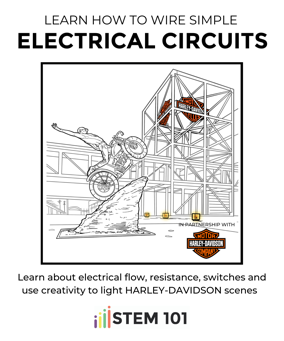
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The ACT-aligned STEM 101 curriculum ensures students build critical skills that directly contribute to academic and career success. By covering key ACT standards, our program reinforces essential competencies in math, science, and problem-solving—areas vital for college and career readiness.

The hands-on unit serves as a powerful classroom resource, transforming theoretical knowledge into real-world application. Through engaging, interactive activities, students gain a deeper understanding of complex concepts while developing critical thinking and technical skills. This immersive approach not only reinforces ACT standards but also sparks curiosity and inspiration, helping students see the real-world impact of STEM and motivating them to pursue future opportunities in high-demand fields.



**SCIENCE:**

The unit on **series and parallel circuits, electrical flow, resistance, and switches** can connect directly to the **ACT College and Career Readiness Standards (CCRS) for Science**. While the ACT doesn’t test specific content knowledge, it heavily emphasizes **interpreting data, designing investigations, and evaluating models**—all of which are embedded in this unit.

**Potential ACT Science Standards Covered**

This unit aligns with three key areas tested on the ACT Science section:

1. **Interpretation of Data** – The ability to analyze experimental results and identify patterns.
2. **Scientific Investigation** – Understanding variables, designing experiments, and predicting outcomes.
3. **Evaluation of Models and Inferences** – Using data to justify scientific conclusions.

**1. Interpretation of Data (Score 16-36)**

At different ACT score ranges, students develop progressively deeper analytical skills:

* **(16-19):** Identifying trends in circuit data, such as resistance and voltage relationships.
* **(20-23):** Comparing results from multiple trials, such as measuring voltage drop across resistors.
* **(24-27):** Predicting how results from one type of circuit (series) might apply to another (parallel).
* **(28-32):** Analyzing graphical data on Ohm’s Law and circuit behavior.
* **(33-36):** Using mathematical relationships, like **V = IR**, to predict and explain circuit performance.

**2. Scientific Investigation (Score 20-36)**

Students engage in the scientific process through hands-on circuit design:

* **(20-23):** Identifying control variables in an experiment.
* **(24-27):** Predicting how adding or removing elements (switches, resistors) changes circuit behavior.
* **(28-32):** Evaluating the validity of circuit experiments.
* **(33-36):** Designing independent investigations on circuit efficiency, materials, and resistance.

**3. Evaluation of Models and Inferences (Score 24-36)**

Students develop reasoning skills by testing and refining their circuit models:

* **(24-27):** Determining which model—series or parallel—best represents experimental data.
* **(28-32):** Predicting circuit behavior when components change (e.g., removing a resistor or battery).
* **(33-36):** Justifying conclusions with experimental evidence and real-world applications.

**Creativity & Problem-Solving Integration**

This unit goes beyond memorization. It fosters **engineering design thinking** and **scientific reasoning**, both of which are essential for **STEM careers and higher ACT performance**:

* **Creativity in Circuit Design** – Students **build, test, and troubleshoot circuits**, learning to think critically.
* **Real-World Application** – They connect **electric flow, resistance, and switches** to **technology, household wiring, and energy systems**.

**Summary**

This unit can be **ACT-aligned** and **engages students in scientific inquiry**, preparing them for higher ACT Science scores (**24-36 range**). By incorporating **hands-on experiments, data analysis, and problem-solving**, students build skills essential for **college and career success**.

### **ACT-BASED SCIENCE ACTIVITIES FOR THE ELECTRICAL CIRCUITS UNIT**

These **hands-on science activities** align with **ACT Science College and Career Readiness Standards (CCRS)** and reinforce key skills like **data interpretation, experimental design, and scientific reasoning**—all while deepening students’ understanding of **electric circuits**.

