Charging and Discharging Capacitor

Aim:

To demonstrate the charging and discharging behavior of a capacitor using two pushbuttons, with two LEDs indicating the capacitor's status: one LED lights up during charging and the other during discharging.

Components Required:

Sr. No	Component	Value	Quantity
1	Capacitor	470µF	1
2	LED		2
3	Breadboard		1
4	Resistor	1K	2
5	Pushbutton		2
6	Jumping Wires	(M-M)	6
7	9v Battery with Cap	9V	1

Components Functionality:

1. Capacitor (470µF):

- Stores electrical energy during charging and releases it during discharge.

2. Pushbuttons (Charging and Discharging):

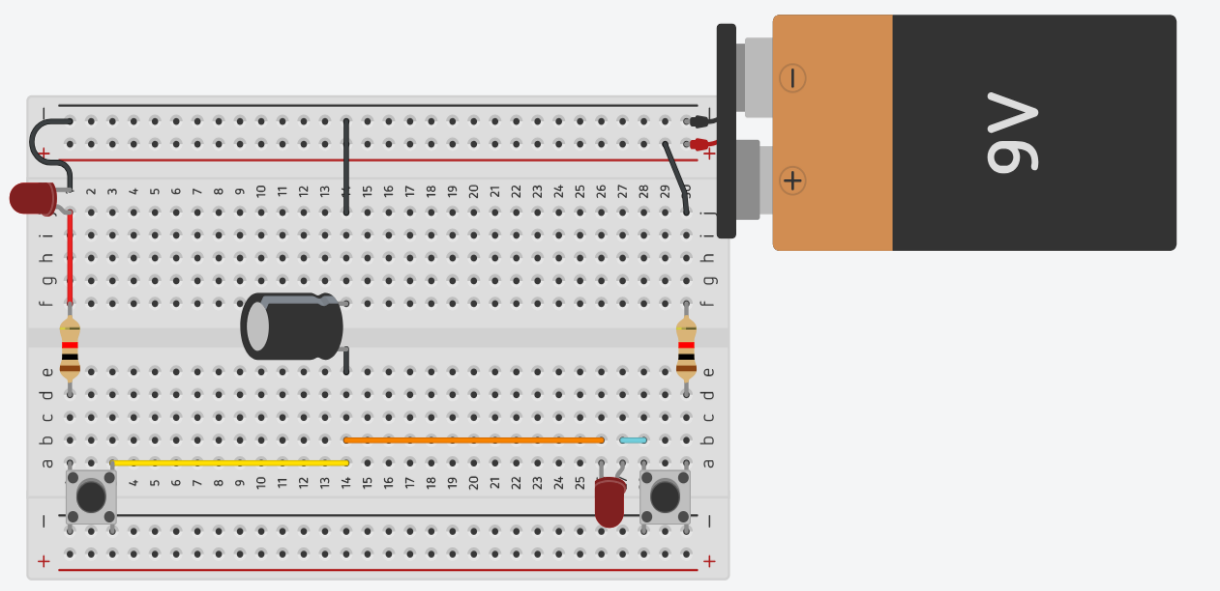
- **Charging Button:** Completes the circuit, allowing the capacitor to charge and the first LED to light up when pressed.
- **Discharging Button:** Completes a separate path, allowing the capacitor to discharge through the second LED when pressed.

3. Resistors (1KΩ):

- Limits the current flow during charging and discharging phases, protecting the capacitor and LEDs.

4. **LEDs (First LED and Second Second):**
    - **First LED:** Lights up when the capacitor is charging, indicating the charging phase.
    - **Second LED:** Lights up when the capacitor is discharging, indicating the discharge phase.
5. **Breadboard:**
    - Holds the components securely for easy prototyping and wiring.
6. **9V Battery with Cap:**
    - Supplies the required voltage to charge the capacitor.
7. **Connecting Wires:**
    - Establish electrical connections between the components on the breadboard.

Schematic Diagram: Refer to the attached image for the circuit layout.



Working: This circuit demonstrates the behavior of a capacitor with separate charging and discharging controls, and provides visual feedback through two LEDs.

1. **Charging Phase:**
    - When the charging pushbutton is pressed, the capacitor charges up to the 9V supply and the first LED lights up, indicating that the capacitor is storing energy.
2. **Discharging Phase:**

- When the discharging pushbutton is pressed, the capacitor releases its stored energy through the second LED and resistor, causing the second LED to light up and indicating that the capacitor is discharging.

Circuit Diagram Explanation:

Step 1: Place the Capacitor and LEDs on the Breadboard:

- Insert the capacitor, first LED, and second LED onto the breadboard. Ensure correct polarity for both the capacitor (longer leg for positive) and LEDs (longer leg for positive).

Step 2: Connect Resistors:

- Place a 1KΩ resistor in series with each LED to limit the current for both charging and discharging phases.

Step 3: Connect the Pushbuttons:

- Insert both pushbuttons on the breadboard.
- **Charging Button:** Connect this pushbutton to the positive terminal of the battery and to the first LED in series with the capacitor. When pressed, this button completes the charging path.
- **Discharging Button:** Connect this pushbutton in a separate path with the second LED, allowing the current to flow through the second LED during discharge when pressed.

Step 4: Power the Circuit:

- Connect the 9V battery to the breadboard rails to provide power for the charging path.

Step 5: Testing the Circuit:

- Press the charging button to charge the capacitor and light up the first LED.
- Release it, then press the discharging button to discharge the capacitor through the second LED, which lights up briefly to indicate the discharge.

Conclusion: This project illustrates the charging and discharging properties of a capacitor with dual indicators. The first LED lights up during charging, and the second LED lights up during discharging. This setup provides a clear visualization of capacitor behavior in electronic circuits.