C4

Starting Electronics Projects

CHAPTER ASSIGNMENT

Name _____ Class _____ No. _____ Date _____

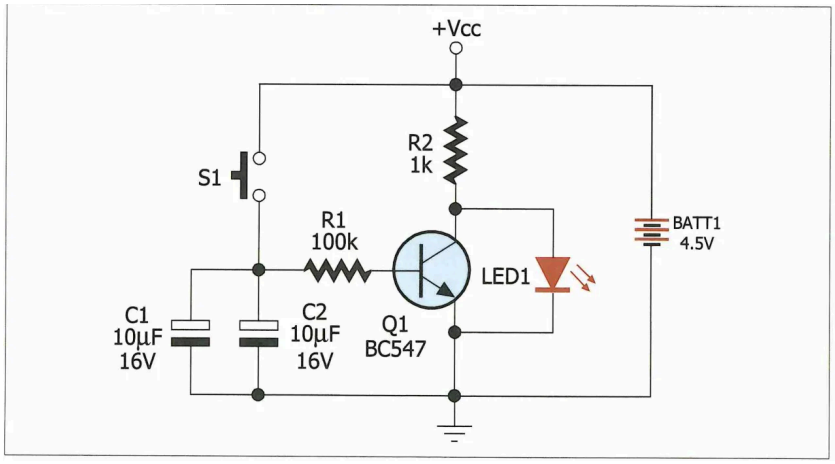
> Answer every question in the space given. Show your working. You may use the chapter page to help you.

Questions from the Guru Jazzy chapter page, for classroom use.

Try it

1. Try it: how capacitance changes the delay

   A rough guide using t ≈ R × C with R = 100 kΩ. The real delay also depends on the transistor and the LED.



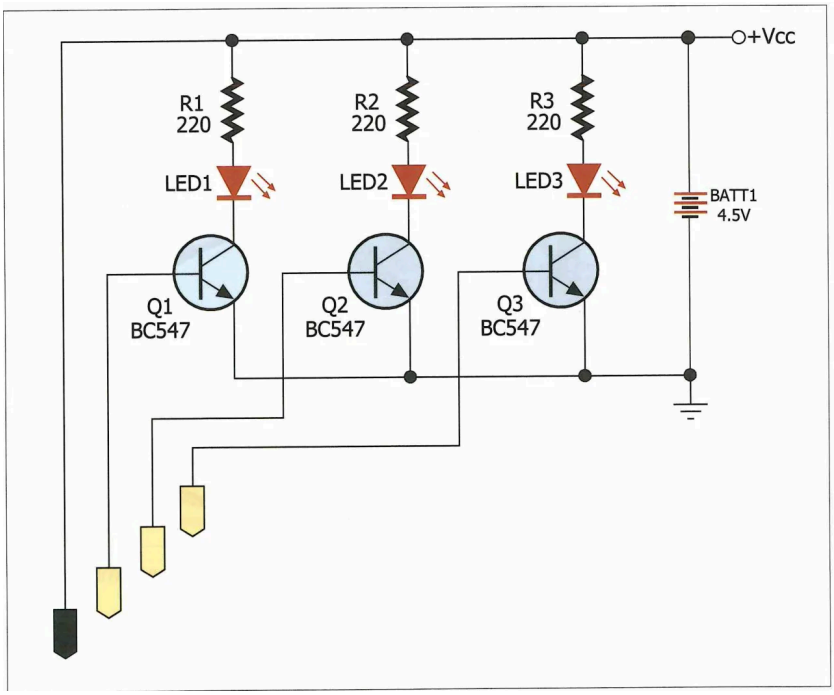
2 Try it: fill the tank

– LED1 · lowest

– LED2 · middle

– LED3 · highest

Red pole = +Vcc. An LED lights when the water touches its pole.