## **⚡ Activity 1: Ohm’s Law Investigation (Data Analysis & Graphing)**

**ACT Skills Practiced:**  
✔ Interpreting data tables & graphs  
✔ Identifying patterns & relationships  
✔ Applying scientific formulas

### **Objective:**

Students will collect and analyze data to determine the relationship between **voltage, current, and resistance** using Ohm’s Law (V=IR)(V=IR).

### **Materials:**

🔹 Batteries (9V)  
🔹 Resistors (various ohm values)  
🔹 Wires & alligator clips  
🔹 Multimeters (to measure voltage & current)  
🔹 Data table worksheet

### **Procedure:**

1️ **Build a Simple Circuit** – Connect a **9V battery**, a **resistor**, and a **multimeter** to measure voltage and current.  
2️ **Test Different Resistors** – Repeat with **different resistor values** (e.g., 10Ω, 50Ω, 100Ω).  
3️ **Record Data** – Fill out a table with **voltage, current, and calculated resistance**.  
4️ **Graph It!** – Plot **Voltage (V) vs. Current (I)** and determine if the relationship is **linear**.

### **ACT-Style Data Table:**

| **Resistor (Ω)** | **Voltage (V)** | **Current (A)** | **Calculated Resistance (Ω)** |
| --- | --- | --- | --- |
| 10Ω | 9V | 0.9A | ? |
| 50Ω | 9V | 0.18A | ? |
| 100Ω | 9V | 0.09A | ? |

✔ **Discussion Questions:**

* Based on your graph, what relationship do you observe between voltage and current?
* How does increasing resistance affect current flow?
* Does your data support Ohm’s Law? Why or why not?

✔ **ACT-Style Multiple Choice Question:**  
Which of the following best describes the relationship between **voltage and current** in a circuit with a fixed resistance?  
A) Exponential  
B) Quadratic  
C) Linear  
D) Random

**(Correct Answer: C – The relationship follows Ohm’s Law and is linear.)**

## **⚡ Activity 2: Series vs. Parallel Circuits – Efficiency Test (Experimental Design & Hypothesis Testing)**

**ACT Skills Practiced:**  
✔ Designing & conducting experiments  
✔ Evaluating multiple variables  
✔ Interpreting scientific data

### **Objective:**

Students will compare the efficiency and brightness of bulbs in **series vs. parallel circuits** and analyze which setup is better for practical applications.

### **Materials:**

🔹 Batteries (9V or AA)  
🔹 Light bulbs (small LED or incandescent)  
🔹 Wires & alligator clips  
🔹 Multimeters

### **Procedure:**

1️ **Build a Series Circuit** – Connect two **light bulbs in series** and observe brightness.  
2️ **Measure Voltage & Current** – Use a **multimeter** to measure **current (A) and voltage (V) across each bulb**.  
3️ **Build a Parallel Circuit** – Connect two **light bulbs in parallel** and observe differences.  
4️ **Record Data** – Fill out the table below.

### **ACT-Style Data Table:**

| **Circuit Type** | **Voltage (V) per Bulb** | **Current (A)** | **Brightness Observation** |
| --- | --- | --- | --- |
| Series | ? | ? | ? |
| Parallel | ? | ? | ? |

✔ **Discussion Questions:**

* How does bulb brightness compare between series and parallel circuits?
* How does current differ between the two circuit types?
* Which circuit is more practical for home electrical wiring? Why?

✔ **ACT-Style Multiple Choice Question:**  
A student observes that light bulbs in a **series circuit** appear dimmer than those in a **parallel circuit**. What is the most likely explanation?  
A) The series circuit provides more voltage to each bulb.  
B) The parallel circuit provides each bulb with full voltage from the power source.  
C) The current in the series circuit is higher than in the parallel circuit.  
D) The series circuit allows for independent bulb operation.

