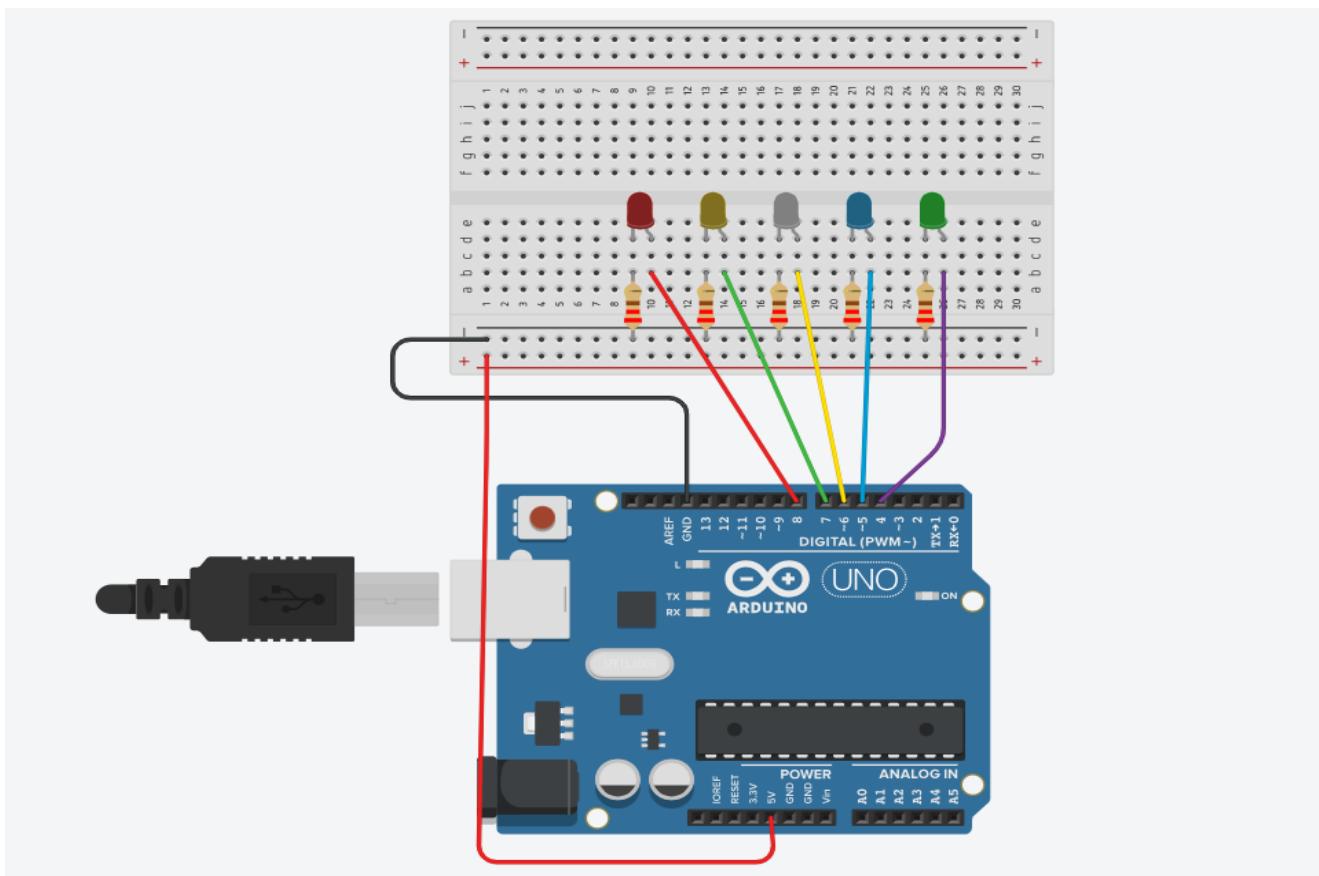


**Experiment No: 1****Develop a program to blink 5 LEDs back and forth.****COMPONENTS:**

S.NO.	Name	Quantity
1.	Arduino Uno	1
2.	Cable	7
3.	Bread Board	1
4.	LED	5
5.	Resistance (220 Ω)	5

**CIRCUIT DIAGRAM:****SET UP:**

- Connect the components as per circuit.
- Make sure VCC and Ground pins connected properly to avoid any damage to Arduino
- Locate the appropriate Components from search for components tab, located at the right-hand side corner of the Tinkercad web-based software.
- Select appropriate components and connect them as per the circuit diagram shown in the figure above.

**CODE:**

```
void setup()
{
    pinMode(4, OUTPUT);
    pinMode(5, OUTPUT);
    pinMode(6, OUTPUT);
    pinMode(7, OUTPUT);
    pinMode(8, OUTPUT);
}

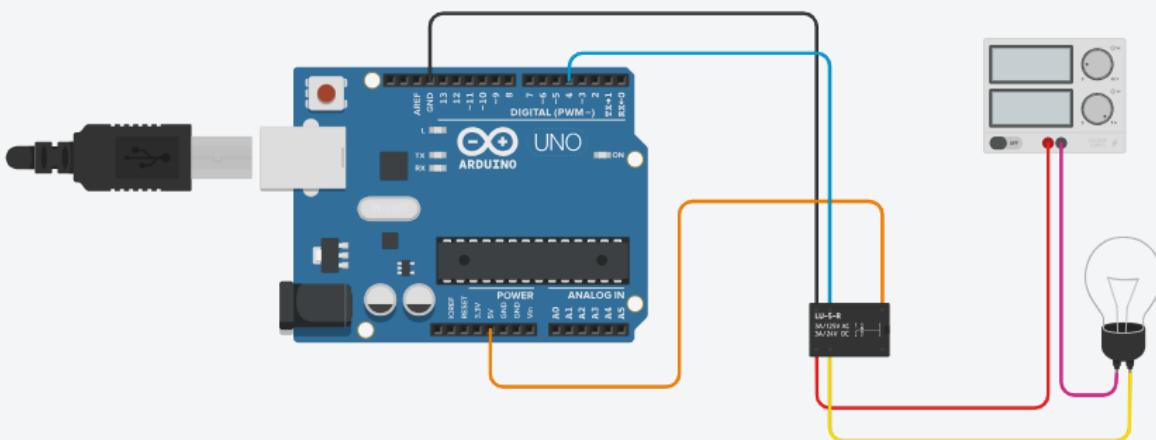
void loop()
{
    digitalWrite(4, HIGH);
    delay(1000);
    digitalWrite(5, HIGH);
    delay(1000);
    digitalWrite(6, HIGH);
    delay(1000);
    digitalWrite(7, HIGH);
    delay(1000);
    digitalWrite(8, HIGH);
    delay(1000); // Wait for 1000 millisecond(s)
    digitalWrite(8,LOW);
    delay(1000);
    digitalWrite(7, LOW);
    delay(1000);
    digitalWrite(6, LOW);
    delay(1000);
    digitalWrite(5, LOW);
    delay(1000);
    digitalWrite(4, LOW);
    delay(1000); // Wait for 1000 millisecond(s)
}
```

**Experiment No: 2**

**Develop a program to interface a relay with Arduino board.**

**COMPONENT:**

S.NO.	Name	Quantity
1.	Arduino Uno	1
2.	Cable	6
3.	Relay SPDT	1
4.	Power Supply	1
5.	Bulb	1

**CIRCUIT DIAGRAM:****SET UP:**

- Connect the Components as per circuit.
- Make sure VCC and Ground pins connected properly to avoid any damage to Arduino
- Locate the appropriate Components in search for components tab, located at the right-hand side corner of the Tinkercad web-based software.
- Select appropriate components and connect them as per the circuit diagram shown in the figure above.
- Type the code in code section tab.
- To get appropriate output click on Start Simulation tab.