Labs

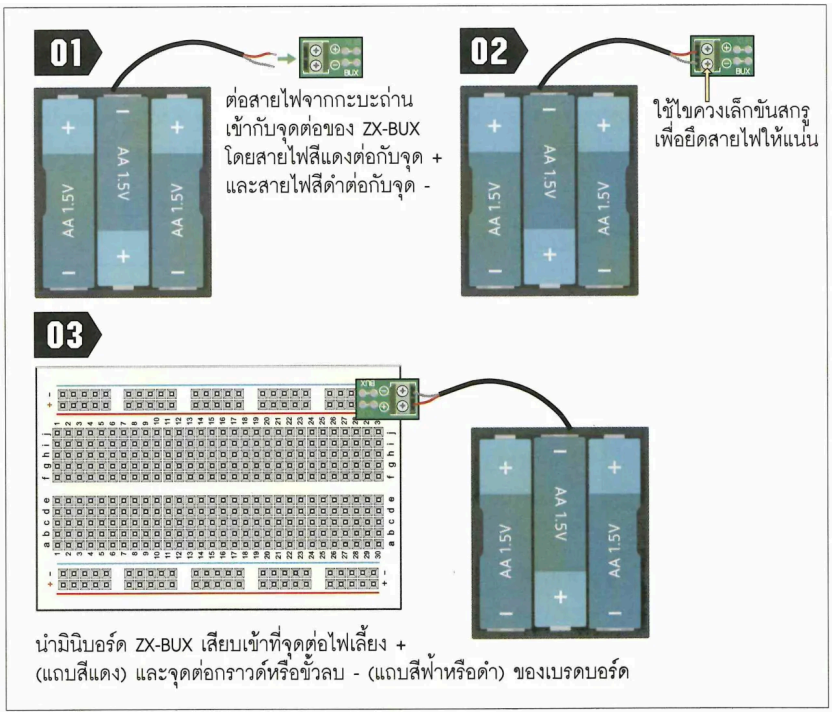
4.1 Prepare the power supply

1. Build the circuit on the breadboard.

2. Connect the wires from the 3 × AA holder to the ZX-BUX terminals, + and −, and tighten the screws firmly.

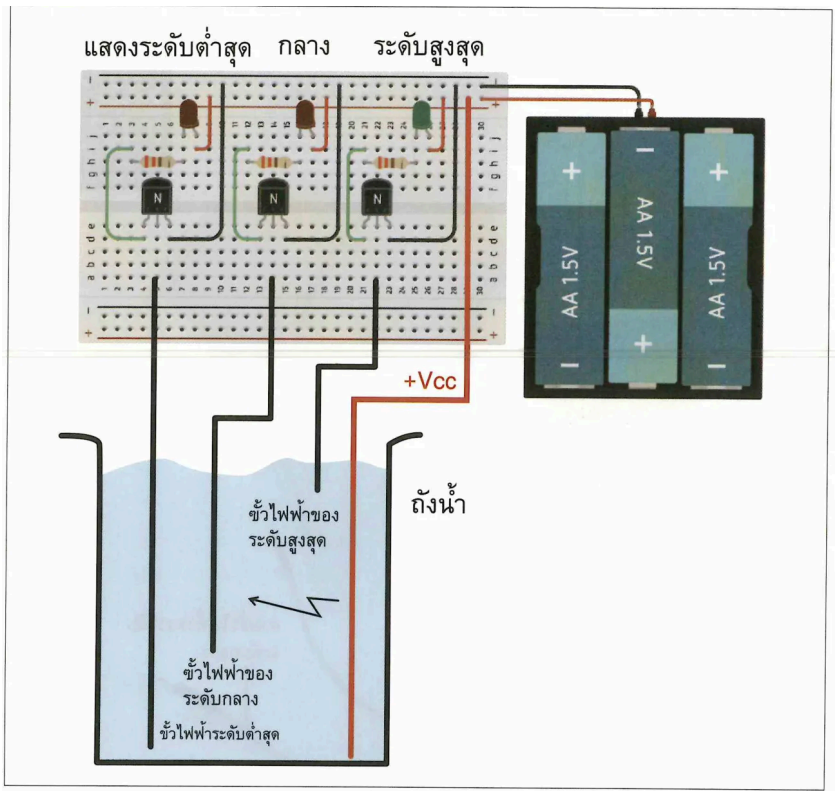
3. Plug the ZX-BUX into the breadboard's power rails. Match the printed + to the **red** line and − to the **black/blue** line.

