

Grade 7

Answer the following question.

1. Identify whether a plastic spoon is a conductor or an insulator.
2. Write a simple Python program to print your name and age.
3. What is the color code for a $220\ \Omega$ resistor?
5. Draw and label an open and closed circuit using a battery, switch, and bulb.
6. In Python, create a program that asks the user for two numbers and prints their sum.
7. Explain the difference between AC and DC current in your own words.
8. A resistor has color bands: Brown, Black, Red, Gold. Find its resistance.
9. Design a buzzer game where two players compete. Explain how you would connect the wires and switches.
10. Write a Python program where the computer asks your name, then greets you with:
"Hello [name], welcome to coding!"
11. How could you use an LDR sensor to make a simple night-lamp circuit? Explain with a diagram.
12. Research and write a short explanation: Why is resistor color coding important in electronics?
13. Write a Python program to ask the user for two numbers and print their **difference**.
14. What happens when you connect a **LED directly to a 9V battery without a resistor**? Explain.
15. A resistor has color bands: **Red, Red, Brown, Gold**. What is its value?
16. Draw and label the connections for **LED blinking in Arduino using Tinkercad**.
17. Creative: Imagine you are designing a **night security alarm system** with a buzzer and switch. How would it work?

1. Chapter 1–2: Introduction to STEAM, Safety, Breadboard Assembling

- **STEAM** is an approach to learning that combines Science, Technology, Engineering, Arts, and Mathematics. These subjects help us solve real-world problems.
- **Robotics** is the branch of science where we design and build robots to make our lives easier (like vacuum robots, factory robots).
- **Safety Rules** in electronics:
 1. Never touch live wires with wet hands.
 2. Always connect the battery in the correct direction (+ to +, – to –).
 3. Don't short circuit a battery (connect + and – directly).
 4. Be careful with sharp tools like cutters or soldering irons.
- **Breadboard**: A plastic board with tiny holes used to connect wires and components without soldering. It is reusable.
- **Battery**: Provides electric energy to the circuit.
- **LED (Light Emitting Diode)**: A small light that glows when current flows in the correct direction. There are two terminals in Battery, i.e. Anode (Longer Leg) and Cathode (Short Leg)
- **Resistor**: A device that slows down the current, so components like LEDs do not burn out.

Possible Exam Questions

1. What does STEAM stand for?
2. Write 2 safety rules when working with electricity.
3. Why do we use a breadboard?
4. What is the function of a resistor? Draw LED circuit.

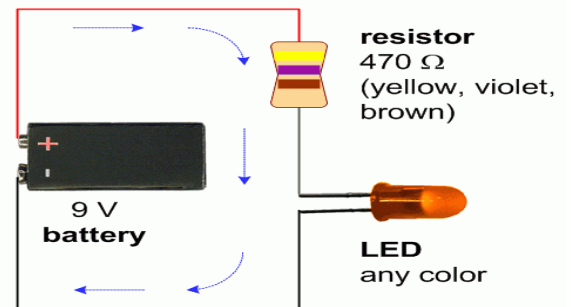


Fig : LED Circuit

2. Chapter 3–4: Introduction to Python (Coding Basics)

- **Python** is a programming language that is simple and widely used.
- Easy to read and write compared to other languages.
- Used in **games, apps, robotics, artificial intelligence, and websites**.
 - **print()** command is used to display messages.

Example: `print("Hello, World!")`

- **input()** command is used to take data from the user. Example:

```
name = input("Enter your name: ")
```

- **Variables** are like containers or boxes that store information. Example: `age = 13`
- **Data Types in Python:**

1. **Integer (int)** → whole numbers (5, 100, -3)
2. **Float** → numbers with decimals (3.14, 2.5)
3. **String** → text inside quotes ("Hello")

