STEAM NOTE FOR Grade 6

Answer the following questions.

1. What does STEAM stand for?
STEAM = **Science, Technology, Engineering, Arts, and Mathematics**.

2. Write two safety rules while working with electricity.

- Always switch off the power before you change connections.

- Don't touch wires or plugs with wet hands; keep things dry.

3. Define an electrical circuit. What is the difference between an open circuit and a closed circuit?

- **Electrical circuit:** a complete path that lets electric current flow from a power source, through components, and back to the source.

- **Closed circuit:** the path is complete and current can flow (device works).

- **Open circuit:** the path is broken (gap or switch off) so current cannot flow (device does not work).

4. List the components required to light an LED on a breadboard.

- LED (light-emitting diode)
- Resistor (to limit current — commonly 220 Ω or 330 Ω)
- Breadboard
- Jumper wires
- Power source (battery or 5V supply)
  (Also useful: a switch and the correct orientation: long LED leg → positive.)

5. What is the use of a motor in robotics?
A motor converts electrical energy into motion. Robots use motors to turn wheels, move arms, rotate sensors, open grippers, etc.

6. What is an LED? Why do we use a resistor with it? What do we call the longer leg and shorter leg of an LED?

- **LED:** Light Emitting Diode — a small component that lights up when current flows through it.

- **Why use a resistor:** the resistor slows (limits) the current so the LED does not burn out and so you can control brightness.

- **Leg names:** longer leg = anode (positive); shorter leg = cathode (negative).

7. What is a breadboard and why is it used?
A breadboard is a plastic board with many tiny holes used to build and test circuits without soldering. Parts and wires plug in so you can change the circuit quickly.

8. In Scratch, what is a sprite? Give one example.
A sprite is a character or object that can move and act on the Scratch stage. Example: the Scratch Cat.

9. Write the steps to make a sprite move and say "Hello" in Scratch.

1. Open your project and click the sprite you want.

2. Use the hat block **"when green flag clicked."**

3. Add a motion block: **"move 10 steps."**

4. Add a look block: `say "Hello" for 2 seconds`.
   (So the script is: `when green flag clicked → move 10 steps → say "Hello" for 2 seconds`.

10. What is the difference between a conductor and an insulator? Give two examples of each.

- **Conductor:** material that allows electricity to flow easily. Examples: copper, aluminum.

- **Insulator:** material that does not let electricity flow easily. Examples: rubber, plastic.

11. How can we make a buzzer game? (Step-by-step)
Materials: low-voltage battery (e.g., 3–9V), buzzer, insulated wire to make a maze, a metal loop (e.g., bent wire or coat-hanger) with an insulated handle, jumper wires, wooden base, tape.

Steps:

1. Fix a long piece of thick wire in a wavy maze shape on a board.

2. Connect one end of the wire to the **positive (+)** terminal of the battery (use a jumper wire).

3. Connect the buzzer's one terminal to the **negative (–)** terminal of the battery.

4. Connect the buzzer's other terminal to a short wire that you attach to the metal loop (so the loop is electrically connected to the buzzer).

5. Hold the metal loop by its insulated handle and try to guide it through the maze without touching the maze wire.

6. If the loop touches the maze wire, the circuit completes (battery → maze wire → contact → loop → buzzer → battery), and the buzzer sounds.

7. Use low voltage and ensure all exposed wires are safe—insulate connections and don't touch exposed metal while the battery is connected.

## 12. What is a potentiometer? Write one use.

- **Potentiometer:** a variable resistor with a knob or slider that changes resistance when you turn or move it.

- **One use:** to adjust volume on a radio or to change the brightness of an LED in a circuit.

14. Full Forms
a. LED: Light Emitting Diode
b. LCD: Liquid Crystal Display
c. DPDT: Double Pole Double Throw
d. AI: Artificial Intelligence
e. DC: Direct Current
f. CPU: Center Processing Unit
g. AC: Alternative Current
h. IoT: Internet of things

# Chapter 1–2: Introduction to STEAM & Circuits

- **STEAM**: Science, Technology, Engineering, Arts, Mathematics → helps us learn, create, and solve problems.

- **Safety Rules**:

    - Don't touch wires with wet hands.

    - Handle batteries carefully.

    - Check connections before switching on.

    - Don't look directly at bright LEDs.

- **Circuit**: It is a path for electricity to flow.