**(Correct Answer: B – In a parallel circuit, each bulb receives the full voltage, making them brighter.)**

## **⚡ Activity 3: Renewable Energy & Circuit Efficiency (Scientific Evaluation & Experimental Design)**

**ACT Skills Practiced:**  
✔ Evaluating competing explanations  
✔ Designing experiments  
✔ Interpreting real-world applications

### **Objective:**

Students will **test the efficiency** of **solar-powered circuits** and analyze how environmental factors (e.g., shade, angle, and circuit design) impact energy output.

### **Materials:**

🔹 Small **solar panels** (1-5V output)  
🔹 Multimeters  
🔹 LED lights  
🔹 Wires & resistors

### **Procedure:**

1️ **Connect a Solar Panel to a Circuit** – Measure initial **voltage output** under **direct sunlight**.  
2️ **Test Different Conditions** – Place the panel **at different angles** and measure voltage.  
3️ **Compare Circuit Setups** – Test a **series vs. parallel circuit** using solar power.  
4️ **Analyze the Data** – Record and graph voltage output.

✔ **ACT-Style Data Analysis Question:**  
A student tested how **panel angle affects solar output**. Their data is below:

| **Panel Angle** | **Voltage Output (V)** |
| --- | --- |
| 90° (Direct Sunlight) | 4.8V |
| 45° | 3.7V |
| 30° | 2.5V |
| 10° | 1.2V |

Which conclusion is best supported by the data?  
A) The voltage output increases as the panel angle decreases.  
B) The voltage output is highest when the panel is perpendicular to sunlight.  
C) The voltage output remains the same regardless of angle.  
D) Solar panels generate more electricity at lower angles.

**(Correct Answer: B – The panel generates the most voltage when facing direct sunlight.)**

## **🌟 Why These ACT-Based Science Activities Matter**

✅ **Prepares students for ACT Science** by reinforcing **data analysis, graph interpretation, and experimental design**.  
✅ **Develops STEM inquiry skills**—helping students **think like scientists and engineers**.  
✅ **Connects electrical circuits to real-world applications**, from home wiring to **renewable energy technologies**.

**MATH:**

**ACT Math Alignment – Electrical Circuits Unit**

As we dive into our unit on **series and parallel circuits, electrical flow, resistance, and switches**, it’s important to recognize that we’re not just teaching science—we’re reinforcing **key mathematical skills** that are directly tested on the **ACT Math section**. This unit can help students develop **algebraic reasoning, data analysis, and problem-solving abilities**, all of which support **higher ACT performance**.

**Potential ACT Math Standards Covered in This Unit**

This unit connects to ACT math skills in five key areas:

**1. Algebra: Equations and Manipulating Formulas (Score 16-36)**

* Students solve equations like **Ohm’s Law** (V=IR), finding voltage, current, or resistance.
* As they progress, they’ll **rearrange formulas**, solve multi-step problems, and even **analyze systems of equations** related to circuits.

**2. Functions and Graphing (Score 20-36)**

* Students explore **linear relationships** between voltage, current, and resistance.
* They’ll interpret **graphs of circuit behavior** and analyze **non-linear relationships**, such as power dissipation.

**3. Geometry and Measurement (Score 16-32)**

* Students calculate wire lengths and distances in circuits.
* They use **ratios and proportions** to determine equivalent resistance in series and parallel circuits.

**4. Data Analysis and Statistics (Score 16-36)**

* Students collect and **interpret experimental data**, calculating averages and identifying trends.
* They’ll analyze **circuit performance under different conditions** and apply **regression models** to predict outcomes.

**5. Real-World Problem Solving (Score 20-36)**

* Students **convert electrical units** (e.g., milliamps to amps, kilovolts to volts).
* They apply **power formulas** (P=VI) to **solve real-world engineering problems**.
* At higher levels, they’ll use **logarithmic functions** to analyze **capacitor charge and discharge rates**.