**CODE:**

```
int relaypin = 4;  
  
void setup()  
{  
    pinMode(relaypin, OUTPUT);  
}  
  
void loop()  
{  
    digitalWrite(relaypin, LOW);  
    delay(1000);  
    digitalWrite(relaypin, HIGH);  
    delay(1000);  
}
```

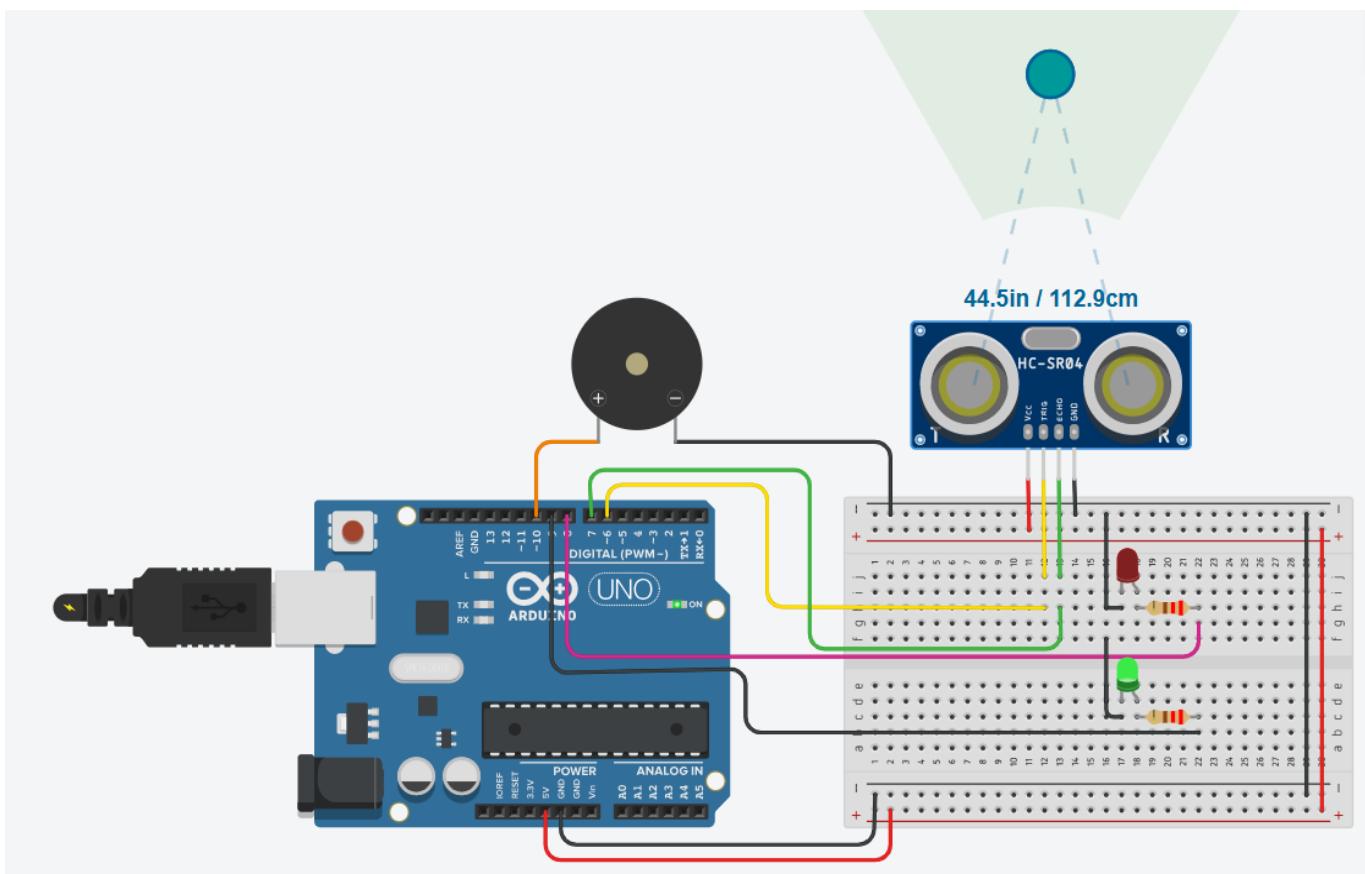
## **Experiment No: 3**

**Develop a program to deploy an intrusion detection system using Ultrasonic and sound sensors.**

## **COMPONENT:**

S.NO.	Name	Quantity
1.	Arduino Uno	1
2.	Cable	6
3.	Bread Board	1
4.	LED	2
5.	Resistance (220 $\Omega$ )	2
6.	Ultrasonic Distance Sensor (4-pin)	1
7.	Piezo / Buzzer	1

## **CIRCUIT DIAGRAM:**



## **SET UP:**

- a) Connect the Components as per circuit.
  - b) Make sure VCC and Ground pins connected properly to avoid any damage to Arduino
  - c) Locate the appropriate Components in search for components tab, located at the right-hand side corner of the Tinkercad web-based software.
  - d) Select appropriate components and connect them as per the circuit diagram shown in the figure above.
  - e) Type the code in code section tab.

- 
- f) To get appropriate output click on Start Simulation tab.
  - g) Click on the Ultrasonic Distance Sensor to get the desired Output.
  - h) Also verify the values in the Serial Monitor Section.

**CODE:**

```
#define echo 2
#define trig 3
#define outA 8
#define outB 9
#define outC 10
float duration;
float distance;
const int intruderDistance = 100;
void setup() {
    pinMode(trig, OUTPUT);
    pinMode(echo, INPUT);
    pinMode(outA, OUTPUT);
    digitalWrite(outA, LOW);
    pinMode(outB, OUTPUT);
    digitalWrite(outB, LOW);
    pinMode(outC, OUTPUT);
    digitalWrite(outC, LOW);
    Serial.begin(9600)
}
void loop()
{
    time_Measurement();
    distance = (float)duration * (0.0343) / 2;
    Serial.println(distance);
    alarm_condition();
}
void time_Measurement()
```

---

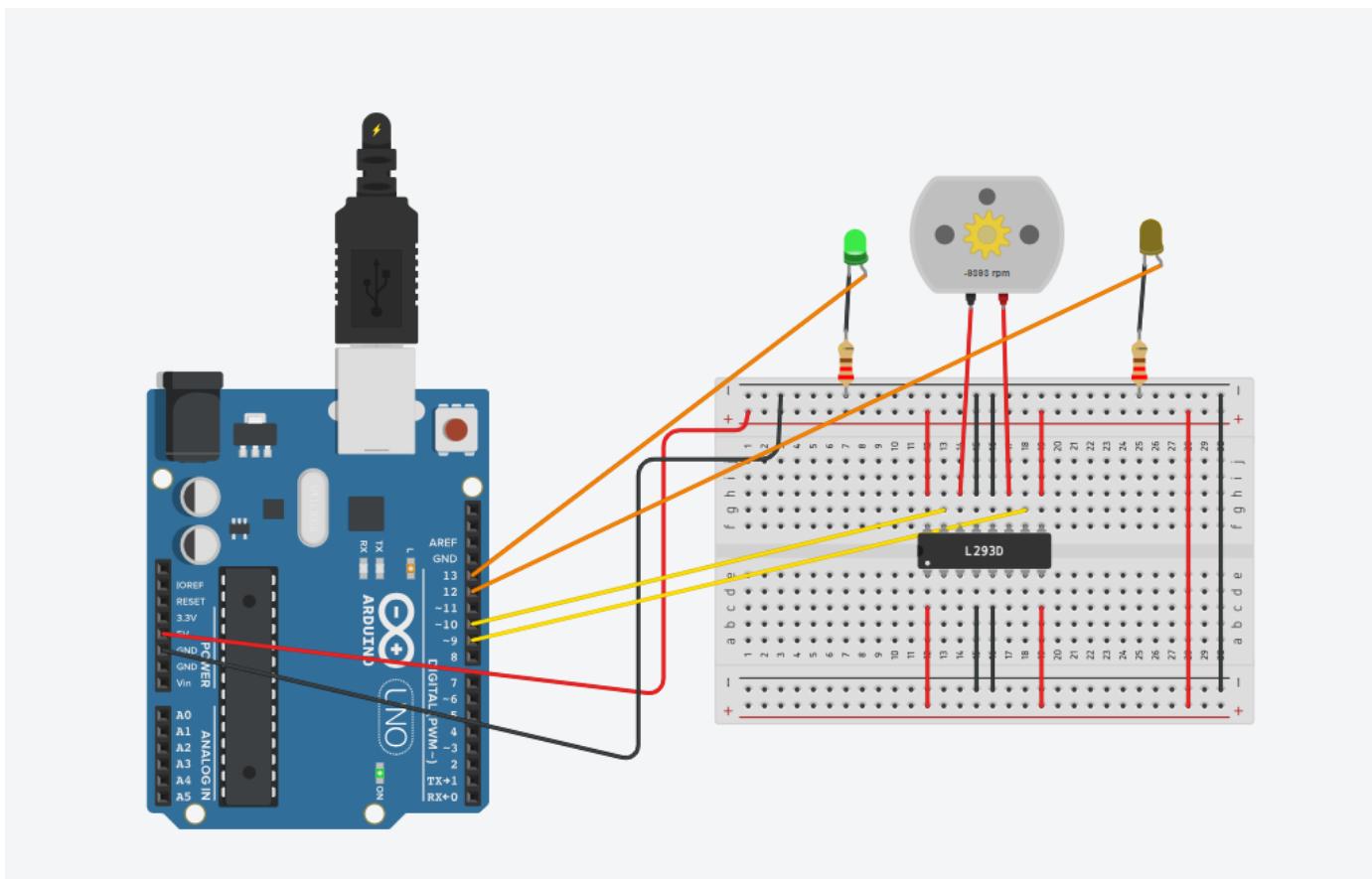
```
{  
    digitalWrite(trig, LOW);  
    delayMicroseconds(2);  
    digitalWrite(trig, HIGH);  
    delayMicroseconds(10);  
    digitalWrite(trig, LOW);  
    duration = pulseIn(echo, HIGH);}  
  
void alarm_condition()  
{  
    if(distance<=intruderDistance)  
    {  
        digitalWrite(outA,HIGH);  
        digitalWrite(outB,LOW);  
        analogWrite(outC,100);}  
    else  
    {  
        digitalWrite(outA,LOW);  
        digitalWrite (outB, HIGH);  
        analogWrite (outC,0);  
    }  
}
```