    - Open Circuit → path broken, electricity does not flow. (Switch OFF)

    - Closed Circuit → complete path, electricity flows.(Switch ON)
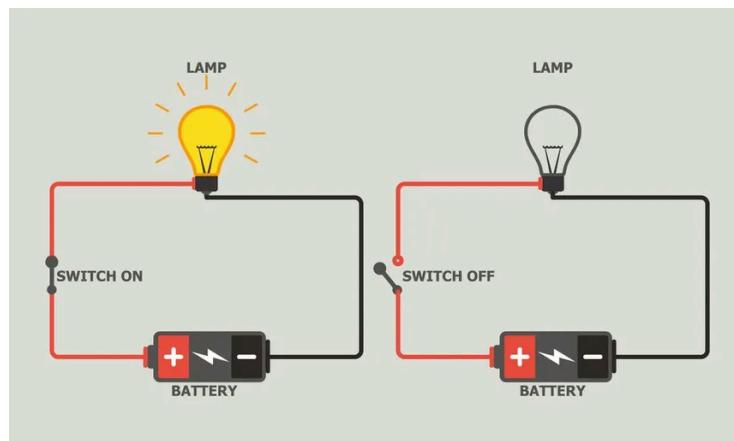
Figure: Closed and Open Circuit

- **Components**:

    - **Battery**: A battery is a device that stores electricity and gives power to things when needed.
    - **LED**: Small light that glows when current flows (long leg is positive also known as Anode , short leg is negative also known as Cathode).

    - **Motor**: A motor is a machine that converts electricity to motion.

    - **Breadboard**: Breadboard is a plastic board with many small holes used to connect wires and electronic parts to make circuits.

○ **Resistor**: A **resistor** is an electronic part that **controls or reduces the flow of electricity** in a circuit.
- **Circuit Diagram:**
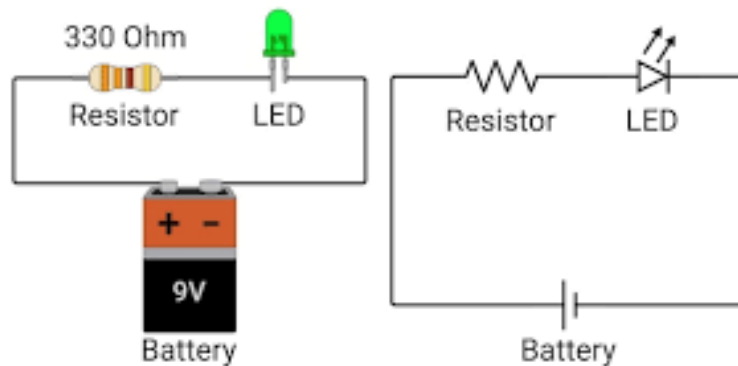
Figure: LED Circuit

Possible Exam Questions

1. What does STEAM stand for?

2. Write 2 safety rules for working with circuits.

3. What is the difference between an open and closed circuit? Draw diagrams.

4. Name two functions of a resistor.

5. Draw and label a simple LED circuit.

Chapter 3–4: Introduction to Scratch Programming

- **Scratch**: Block-based coding platform for games, animations, and stories.

- **Key Terms**:

　　○ **Sprite**: Character/object.

　　○ **Backdrop**: Background.

　　○ **Code Blocks**: Colorful commands to control sprites.
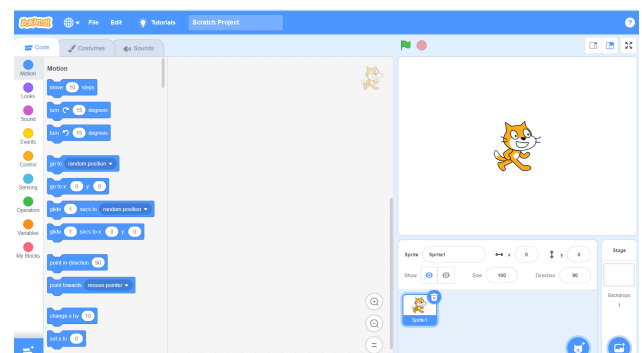
- **Scratch Interface**:

  - Stage Area, Sprite List, Block Palette, Script Area.

Examples

- Make a sprite move: `when the green flag clicked → move 10 steps`.

- Make sprite dance: `forever → next costume → wait 0.3s`.

Possible Exam Questions

1. What is Scratch used for?

2. Define Sprite and Backdrop.

3. Write steps to make a sprite move and speak.

4. What are code blocks in Scratch?

Chapter 5–6: Conductors, Insulators & Crafting

Conductor: A conductor is a substance through which electric current or heat can flow freely because it has free-moving particles (like electrons).
**Examples:** copper wire, iron rod, gold, seawater**.**

5 Electrical Conductors
silver gold copper steel sea water
5 Electrical Insulators
rubber glass oil diamond dry wood

Insulator: An insulator is a substance that resists the flow of electric current or heat because it does not have free-moving particles.
Examples: plastic, rubber, glass, dry wood.