**Why This Matters for ACT Preparation**

This unit does more than just teach students about circuits—it can build **critical ACT math skills**, helping them succeed in both **science and mathematics**. Through **hands-on experiments, problem-solving, and mathematical modeling**, students develop **higher-order thinking skills** that are essential for **college and career readiness**.

**MATH ACTIVITIES:**

Here are **math-based activities and ACT-style questions** that align with your **electrical circuits unit** while reinforcing key **ACT Math skills** in **algebra, functions, graphing, geometry, and data analysis**.

## **Math-Based Activities for the Electrical Circuits Unit**

### **Activity 1: Ohm’s Law Calculations (Algebra & Proportional Relationships)**

**Objective:** Help students apply **Ohm’s Law** (V=IR)(V=IR) to solve for voltage, current, and resistance in different circuit setups.

#### **Instructions:**

1. Provide students with this problem:
   * A circuit has a **12V battery** and a **resistor of 4Ω**. What is the current flowing through the circuit?
   * Follow-up: If the resistance increases to **8Ω**, what happens to the current?
2. **Discussion Questions:**
   * How does resistance affect current?
   * What happens if voltage increases while resistance stays the same?
3. **Extension:**
   * Have students **rearrange Ohm’s Law** to solve for II or RR.
   * Introduce more complex circuits with **multiple resistors in series and parallel**.

### **Activity 2: Series vs. Parallel Circuits – Equivalent Resistance (Functions & Graphing)**

**Objective:** Have students calculate **total resistance** for series and parallel circuits and analyze the difference.

#### **Instructions:**

1. Provide formulas:
   * **Series Circuit:** Rtotal=R1+R2+R3Rtotal​=R1​+R2​+R3​
   * **Parallel Circuit:** 1Rtotal=1R1+1R2+1R3Rtotal​1​=R1​1​+R2​1​+R3​1​
2. **Example Problems:**
   * Calculate total resistance for a **series circuit** with **three resistors (5Ω, 10Ω, 15Ω)**.
   * Calculate total resistance for a **parallel circuit** with **three resistors (5Ω, 10Ω, 15Ω)**.
3. **Graphing Extension:**
   * Have students plot **total resistance vs. number of resistors** for both series and parallel circuits to visualize trends.

### **Activity 3: Graphing Voltage vs. Current (Linear Relationships & Slope)**

**Objective:** Help students explore the relationship between voltage and current using **Ohm’s Law**.

#### **Instructions:**

1. Provide **voltage (V) and current (I) data** for a circuit with a fixed resistor.
2. Have students **plot V vs. I** on a coordinate plane.
3. Ask:
   * What type of relationship do you observe? (It should be **linear**.)
   * What does the **slope** of the line represent? (The **resistance, R**.)
   * If the slope increases, what does that mean for the circuit?
4. **Extension:**
   * Have students determine the **equation of the line** in the form **V=mIV=mI**, where **m=Rm=R**.

### **Activity 4: Power Calculations and Energy Usage (Problem-Solving & Real-World Application)**

**Objective:** Connect electrical circuits to **energy consumption and power calculations**.

#### **Instructions:**

1. Introduce the **power formula**:
   * P=VIP=VI (Power = Voltage × Current)
2. **Example Problem:**
   * A **60W** lightbulb operates at **120V**. How much current does it draw?
3. **Real-World Application:**
   * Have students calculate the cost of running an electrical device for **5 hours per day for a month**, using the formula:
     + **Energy Used (kWh) = Power (kW) × Time (h)**
   * Ask: How does energy efficiency impact electricity costs?