**Experiment No: 4**

**Develop a program to control a DC motor with Arduino board.**

**COMPONENTS:**

S.NO.	Name	Quantity
1.	Arduino Uno	1
2.	Cable	6
3.	Bread Board	1
4.	LED's	2
5.	Resistance (220 Ω)	2
6.	DC Motor	1
7.	L293D Motor Driver	1

**CIRCUIT DIAGRAM:****SET UP:**

- Connect the Components as per circuit.
- Make sure VCC and Ground pins connected properly to avoid any damage to Arduino
- Locate the appropriate Components in search for components tab, located at the right-hand side corner of the Tinkercad web-based software.
- Select appropriate components and connect them as per the circuit diagram shown in the figure above.
- Type the code in code section tab.
- To get appropriate output click on Start Simulation tab.

**CODE:**

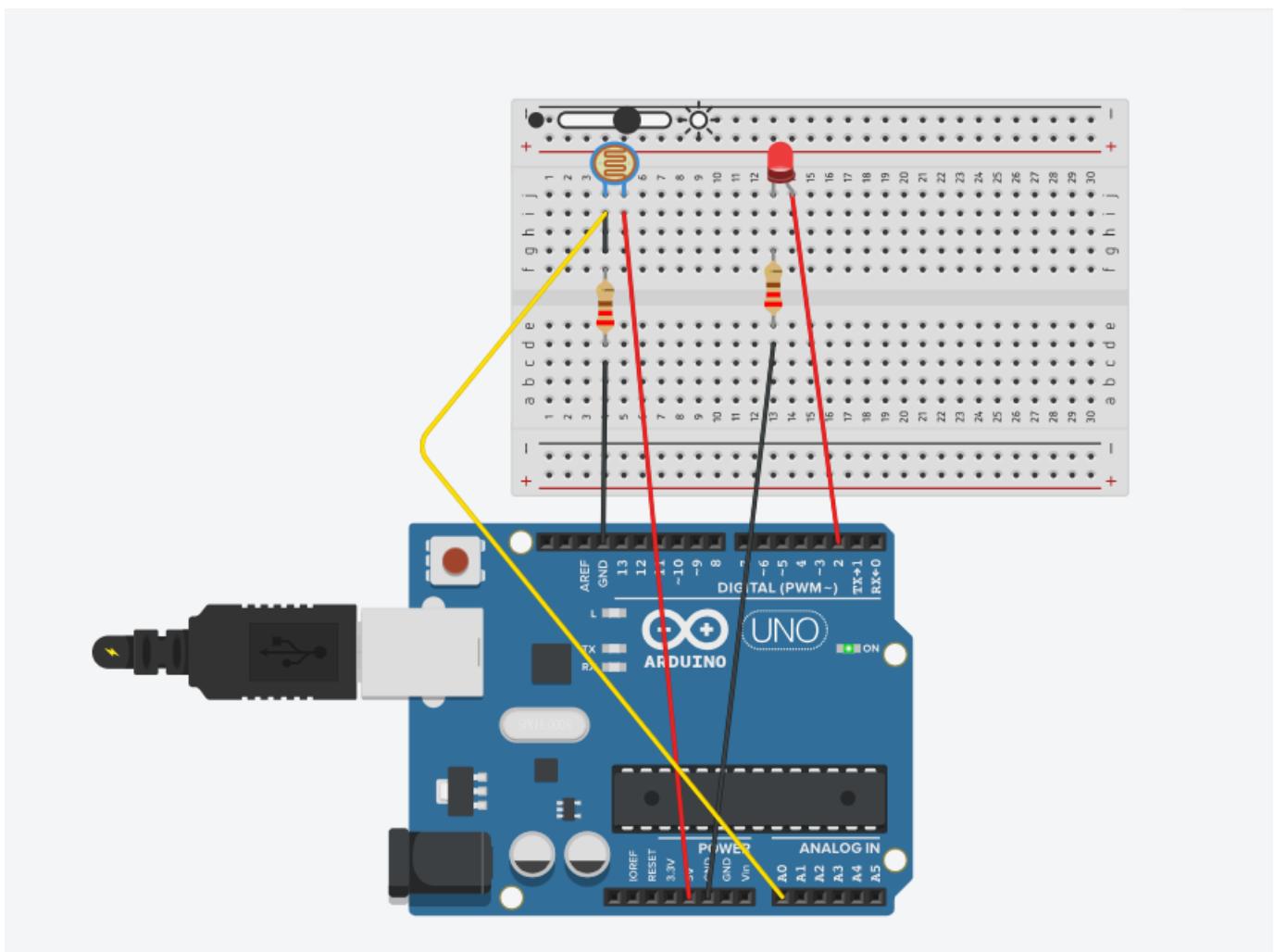
```
int ledgreen = 13;  
int ledyellow = 12;  
int inputpin1 = 10;  
int inputpin2 = 9;  
  
void setup()  
{  
    pinMode(10, INPUT);  
    pinMode(9, INPUT);  
    pinMode(12, OUTPUT);  
    pinMode(13, OUTPUT);  
}  
  
void loop()  
{  
    digitalWrite(10, HIGH);  
    digitalWrite(13, HIGH);  
    delay(1000);  
    digitalWrite(9, LOW);  
    digitalWrite(12, LOW);  
    delay(1000);  
  
    digitalWrite(9, HIGH);  
    digitalWrite(12, HIGH);  
    delay(1000);  
    digitalWrite(10, LOW);  
    digitalWrite(13, LOW);  
    delay(1000);  
}
```

**Experiment No: 5**

**Develop a program to deploy smart street light system using LDR sensor.**

**COMPONENTS:**

S.NO.	Name	Quantity
1.	Arduino Uno	1
2.	Cable	4
3.	Bread Board	1
4.	LED	1
5.	Resistance (850 Ω)	2
6.	LDR	1

**CIRCUIT DIAGRAM:****SET UP:**

- Connect the Components as per circuit.
- Make sure VCC and Ground pins connected properly to avoid any damage to Arduino
- Locate the appropriate Components in search for components tab, located at the right-hand side corner of the Tinkercad web-based software.
- Select appropriate components and connect them as per the circuit diagram shown in the

figure above.