- **Simple Calculator Example:**

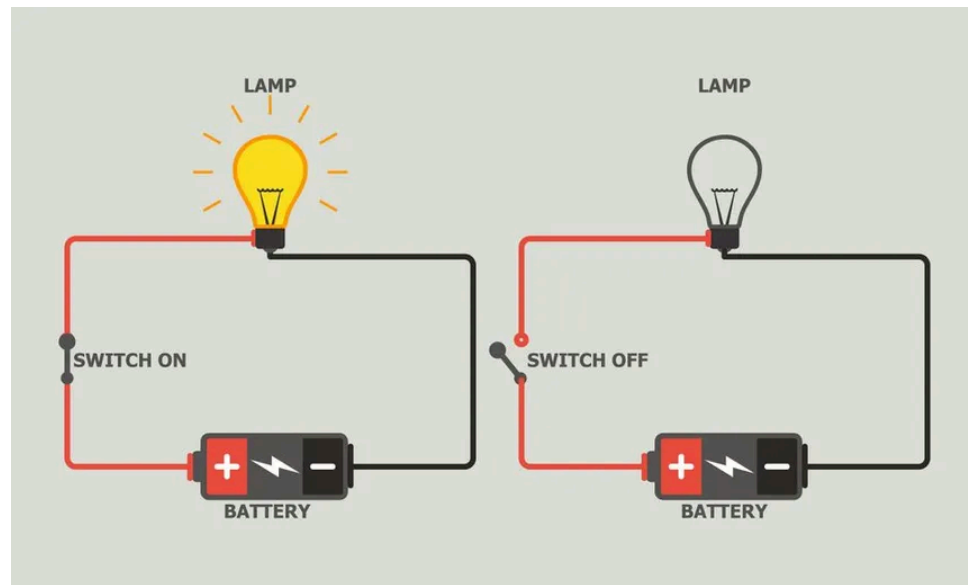
```
a = int(input("Enter first number: "))  
b = int(input("Enter second number: "))  
print("Sum = ", a + b)
```

Possible Exam Questions

1. What is Python used for?
2. Write a Python program to print your name.
3. What are the 3 basic data types in Python and explain them.
4. Write a Python program to add two numbers.

3. Chapter 5–6: Robotics – Electricity & Circuits

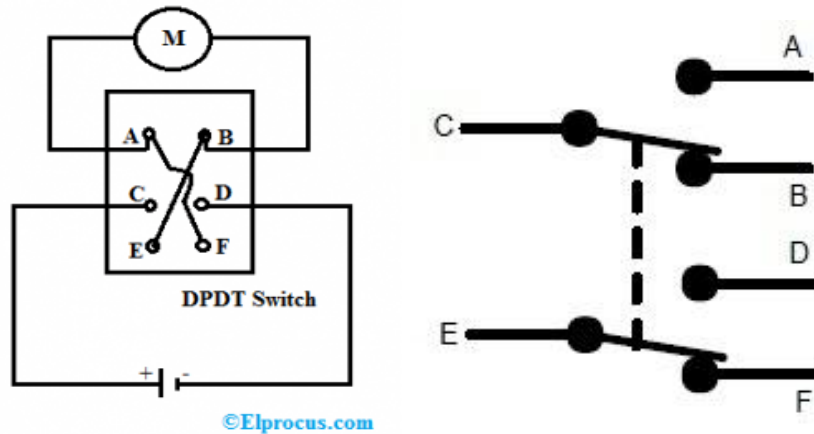
- **Electricity:** The movement of tiny charged particles called electrons is called electricity. It powers our lights, fans, mobiles, and computers.
- **Circuit:** Circuit is a complete path for electricity to flow. It needs: a battery (source), wires (path), and a load (device like bulb/LED).
- **Types of Circuits:**
 - **Open Circuit** → when the path is broken (switch OFF), no current flows.
 - **Closed Circuit** → complete path (switch ON), current flows and devices work.



- **Buzzer:**
 - An electronic part that makes sound when electricity flows.
 - Used in doorbells, alarms, and games (like the wire buzzer game).
- **Switch:**
 - A device used to open (break) or close (connect) a circuit.
 - Example: The switch on a fan or light.
- **Conductor:**
 - Materials that allow electricity to pass easily.
 - Examples: Copper, aluminum, iron.
- **Insulator:**
 - Materials that block electricity.
 - Examples: Plastic, wood, rubber, glass.
- **AC (Alternating Current):**
 - Current that changes direction repeatedly.
 - Example: Electricity in homes (fans, bulbs).
- **DC (Direct Current):**
 - Current that flows in one direction only.
 - Example: Battery-powered devices (toys, remotes).

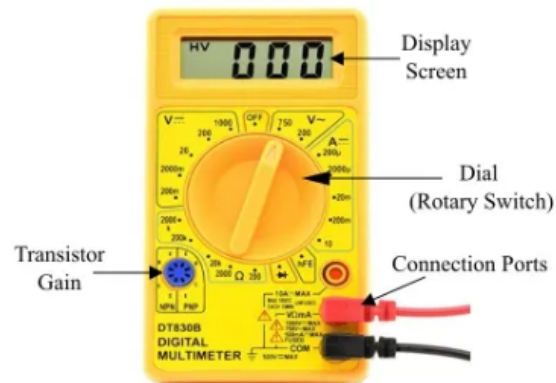
- **DPDT Switch (Double Pole Double Throw):**

- A special switch that can control two separate circuits at once.(two-way switch)
- Used in robotics to change motor direction (forward/reverse).