## **ACT-Style Math Questions for Electrical Circuits**

### **Question 1 (Algebra – Ohm’s Law)**

A circuit has a **24V** power supply and a **resistor of 8Ω**. What is the current flowing through the circuit?  
A) 1.5A  
B) 2A  
C) 3A  
D) 4A

(Correct Answer: B –*I=VR=24V8Ω=3AI=RV​=8Ω24V​=3A*)

### **Question 2 (Functions – Resistance in Series)**

A series circuit contains three resistors: **4Ω, 6Ω, and 10Ω**. What is the total resistance?  
A) 7Ω  
B) 10Ω  
C) 14Ω  
D) 20Ω

(Correct Answer: D –*Rtotal=4+6+10=20ΩRtotal​=4+6+10=20Ω*)

### **Question 3 (Graphing & Proportions)**

A student records the following data for a circuit with a **fixed resistor**:

| **Voltage (V)** | **Current (A)** |
| --- | --- |
| 5 | 0.5 |
| 10 | 1.0 |
| 15 | 1.5 |
| 20 | 2.0 |

Which of the following best describes the relationship between voltage and current?  
A) Exponential  
B) Quadratic  
C) Linear  
D) Logarithmic

(Correct Answer: C – The data follows a***linear***trend where*V=IRV=IR*.)

### **Question 4 (Power & Energy)**

A **1500W** space heater runs for **3 hours per day**. If electricity costs **$0.12 per kWh**, how much does it cost to operate the heater for **30 days**?  
A) $5.40  
B) $12.60  
C) $16.20  
D) $54.00

(Correct Answer: C – Energy used =*1.5kW×3h×301.5kW×3h×30*= 135 kWh. Cost =*135×0.12135×0.12*=***$16.20***.)

## **⚡ Why These Activities and Questions Matter**

By incorporating these **math-based activities and ACT-style questions**, students:  
✅ **Apply algebra, functions, and problem-solving skills** to real-world electrical scenarios.  
✅ **Strengthen graph interpretation and data analysis**—core ACT math skills.  
✅ **Develop higher-order thinking** while exploring practical circuit applications.

**READING:**

**ACT Reading Alignment – Electrical Circuits Unit**

In addition to covering important science and math concepts, this **electrical circuits unit** can support **ACT Reading skills**. The ACT Reading section doesn’t just test students’ ability to recall facts—it challenges them to **analyze technical information, interpret data, and evaluate arguments**. By incorporating **scientific reading materials and real-world applications**, we can help students strengthen their **reading comprehension and critical thinking skills**, all while deepening their understanding of circuits.

**Potential ACT Reading Standards Covered in This Unit**

This unit can connect to three key areas assessed on the ACT Reading test:

**1. Key Ideas and Details (Score 16-36)**

* Students will **identify main ideas** in technical passages about circuits.
* They’ll recognize **how scientific concepts relate to real-world applications**, such as how resistance affects current flow.
* Higher-level students will **synthesize information from multiple sources**, such as circuit schematics and written explanations.

**2. Craft and Structure (Score 16-36)**

* Students will **define technical vocabulary** like voltage, current, and resistance in context.
* They’ll **analyze the structure of a scientific passage**—how text, diagrams, and tables work together to explain a concept.
* At higher levels, they’ll **evaluate an author’s intent and compare writing styles** in scientific vs. non-scientific texts.

**3. Integration of Knowledge and Ideas (Score 20-36)**

* Students will **compare different explanations** of electrical concepts, such as series vs. parallel circuits.
* They’ll **evaluate the credibility of scientific sources**, helping them distinguish between well-supported explanations and misconceptions.
* Advanced students will **integrate text and data**, interpreting circuit performance from written descriptions, tables, and graphs.

**Why This Matters for ACT Preparation**

By engaging students in **scientific reading, data interpretation, and critical analysis**, this unit builds **ACT-ready reading skills**. They will learn to **think like scientists**, applying the same comprehension strategies they need for **success on the ACT and beyond**.