4. With the switch **OFF** (or before wiring the circuit), fit the batteries the right way round. Switch on, set the multimeter to DC volts, and measure red on + and black on − of the ZX-BUX. You should read about **4.5 V**. Then switch off again.



4.2 Test the water levels

Dip the electrodes for each level into a glass of water together with the supply electrode, one at a time. Check that the matching LED lights each time, and that all three light when every electrode is in the water.

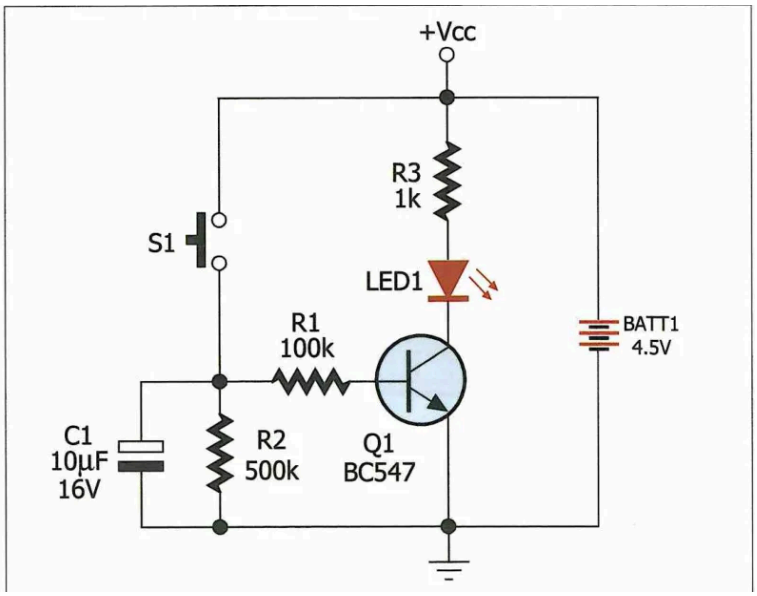


Activity: Experiment with the projects

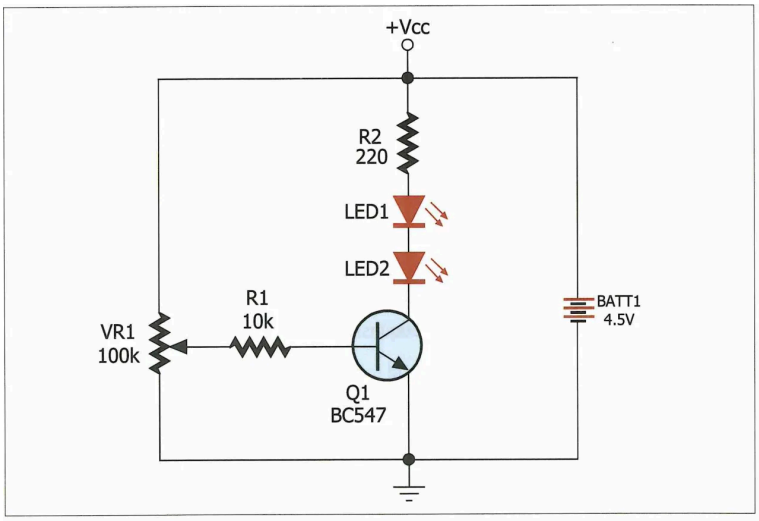
1. **Project 1:** simulate with both capacitors, then delete one. Time how long the LED stays off each time.

2. **Project 1:** add a multimeter (Voltage) between Q1's base and ground. Note the voltage at the moment the LED comes back on. Is it close to 0.7 V?