- **Multimeter:**

- A tool used to measure voltage, current, and resistance in a circuit.



Possible Exam Questions

1. What is the difference between an open and a closed circuit? Draw diagrams.
2. Give two examples each of conductors and insulators.
3. What is the difference between AC and DC current?
4. What is the function of a buzzer?
5. What does a multimeter measure?

4.Chapter 7–8: Coding (Conditional Statements, Comparison Operators)

Computers are not smart by themselves – they only follow instructions. But sometimes, our programs need to make choices depending on conditions. This is where conditional statements are used.

a. The IF Statement

- The **if** statement checks a condition.
- If the condition is **true**, the code inside runs.
- If it is **false**, the code is skipped.

[Example 1: Checking age]

```
age = 15
```

```
if age >= 13:
```

```
    print("You are a teenager")
```

Output: You are a teenager

(If my age was less than 13, nothing would be printed.)

b. IF-ELSE Statement

- Sometimes we want **two different paths**: one if the condition is true, another if it's false.

[Example 2: Voting eligibility]

```
age = int(input("Enter your age: "))
```

```
if age >= 18:
```

```
    print("You can vote")
```

```
else:
```

```
    print("You cannot vote")
```

If age = 20 → Output: **You can vote**

If age = 12 → Output: **You cannot vote**

c. IF-ELIF-ELSE Statement

- When there are **multiple conditions**.
- The program checks each condition in order.

[Example 3: Grading system]

```
marks = int(input("Enter your marks: "))
```

```
if marks >= 90:
```

```
    print("Grade: A+")
```

```
elif marks >= 80:
```

```
    print("Grade: A")
```

elif marks >= 70:

```
print("Grade: B")
```

elif marks >= 60:

```
print("Grade: C")
```

else:

```
print("Grade: Fail")
```

If marks = 85 → Output: **Grade: A**

If marks = 55 → Output: **Grade: Fail**

d. Comparison Operators

These are used in conditions:

- **==** → equal to
- **!=** → not equal to
- **>** → greater than
- **<** → less than
- **>=** → greater than or equal to
- **<=** → less than or equal to

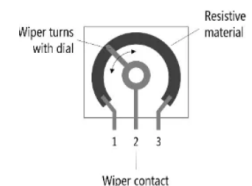
5. Chapter 9–10: Robotics – Arduino & Sensors

a.Arduino:

- A small computer board (microcontroller) that can control LEDs, motors, and sensors.
- Used in robotics to make smart devices.

b.Potentiometer:

- A **variable resistor** that can change resistance.
- Works like a **volume knob** – turn it to increase or decrease current.



c.Sensors:

- Devices that sense changes in the environment.
- Types:
 - LDR (Light Dependent Resistor) → detects light.
 - Temperature sensor → detects heat.
 - Ultrasonic sensor → measures distance.

Sensors send data to Arduino → Arduino decides what to do.

Examples:

- A **streetlight** with an LDR: turns ON at night, OFF in the day.
- A **car parking sensor** uses ultrasonic sensors to warn the driver.

Possible Exam Questions

1. What is Arduino and why is it used in robotics?
2. What is a potentiometer? Give one use.
3. Name 3 types of sensors and their uses.
4. How does an LDR work?

6. Chapter 11–12: Coding + Robotics – Tinkercad & Simulation

Tinkercad: An online tool to design and test electronic circuits without real hardware.

It is safe and easy for beginners to experiment.

Simulation:

- Testing circuits on a computer before building them in real life.
- Helps avoid mistakes and saves components.

LDR (Light Dependent Resistor):

- A resistor that changes resistance based on light.
- More light → lower resistance → more current flows.
- Less light → higher resistance → less current flows.

Arduino LED Blinking Program:

- The first basic program (like “Hello, World” in coding).
- Makes an LED blink ON and OFF repeatedly.

Example in Arduino code (C++ style):

```
void setup() {  
  pinMode(13, OUTPUT); // set pin 13 as output  
}  
  
void loop() {  
  digitalWrite(13, HIGH); // LED ON  
  delay(1000);           // wait 1 second
```



```
digitalWrite(13, LOW); // LED OFF  
delay(1000);           // wait 1 second  
}
```

Possible Exam Questions

1. What is Tinkercad used for?
2. What is simulation? Why is it important?
3. Explain how an LDR works with light.
4. Write the basic idea of the LED blinking program.