Instructions

Step 1: Setup the Circuit

- Open Tinkercad and create a new circuit project.
- Drag all the required components (LDR, Arduino, relay, light bulb, power source, and optional breadboard) into the workspace.

Step 2: Arrange Components

- Place the components on the breadboard for better organization and easy wiring. Position the Arduino, LDR, relay, and light bulb logically to minimize clutter.

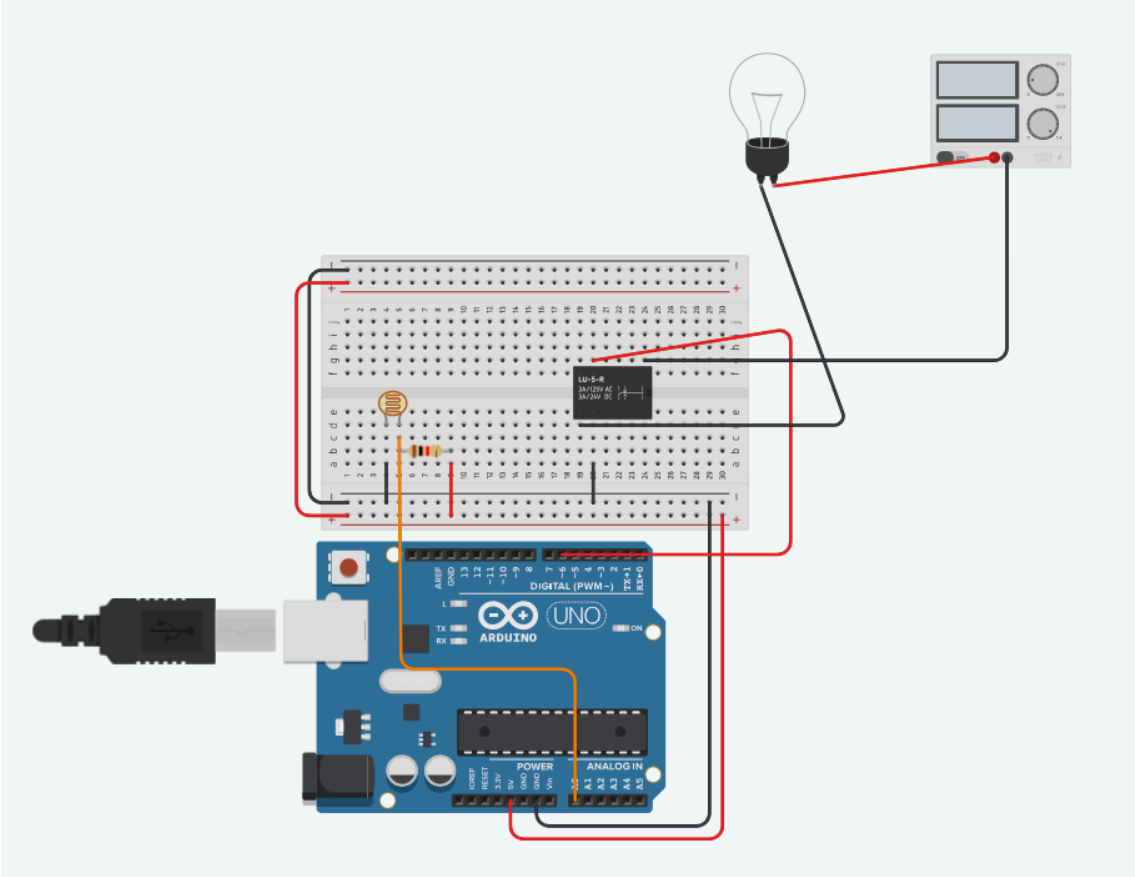
Step 3: Connect the Wires

A. Wiring the Relay and Light Bulb

1. Connect the **5V pin** of the Arduino to the **power rail** on the breadboard.
2. Connect the **GND pin** of the Arduino to the **ground rail**.
3. Attach the **positive terminal** of the power source to **Terminal 2** of the light bulb.
4. Connect the **negative terminal** of the power source to **Terminal 1** of the relay.
5. Link the **negative terminal** of the light bulb to **Terminal 7** of the relay.
6. Connect **Terminal 8** of the relay to the **ground rail**.
7. Finally, connect **Terminal 5** of the relay to any **digital pin** on the Arduino.