- e) Type the code in code section tab.
- f) To get appropriate output click on Start Simulation tab.
- g) Click on the LDR Sensor to and adjust the values to get the desired output.
- h) Also verify the values in the Serial Monitor Section.

**CODE:**

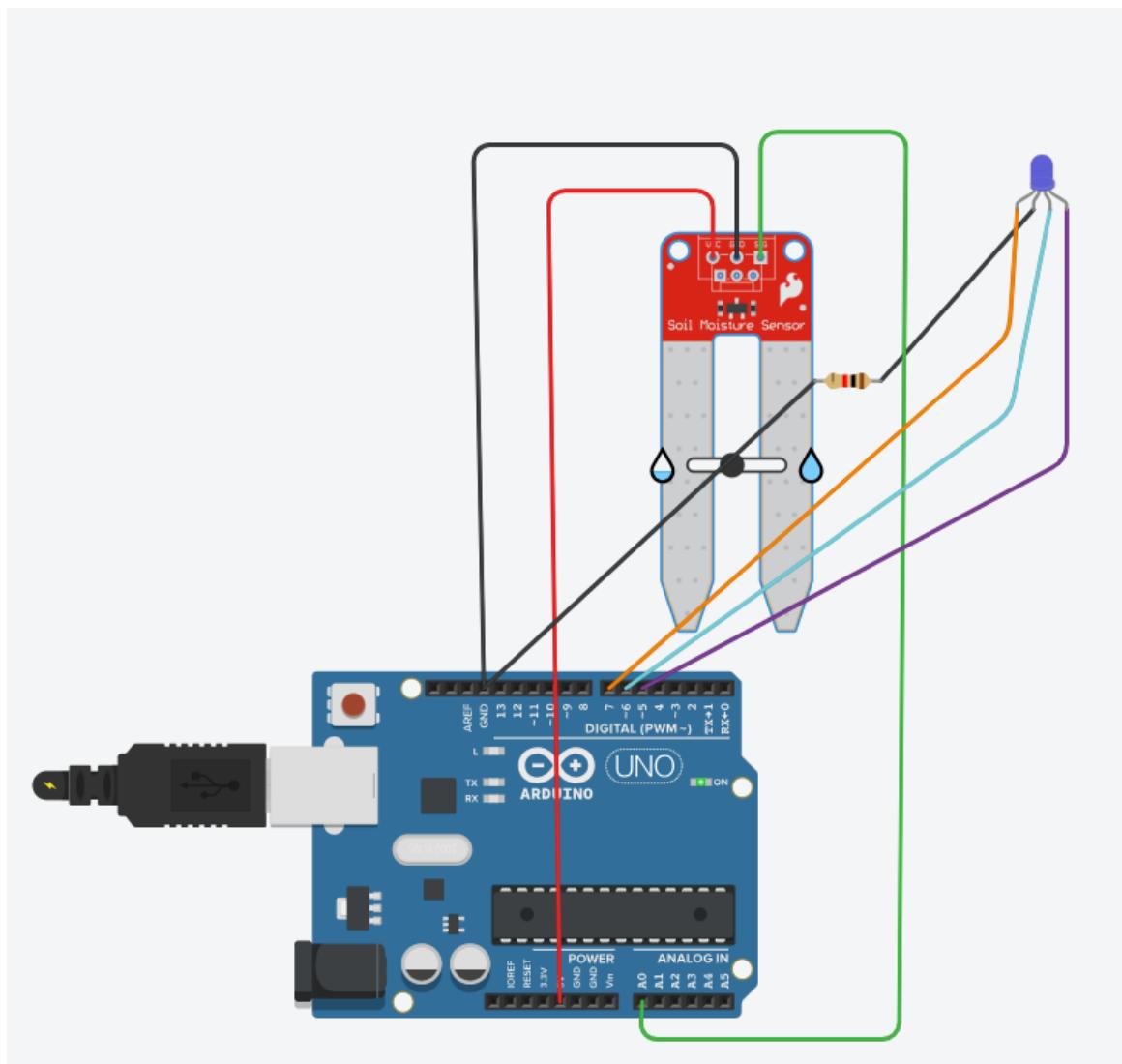
```
int ldr = A0;  
  
int led = 2;  
  
int ldrValue = 0;  
  
void setup()  
{  
    pinMode(led, OUTPUT);  
    pinMode(ldr, INPUT);  
    Serial.begin(9600);  
}  
  
void loop()  
{  
    ldrValue=analogRead(ldr);  
    Serial.println(ldrValue);  
    if(ldrValue>=100)  
        digitalWrite(led, HIGH);  
    else  
        digitalWrite(led, LOW);  
}
```

**Experiment No: 6**

**Develop a program to classify dry and wet waste with the Moisture sensor (DHT22).**

**COMPONENTS:**

S.NO.	Name	Quantity
1.	Arduino Uno	1
2.	Cable	8
3.	Bread Board	1
4.	LED	1
5.	Resistance ( $1K\Omega$ )	1
6.	Moisture sensor (DHT22)	1

**CIRCUIT DIAGRAM:****SET UP:**

- Connect the Components as per circuit.
- Make sure VCC and Ground pins connected properly to avoid any damage to Arduino
- Locate the appropriate Components in search for components tab, located at the right-hand side corner of the Tinkercad web-based software.

- 
- d) Select appropriate components and connect them as per the circuit diagram shown in the figure above.
  - e) Type the code in code section tab.
  - f) To get appropriate output click on Start Simulation tab.
  - g) Adjust the values by clicking on the Moisture sensor to get the desired output.
  - h) Also verify the values in the Serial Monitor Section.

**CODE:**

```
int moisture_Value=0;  
  
float moisture_percentage=0;  
  
void setup()  
{  
    pinMode(7, OUTPUT);  
    pinMode(6, OUTPUT);  
    pinMode(5, OUTPUT);  
    Serial.begin(9600);  
}  
  
void loop()  
{  
    moisture_Value = analogRead(A0);  
    moisture_percentage = ((moisture_Value/539.00)*100);  
    if ( moisture_percentage>0 && moisture_percentage<25)  
    {  
        digitalWrite(7,HIGH);  
        digitalWrite(6,LOW);  
        digitalWrite(5,LOW);  
    }  
    if (moisture_percentage>25 && moisture_percentage<80)  
    {  
        digitalWrite(7,LOW);  
        digitalWrite(6,HIGH);  
        digitalWrite(5,LOW);  
    }  
}
```