**READING-BASED ACTIVITIES AND ACT-STYLE QUESTIONS TO REINFORCE SKILLS**

**Activity 1: Technical Reading Comprehension – Ohm’s Law in Action**

**Objective:** Strengthen students’ ability to extract and analyze information from a technical passage.  
**Instructions:**

1. Provide students with the following passage:

**Passage:**  
*Ohm’s Law, named after German physicist Georg Ohm, defines the relationship between voltage, current, and resistance in an electrical circuit. It states that the current (I) in a circuit is directly proportional to the voltage (V) and inversely proportional to the resistance (R), represented mathematically as: V=IRV=IR.*

*In practical applications, understanding Ohm’s Law helps engineers design circuits that prevent overheating and power failures. If a circuit’s resistance increases while voltage remains constant, the current decreases, potentially leading to inefficient energy use. On the other hand, reducing resistance can cause a surge in current, which may damage electronic components. Therefore, electrical engineers carefully calculate resistance levels when designing safe and efficient circuits.*

1. **Discussion Questions:**
   * What is the main idea of this passage? (**Key Ideas and Details**)
   * How does the passage explain the effect of resistance on current? (**Integration of Knowledge**)
   * Which real-world application of Ohm’s Law is described? (**Application of Concepts**)
2. **Follow-Up Activity:**
   * Have students **rewrite** the passage in their own words, simplifying technical terms.

**Activity 2: Analyzing a Scientific Argument – Series vs. Parallel Circuits**

**Objective:** Help students compare different viewpoints and evaluate explanations.  
**Instructions:**

1. Provide students with two short excerpts:

**Excerpt 1 (Supporting Series Circuits):**  
*Series circuits are commonly used in simple electrical devices such as flashlights. One of their advantages is that they require less wiring, making them cost-effective and easy to construct. However, a drawback is that if one component fails, the entire circuit is disrupted.*

**Excerpt 2 (Supporting Parallel Circuits):**  
*Parallel circuits are widely used in homes and businesses because they allow multiple devices to operate independently. If one device stops working, the others remain unaffected. The main disadvantage is that they require more complex wiring, which increases material costs.*

1. **Discussion Questions:**
   * What is the main argument of each excerpt? (**Key Ideas and Details**)
   * How do the authors support their claims? (**Craft and Structure**)
   * Which type of circuit would be better for household wiring? Why? (**Integration of Knowledge**)
2. **Extension:**
   * Have students **write a short paragraph** arguing which circuit type is superior, using evidence from the excerpts.

**Sample ACT-Style Questions (Multiple Choice)**

**Question 1 (Key Ideas and Details):**  
According to Ohm’s Law, if resistance in a circuit increases while voltage remains constant, what will happen to the current?  
A) It will increase.  
B) It will decrease.  
C) It will remain the same.  
D) It will fluctuate randomly.

*(Correct Answer: B – It will decrease.)*

**Question 2 (Craft and Structure):**  
In the passage about Ohm’s Law, which of the following best describes the role of the second paragraph?  
A) It provides a historical background on Georg Ohm.  
B) It presents an opposing viewpoint on electrical resistance.  
C) It explains real-world applications of Ohm’s Law.  
D) It describes the mathematical derivation of Ohm’s Law.

*(Correct Answer: C – It explains real-world applications of Ohm’s Law.)*

**Question 3 (Integration of Knowledge and Ideas):**  
Which of the following best describes the key difference between series and parallel circuits as discussed in the excerpts?  
A) Series circuits are more complex than parallel circuits.  
B) Parallel circuits stop functioning if one component fails.  
C) Series circuits use less wiring but are less reliable.  
D) Parallel circuits are mainly used in low-power devices.

*(Correct Answer: C – Series circuits use less wiring but are less reliable.)*

**Bonus: Cross-Curricular Writing Prompt**

**Prompt:**  
*"Imagine you are an electrical engineer designing circuits for a new building. Would you choose series or parallel circuits? Write a short essay explaining your choice, using scientific reasoning and real-world applications."*

**ENGLISH:**

**Potential ACT English Alignment – Electrical Circuits Unit**

Our **electrical circuits unit** can connect not just to science and math, but also to **ACT English skills**. The ACT English section isn’t just about grammar—it’s about **clarity, precision, and effective communication**, all of which are essential for **scientific writing and technical literacy**.