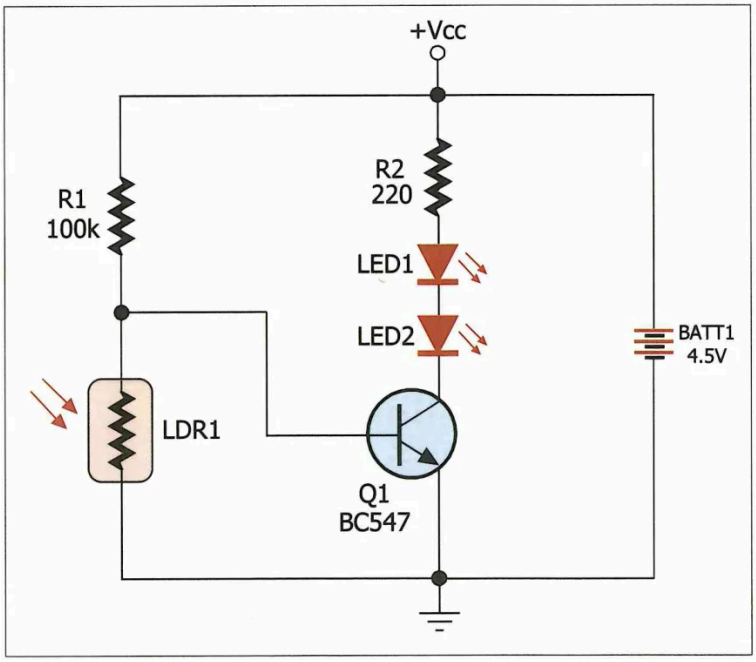
3 **Project 2:** change R2 from 500 kΩ to 100 kΩ. Does the LED stay on longer or shorter after you let go?



4 **Project 3:** remove one LED and add a 220 Ω resistor in its place. Does the dimmer still work? Why might two LEDs need 4.5 V?



5 **Project 4:** during the simulation, click the photoresistor and slide the light level. Find the point where the LEDs switch on.



Chapter quiz

1 What does the ZX-BUX mini board do?

A	B	C	D
It measures current	It connects the battery wires to the breadboard's power rails	It is a switch for the LED	It stores charge like a capacitor

2 Before you build a project, how do you check the battery pack is working?

A	B	C	D
Touch the wires together	Switch it on and measure about 4.5 V across the ZX-BUX with a multimeter	Connect an LED directly	Measure its resistance

3 At about what base voltage does a BC547 transistor start to conduct?

A. 0.07 V B. 0.7 V C. 4.5 V D. 7 V

4 In Project 1, how can you make the LED stay off for longer?

A	B	C	D
Use a smaller capacitor	Add more capacitance (put capacitors in parallel)	Remove the 1 kΩ resistor	Use a 1.5 V supply

5 In Project 2, what happens when you press and release the switch?

A	B	C	D
The LED turns off for a while, then on	The LED turns on, stays on for a while, then goes off	The LED flashes forever	Nothing

6 Why does Project 3 need a 4.5 V supply to light two red LEDs in series?

A	B	C	D
Each LED drops about 2 V, so two need about 4 V	LEDs only work at 4.5 V	The transistor needs 4.5 V	The potentiometer uses 2.5 V

7 In the automatic light (Project 4), when do the LEDs come on?

A. When it is bright B. When it is dark C. When it is hot D. When the switch is pressed

8 Why can’t Project 5 (heat alarm) be simulated in Tinkercad?

A	B	C	D
Tinkercad has no transistors	Tinkercad has no NTC thermistor part	It needs 9 V	Tinkercad cannot simulate LEDs

9 In Project 6, the water reaches the middle electrode. Which LEDs are on?

A. None B. LED1 only C. LED1 and LED2 D. All three

End of assignment · Check your answers against the chapter at gurujazzy.com/subjects/tinkercad/chapter-4-electronics-projects/