---

```
if (moisture_percentage>80 && moisture_percentage<100)
{
    digitalWrite(7,LOW);
    digitalWrite(6,LOW);
    digitalWrite(5,HIGH);
}

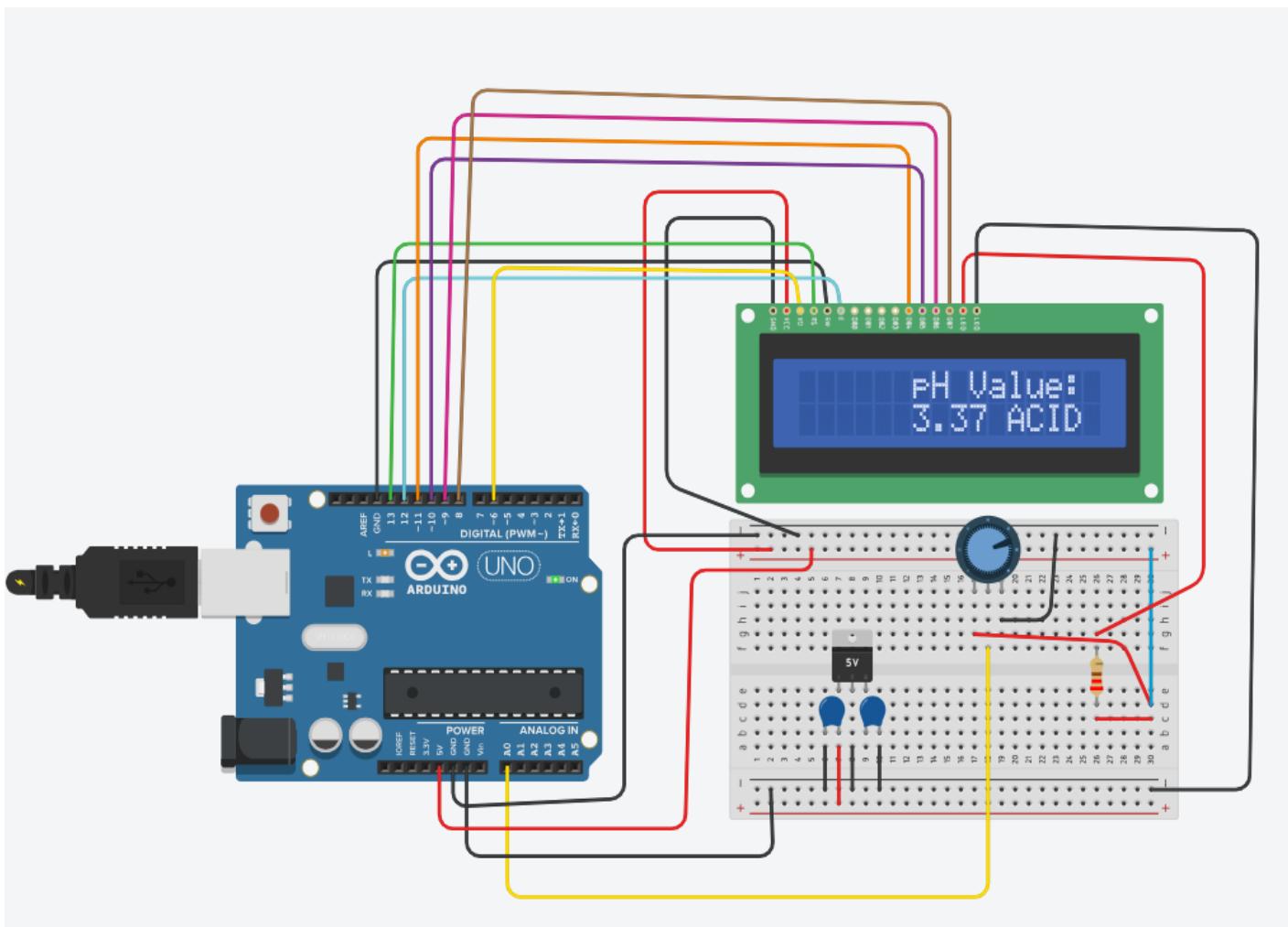
Serial.println("Moisture Value : ");
Serial.println(moisture_percentage);
delay(1000);
}
```

**Experiment No: 7**

**Develop a program to read the pH value of a various substances like milk, lime and water.**

**COMPONENTS:**

S.NO.	Name	Quantity
1.	Arduino Uno	1
2.	Cable	12
3.	Bread Board	1
4.	Resistance ( $220 \Omega$ )	1
5.	LCD 16 x 2	1
6.	10 M $\Omega$ Potentiometer	1
7.	5V Regulator [LM7805]	1
8.	0.22 uF Capacitor	1
9.	0.1 uF Capacitor	1

**CIRCUIT DIAGRAM:****SET UP:**

- Connect the Components as per circuit.
- Make sure VCC and Ground pins connected properly to avoid any damage to Arduino

- 
- c) Locate the appropriate Components in search for components tab, located at the right-hand side corner of the Tinkercad web-based software.
  - d) Select appropriate components and connect them as per the circuit diagram shown in the figure above.
  - e) Type the code in code section tab.
  - f) To get appropriate output click on Start Simulation tab.
  - g) Click on the Potentiometer and try to adjust the range to get the desired Output on the LCD Display.
  - h) Also verify the values in the Serial Monitor Section.

**CODE:**

```
#include<LiquidCrystal.h>

const int rs =13, en = 12, d4 =11, d5 =10, d6 =9, d7 =8;

LiquidCrystal lcd( rs,en, d4, d5, d6, d7);

int Contrast = 0;

void setup()

{

    Serial.begin(9600);

    analogWrite (6,Contrast);

    lcd.begin(10,2);

    lcd.setCursor(6,0);

    lcd.print("pH Value:");

}

void loop()

{

    int sensorValue = analogRead(A0);

    float ph = sensorValue * (14.0/1023.0);

    Serial.println(ph);

    lcd.setCursor(6,1);

    if (ph>0.0 && ph<5.0)

    {

        lcd.print (ph); lcd.print (" ACID");

    }

    if (ph>5.0 && ph<7.0)
```

---

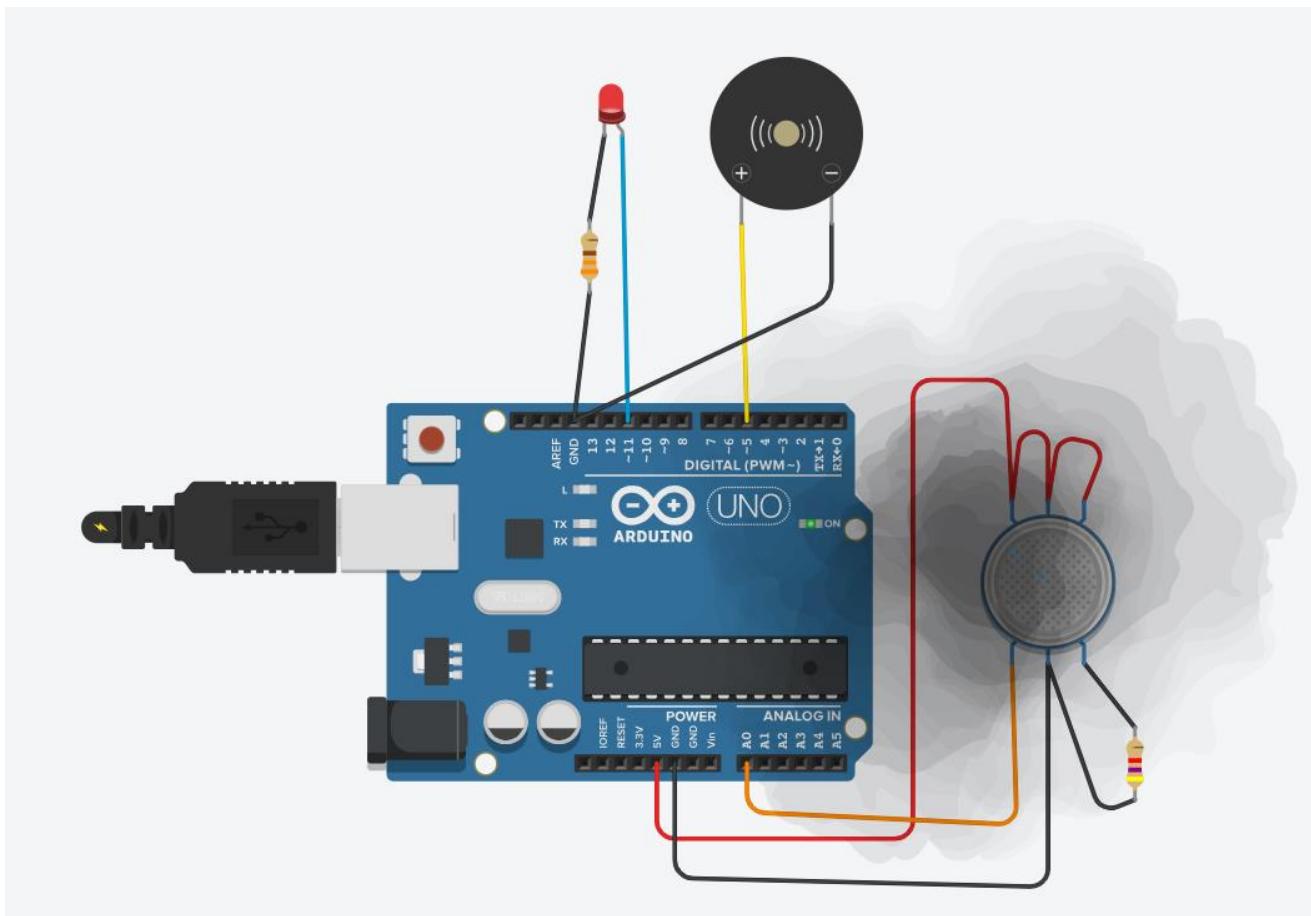
```
{  
lcd.print (ph);  
lcd.print (" Normal");  
}  
if (ph>7.0 && ph<14.0)  
lcd.print (ph);  
{  
lcd.print (" Base");  
}  
}
```

**Experiment No: 8**

**Develop a program to detect the gas leakage in the surrounding environment.**

**COMPONENTS:**

S.NO.	Name	Quantity
1.	Arduino Uno	1
2.	Cable	6
3.	Gas Sensor	1
4.	MCP23008-based, 32 (0x20) LCD 16 x 2 (I2C)	1
5.	Resistor (4.7 kΩ)	1
6.	Gas Sensor	1

**CIRCUIT DIAGRAM:****SET UP:**

- Connect the Components as per circuit.
- Make sure VCC and Ground pins connected properly to avoid any damage to Arduino
- Locate the appropriate Components in search for components tab, located at the right-hand side corner of the Tinkercad web-based software.
- Select appropriate components and connect them as per the circuit diagram shown in the figure above.
- Type the code in code section tab.