- **Buzzer Game**: Wire loop touches path → buzzer sounds.

Buzz Wire Game
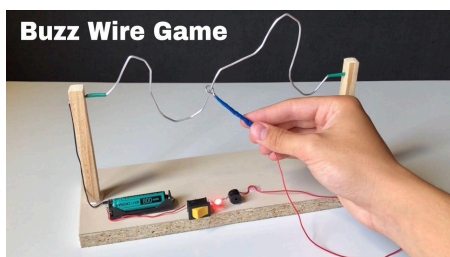
- **Crafting**: Build models of Nepali houses using cardboard, paper, and glue.

Safety Tip: Use a hot glue gun with supervision.

Possible Exam Questions

1. Define conductor and give 2 examples.

2. What is an insulator and give 2 examples.

3. Explain how a buzzer game works.

4. List materials used in a Nepali house model.

Chapter 7–8: Variables & Loops in Scratch

- **Events**: Blocks that trigger scripts (`when green flag clicked`).

- **Variables**: Store values (like Score, Timer).

- **Loops**: Repeat actions.

    - **Repeat [n]**: Fixed times.

    - **Forever**: Runs endlessly.

Examples

- **Click the Sprite Game**: `when sprite clicked → change score by 1`.

- **Self-drawing Pen**: Use pen extension + motion + repeat blocks.

Possible Exam Questions

1. What is a variable in Scratch?

2. Name 2 types of loops in Scratch.

3. Write steps to create a sprite-clicking game.

Chapter 9–10: Potentiometer, Tinkercad & Robotics Components

- **Potentiometer**: potentiometer is a special knob that controls things like light, sound, or motor speed.
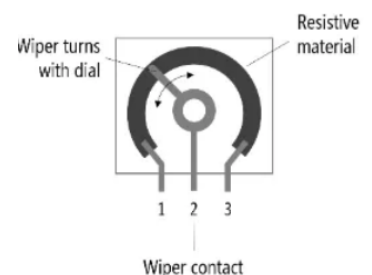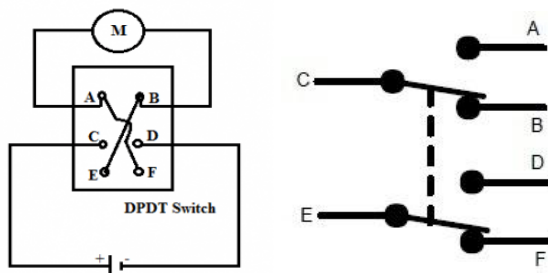
For example: Controlling LED brightness, Controlling Fan Speed

- **Switch**: A switch is a device that can turn electricity ON or OFF in a circuit.
  Types of Switch:
    - SPST, DPDT, Push Button, Toggle, Rotary.

- **DPDT Switch**: Double Pole Double Throw (DPDT) Switch can control 2 circuits and is used for motor direction.

- **Multimeter**: Measures voltage, current, resistance.

Figure: Multimeter

- **Tinkercad**:Tinkercad is a free online tool where you can design 3D objects and make electronic circuits on a computer. For example: Led blink, Traffic light system and Controlling led brightness with potentiometer.
- **AC:** Alternating Current (AC) changes the direction of electricity again and again.
  Example**:** Electricity from your home wall socket.

- **DC**: Direct Current(DC) flows electricity in only one direction. Example: Battery in a toy or remote.

Possible Exam Questions

1. What is a potentiometer? Give one use.

2. Write names of 3 types of switches.

3. What does a multimeter measure?

4. What is Tinkercad used for?

Chapter 11–12: Conditionals & Donut Collector Game

- **Conditional Statements**: Run code only if a condition is true.

    - If-Then

    - If-Then-Else

- **Sensing Blocks**: Detect interaction (touching sprite?, key pressed?).

Donut Collector Game

- Sprite collects donuts → score increases.

- Uses variables, loops, and conditionals.

Scratch Programming Quick Revision:

- **Sprite**: The character (e.g., Cat, Car)
- **Backdrop**: The background (e.g., City, Jungle)
- **Events Block**: When green flag clicked
- **Motion Block**: Move 10 steps
- **Looks Block**: Say "Hello"
- **Loops**: Repeat, Forever
- **Variables**: Store values like Score
- **Conditionals**: If-then, If-then-else