B. Wiring the Photoresistor

1. Connect **Terminal 1** of the LDR to the **ground rail**.
2. Connect **Terminal 2** of the LDR to an **analog pin** on the Arduino (e.g., A0) and to the **power rail** using a **1kΩ resistor**.

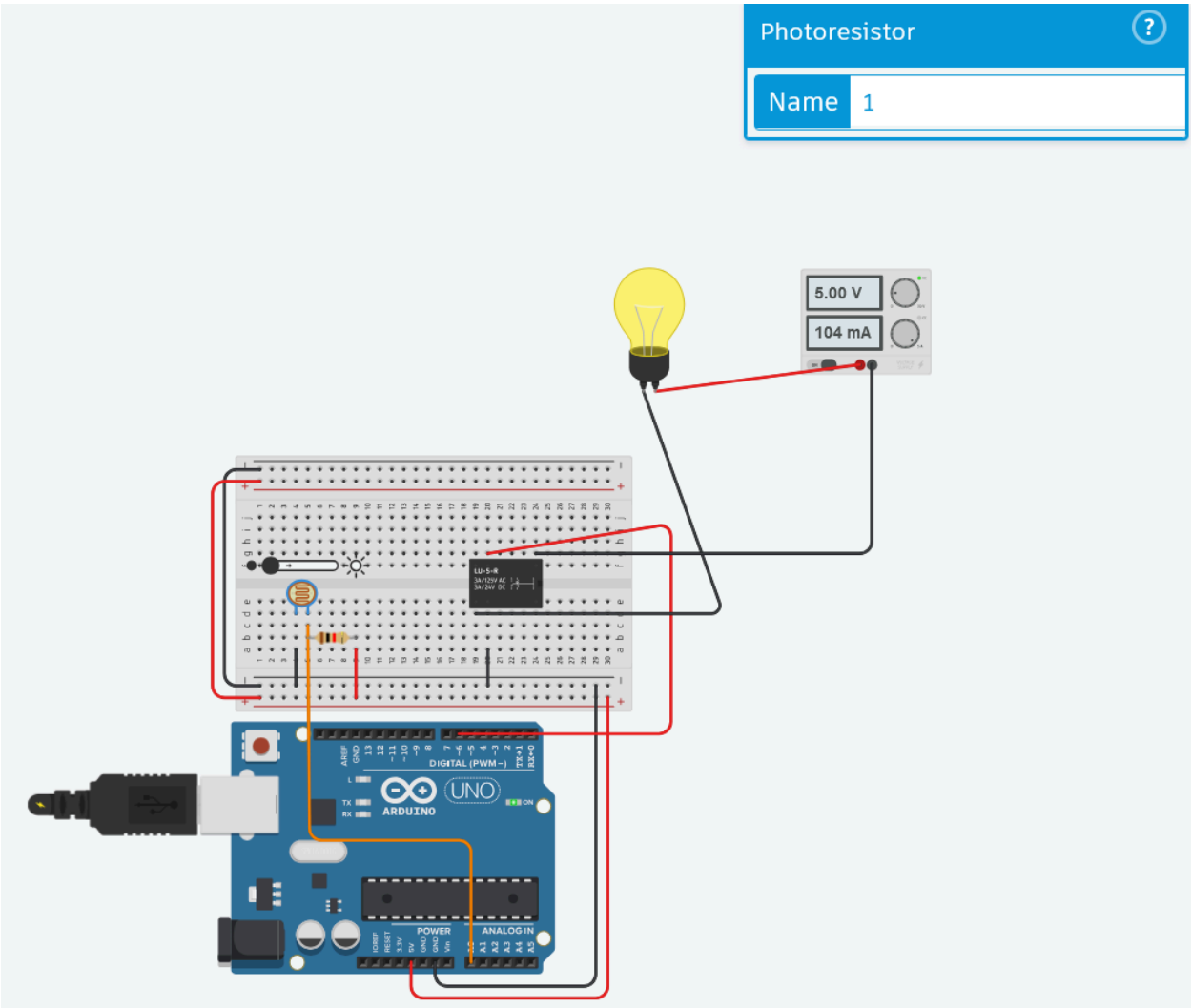


Code

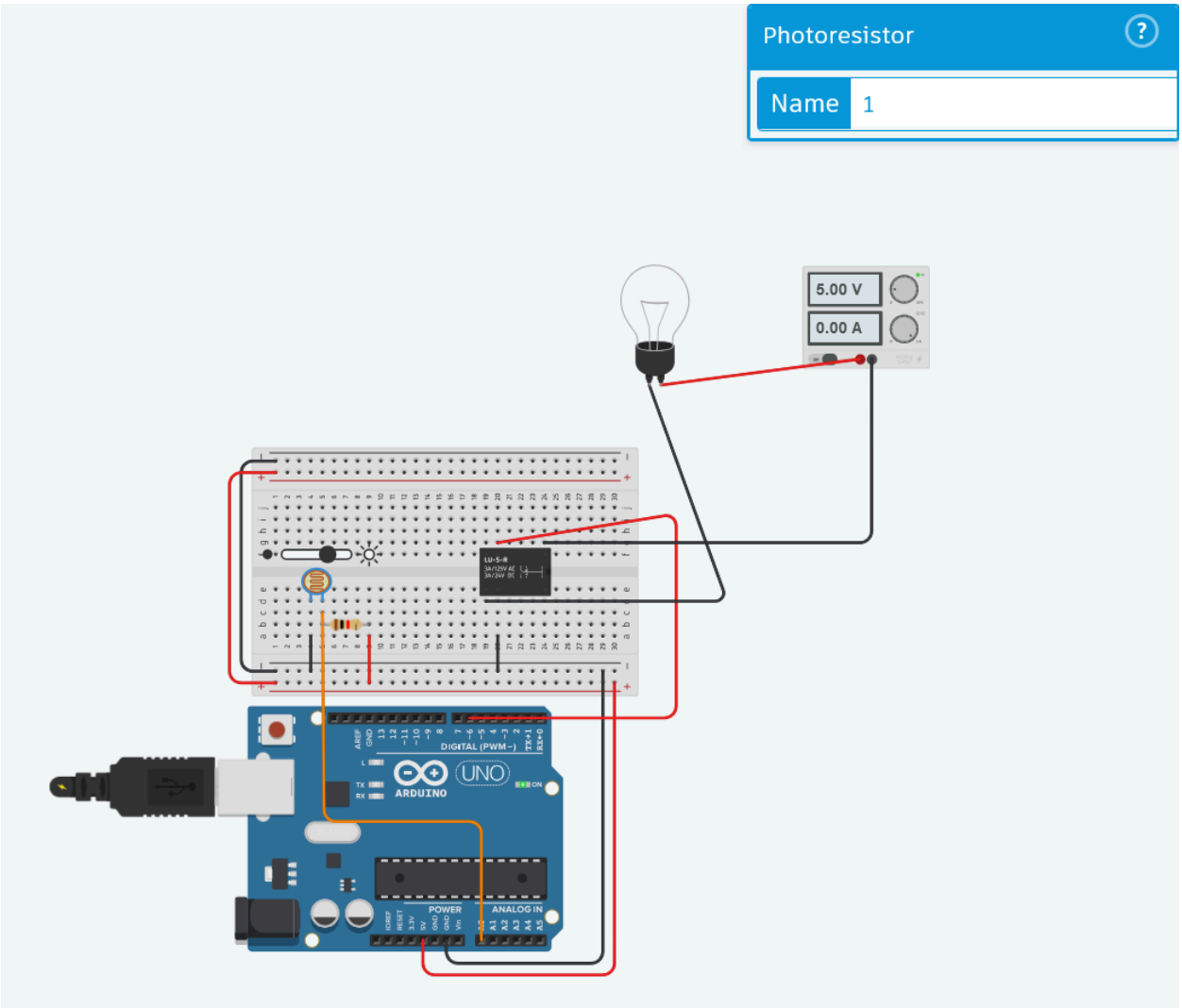
```
void setup()
{
  pinMode(A0, INPUT);
  pinMode(6, OUTPUT);
}

void loop()
{
    Serial.println(analogRead(A0));
  if (analogRead(A0) > 500)
    {
        digitalWrite(6, LOW);
    }
  else
    {
      digitalWrite(6, HIGH);
    }
    delay(10);
}
```

Output

LDR in low light



LDR in high light



We can see the behavior of the circuit for different light conditions. The light bulb will automatically turn ON when the light intensity drops and turn OFF when the light intensity rises, simulating an energy-efficient system for real-world applications.