- f) To get appropriate output click on Start Simulation tab.
- g) Click on the Gas sensor and try to adjust the values to see the appropriate Output
- h) Also verify the values in the Serial Monitor Section.

**CODE:**

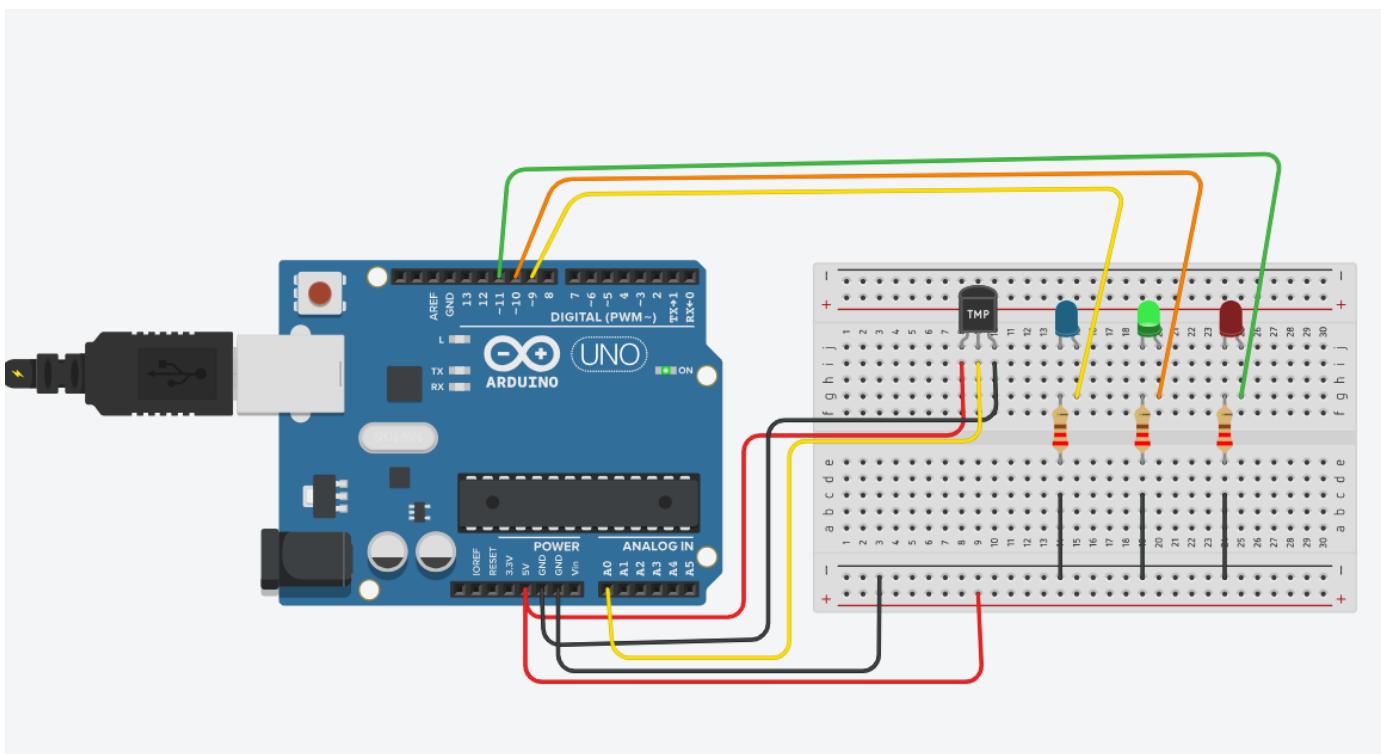
```
int redled = 11;  
  
int gassensor = A0;  
  
int buzzer = 5;  
  
void setup()  
{  
    pinMode(A0, INPUT);  
    pinMode(11, OUTPUT);  
    pinMode(5, OUTPUT);  
    Serial.begin(9600);  
}  
  
void loop()  
{  
    gassensor = analogRead(A0);  
    Serial.println(gassensor);  
    if(gassensor>=100)  
    {  
        digitalWrite(11,HIGH);  
    }  
    else {  
        digitalWrite(11,LOW);  
        digitalWrite(5,LOW);    }  
    if(gassensor>=150)  
    {  
        digitalWrite(5, HIGH);  
        digitalWrite(11, HIGH);  
    }  
    delay(100);  
}
```

**Experiment No: 9**

**Develop a program to demonstrate weather station readings using Arduino.**

**COMPONENTS:**

S.NO.	Name	Quantity
1.	Arduino Uno	2
2.	Cable	11
3.	Resistors ( $220 \Omega$ )	3
4.	LED's	3
5.	Temperature Sensor (TMP36)	1

**CIRCUIT DIAGRAM:****SET UP:**

- Connect the Components as per circuit.
- Make sure VCC and Ground pins connected properly to avoid any damage to Arduino
- Locate the appropriate Components in search for components tab, located at the right-hand side corner of the Tinkercad web-based software.
- Select appropriate components and connect them as per the circuit diagram shown in the figure above.
- Type the code in code section tab.
- To get appropriate output click on Start Simulation tab.
- Click on the Temperature sensor and try to adjust the values to see the appropriate Output on the Led's.
- Also verify the values in the Serial Monitor Section.

**CODE:**

```
const int tmp = A0;  
const int blue=9;  
const int green=10;  
const int red=11;  
float volt, heat;  
  
void setup()  
{  
    Serial.begin(9600);  
    pinMode(blue,OUTPUT);  
    pinMode(green,OUTPUT);  
    pinMode(red,OUTPUT);  
}  
  
void loop()  
{  
    int tmpValue = analogRead(tmp);  
    volt = tmpValue * (5.0 / 1023.0);  
    heat = (volt - 0.5) * 100.0;  
    if(heat<0)  
    {  
        digitalWrite(blue,HIGH);  
        digitalWrite(green,LOW);  
        digitalWrite(red,LOW);  
        Serial.println(String(heat) + "C Cold Temperature");  
    }  
    else if(heat>=0 && heat<=42){  
        digitalWrite(green,HIGH);  
        digitalWrite(blue,LOW);  
        digitalWrite(red,LOW);  
        Serial.println(String(heat) + "C Normal Temperature");  
    }  
}
```

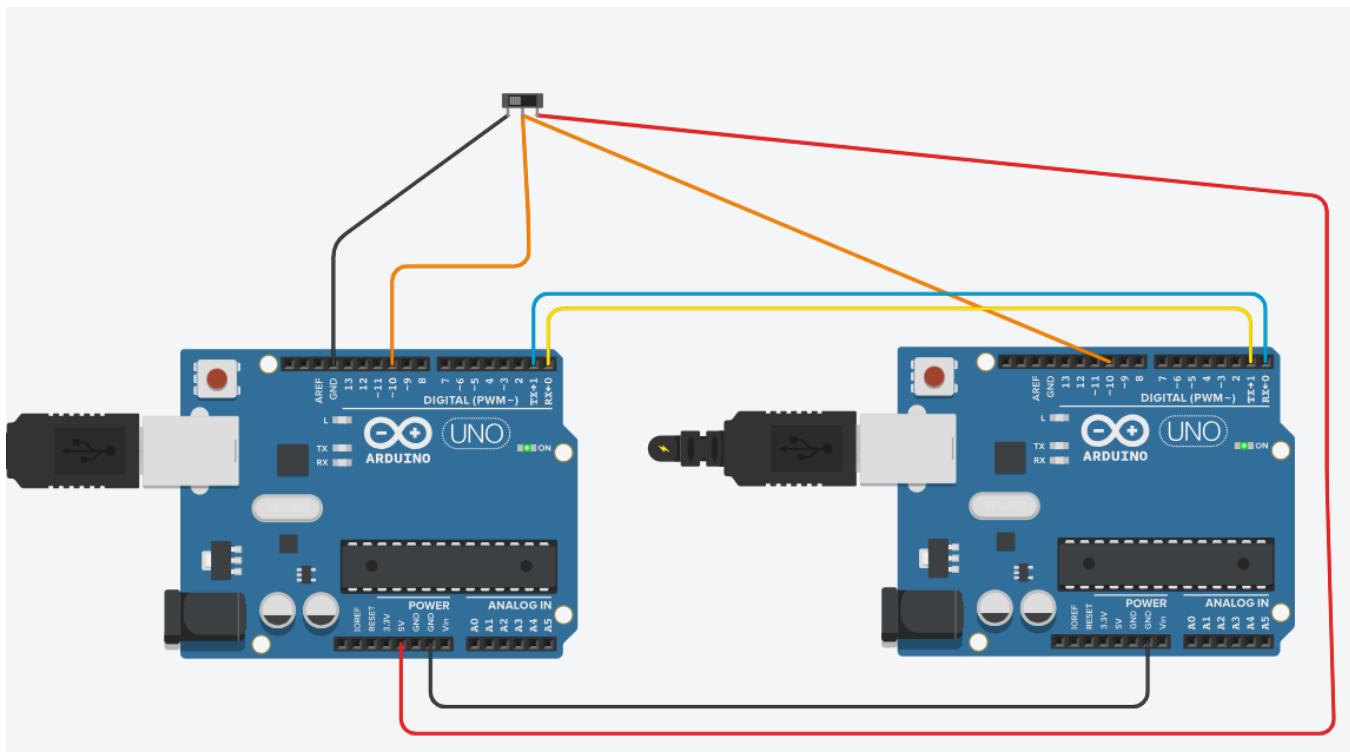
```
else
{
    digitalWrite(red,HIGH);
    digitalWrite(blue,LOW);
    digitalWrite(green,LOW);
    Serial.println(String(heat) + "C Hot Temperature");
}
delay(500);
}
```

**Experiment No: 10**

**Develop a program to setup a UART protocol and pass a string through the protocol.**

**COMPONENTS:**

S.NO.	Name	Quantity
1.	Arduino Uno	2
2.	Cable	7
3.	Slideswitch	1

**CIRCUIT DIAGRAM:****SET UP:**

- Connect the Components as per circuit.
- Make sure VCC and Ground pins connected properly to avoid any damage to Arduino
- Locate the appropriate Components in search for components tab, located at the right-hand side corner of the Tinkercad web-based software.
- Select appropriate components and connect them as per the circuit diagram shown in the figure above.
- Type the code in code section tab.
- To get appropriate output click on Start Simulation tab.
- With the help of switch, slide the switch button to see the message sent from one Arduino Uno 1 board to another Arduino board Uno 2.
- Also verify the values in the Serial Monitor Section.

**CODE:**

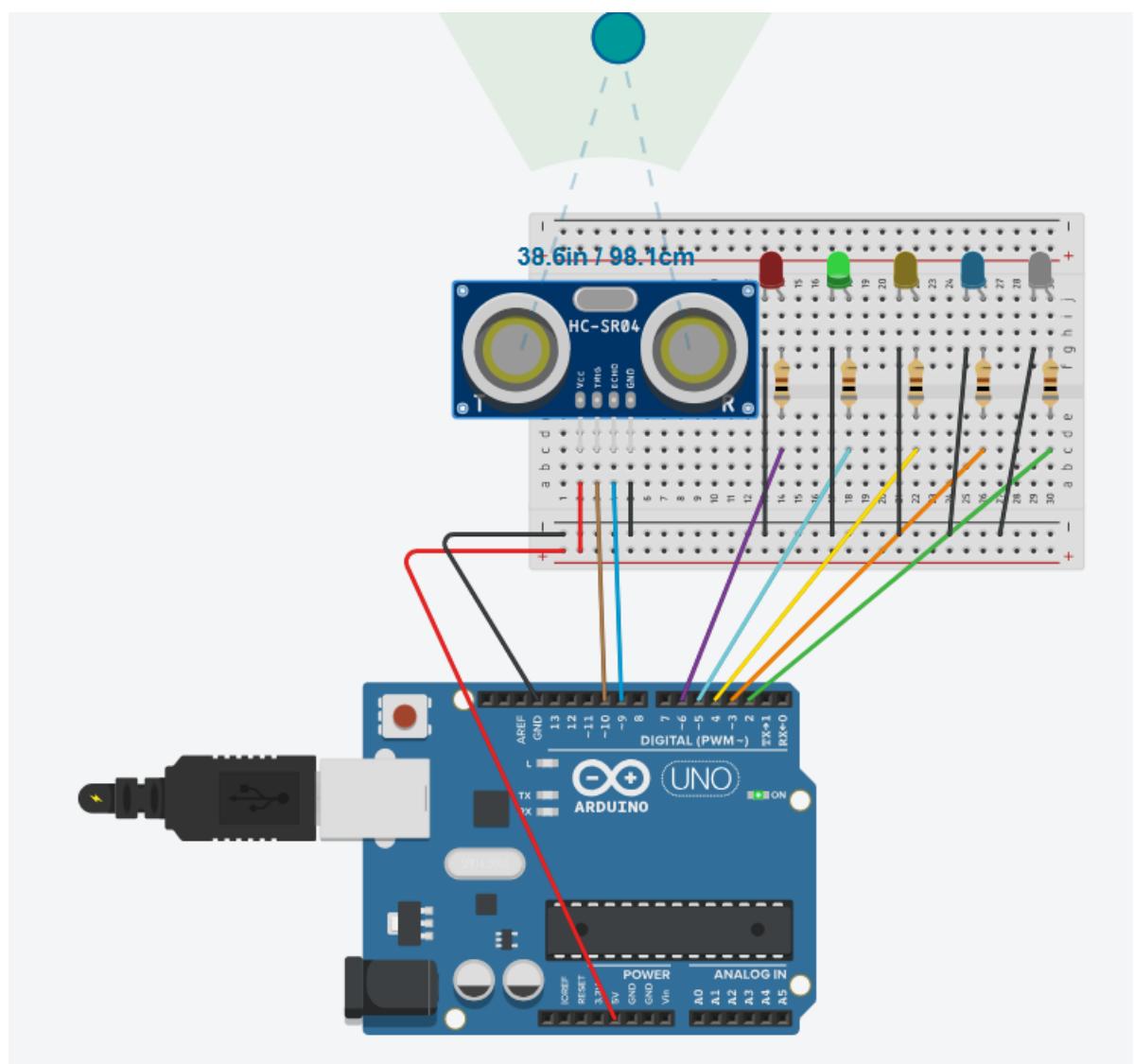
```
const int MAX_LEN = 100;  
  
char send[MAX_LEN] = "Hello\n";  
  
char recieve[MAX_LEN];  
  
int switch1 = 1;  
  
int switch_pin = 10;  
  
void setup()  
{  
    Serial.begin(9600);  
    pinMode(switch_pin, INPUT);  
}  
  
void loop() {  
    switch1 = digitalRead(switch_pin);  
    if (!switch1)  
    {  
        int len = Serial.parseInt();  
        char garbage = Serial.read();  
        Serial.readBytes(recieve, len);  
        Serial.print("Length = ");  
        Serial.println(len);  
        Serial.print("Message = ");  
        Serial.println(recieve);  
        delay(1000); }  
    else {  
        int len = strlen(send);  
        Serial.println(len);  
        Serial.write(send, len);  
        delay(1000); }  
}
```

**Experiment No: 11**

**Develop a water level depth detection system using Ultrasonic sensor.**

**COMPONENTS:**

S.NO.	Name	Quantity
1.	Arduino Uno	1
2.	Cable	17
3.	Bread Board	1
4.	LED	5
5.	Resistance (800 Ω)	5
6.	Ultrasonic Distance Sensor (4-pin)	1

**CIRCUIT DIAGRAM:**

**SET UP:**

- a) Connect the Components as per circuit.
- b) Make sure VCC and Ground pins connected properly to avoid any damage to Arduino
- c) Locate the appropriate Components in search for components tab, located at the right-hand side corner of the Tinkercad web-based software.
- d) Select appropriate components and connect them as per the circuit diagram shown in the figure above.
- e) Type the code in code section tab.
- f) To get appropriate output click on Start Simulation tab.
- g) Click on the Ultrasonic Distance Sensor to adjust the distance and observe the different led's Glow.
- h) Also verify the values in the Serial Monitor Section.

**CODE:**

```
int led1 =6;
int led2 =5;
int led3 =4;
int led4 =3;
int led5 =2;
int trigPin =10;
int echoPin =9;
int ival;
void setup()
{
    pinMode(6, OUTPUT);
    pinMode(5, OUTPUT);
    pinMode(4, OUTPUT);
    pinMode(3, OUTPUT);
    pinMode(2, OUTPUT);
    pinMode(10,OUTPUT);
    pinMode(9, INPUT);
    Serial.begin(9600);
}
void loop()
{
    digitalWrite(trigPin, LOW);
    delay(10);
    digitalWrite(trigPin, HIGH);
    delay(10);
    digitalWrite(trigPin, LOW);
    ival=pulseIn(echoPin, HIGH);
    int dist=(ival/2)/29.154;
    Serial.print("dist");
    Serial.println(dist);
    if(dist<=50)
```

```
{  
    digitalWrite(6,HIGH);  
    digitalWrite(5,LOW);  
    digitalWrite(4,LOW);  
    digitalWrite(3,LOW);  
    digitalWrite(2,LOW);  
}  
else if(dist<=100)  
{  
    digitalWrite(6,LOW);  
    digitalWrite(5,HIGH);  
    digitalWrite(4,LOW);  
    digitalWrite(3,LOW);  
    digitalWrite(2,LOW);  
}  
else if(dist<=150)  
{  
    digitalWrite(6,LOW);  
    digitalWrite(5,LOW);  
    digitalWrite(4,HIGH);  
    digitalWrite(3,LOW);  
    digitalWrite(2,LOW);  
}  
else if(dist<=200)  
{  
    digitalWrite(6,LOW);  
    digitalWrite(5,LOW);  
    digitalWrite(4,LOW);  
    digitalWrite(3,HIGH);  
    digitalWrite(2,LOW);  
}  
else if(dist<=250)  
{  
    digitalWrite(6,LOW);  
    digitalWrite(5,LOW);  
    digitalWrite(4,LOW);  
    digitalWrite(3,LOW);  
    digitalWrite(2,HIGH);  
}  
else  
{  
    digitalWrite(6,HIGH);  
    digitalWrite(5,HIGH);  
}
```

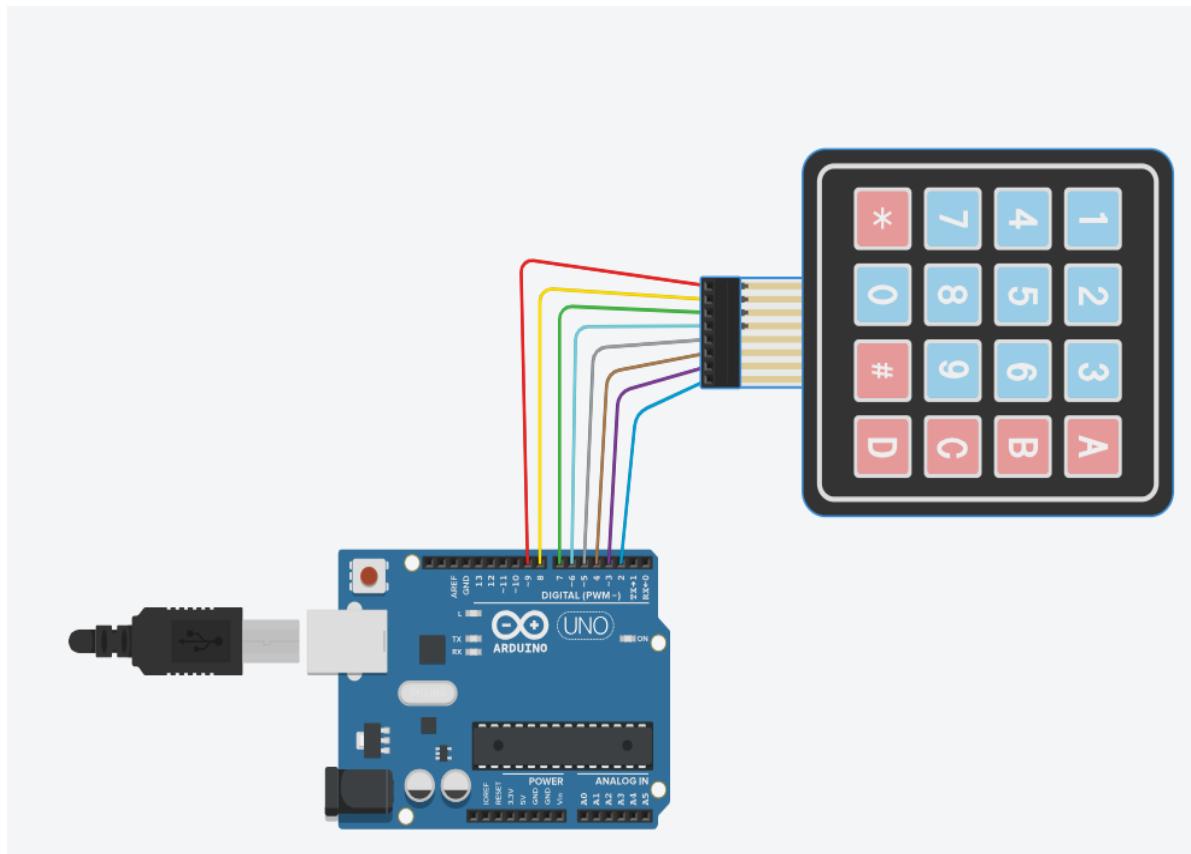
```
digitalWrite(4,HIGH);
digitalWrite(3,HIGH);
digitalWrite(2,HIGH);
}
delay (50);
}
```

**Experiment No: 12**

**Develop a program to simulate interfacing with the keypad module to record the keystrokes.**

**COMPONENTS:**

S.NO.	Name	Quantity
1.	Arduino Uno	1
2.	Cable	17
3.	Keypad 4X4	1

**CIRCUIT DIAGRAM:****SET UP:**

- Connect the Components as per circuit.
- Make sure VCC and Ground pins connected properly to avoid any damage to Arduino
- Locate the appropriate Components in search for components tab, located at the right-hand side corner of the Tinkercad web-based software.
- Select appropriate components and connect them as per the circuit diagram shown in the figure above.
- Type the code in code section tab.
- To get appropriate output click on Start Simulation tab.
- Click the keys on the Keypad to see the desired output in the Serial Monitor Section

**CODE:**

```
#include <Keypad.h>

const byte ROWS = 4;
const byte COLS = 4;
char hexaKeys[ROWS][COLS] =
{
    {'1','2','3','A'},
    {'4','5','6','B'},
    {'7','8','9','C'},
    {'*','0','#','D'},
};

byte rowPins[ROWS] = {9, 8, 7, 6};
byte colPins[COLS] = {5, 4, 3, 2};

Keypad customKeypad = Keypad(makeKeymap(hexaKeys), rowPins, colPins, ROWS, COLS);

void setup()
{
    Serial.begin(9600);
}

void loop()
{
    char customKey = customKeypad.getKey();
    if (customKey)
    {
        Serial.println(customKey);
        delay(100);
    }
}
```