This unit can reinforce ACT English skills in **three key areas**:

**1️ Production of Writing – Organization & Clarity**

First, we focus on how students **organize and structure their writing** when explaining scientific concepts.

* They’ll practice writing **clear, logical explanations** of circuits and electricity.
* We’ll help them **revise** their writing to remove **redundancy and ambiguity**—just like they would on the ACT.

✔️ **Example Skills Covered:**

* Identifying **the main idea** in a paragraph about voltage and current.
* Choosing **the most logical order** of sentences in an explanation of Ohm’s Law.
* Revising **wordy or unclear explanations** for precision and clarity.

**2️ Knowledge of Language – Precision & Word Choice**

Next, we’ll work on **scientific word choice and tone** to make writing more precise.

* Students will learn how to **simplify technical language** while keeping it **accurate**.
* They’ll eliminate **wordiness and unnecessary jargon**, just like the ACT asks them to do.

✔️ **Example Skills Covered:**

* Selecting the **best transition** between ideas in a discussion of series vs. parallel circuits.
* Ensuring **scientific terminology** is used correctly and effectively.
* Making explanations **more formal, direct, and clear**.

**3️ Conventions of Standard English – Grammar & Sentence Structure**

Finally, we’ll reinforce **sentence structure, punctuation, and grammar**, which are critical for technical writing.

* Students will **proofread and edit** explanations of circuits, applying ACT grammar rules.
* They’ll refine **sentence structure** to make their writing smoother and more effective.

✔️ **Example Skills Covered:**

* Correcting **misplaced modifiers** in a passage about resistance and current.
* Identifying **sentence fragments** in a scientific explanation.
* Improving **comma usage and parallel structure** in circuit comparisons.

**Why This Matters for ACT Success**

This unit not only strengthens students' understanding of **electricity and circuits**, but also builds **the communication skills they need for the ACT and beyond**. Whether they’re explaining a scientific principle, analyzing data, or writing a technical report, these are skills that will serve them well in **STEM careers, college courses, and professional communication**.

### **ACT-STYLE ENGLISH QUESTIONS & EDITING EXERCISES – ELECTRICAL CIRCUITS UNIT**

These **editing exercises and ACT-style English questions** focus on **grammar, sentence structure, clarity, and word choice**, reinforcing key ACT English skills while keeping the content relevant to your **electrical circuits unit**.

## **✍️ Editing Exercise: Improving Technical Writing**

**Objective:** Students will **revise sentences** to improve clarity, conciseness, and grammatical accuracy.

**Instructions:** Each sentence below contains an error or could be improved. Have students **rewrite** each sentence in a clearer, more concise, or grammatically correct way.

### **1️ Wordiness & Clarity**

✖ **Original:** The flow of electric current that moves through a conductor is something that happens when there is a voltage difference applied across the two ends of the conductor.  
✔ **Edited:** Electric current flows through a conductor when a voltage difference is applied.

### **2️ Sentence Fragment**

✖ **Original:** When the circuit is open and the current cannot flow.  
✔ **Edited:** When the circuit is open, the current cannot flow.

### **3️ Subject-Verb Agreement**

✖ **Original:** The voltage and the current in a series circuit **determines** the total resistance.  
✔ **Edited:** The voltage and the current in a series circuit **determine** the total resistance.

### **4️ Misplaced Modifier**

✖ **Original:** The students observed the current with a multimeter, which was flowing through the circuit.  
✔ **Edited:** The students used a multimeter to observe the current flowing through the circuit.

### **5️ Parallel Structure**

✖ **Original:** The engineer designed the circuit to be **efficient, reliable, and with low energy loss**.  
✔ **Edited:** The engineer designed the circuit to be **efficient, reliable, and low in energy loss**.

## **📝 ACT-Style English Questions (Multiple Choice)**

### **Question 1 (Conciseness & Clarity)**

**Original Sentence:**  
"Electric circuits are used in many types of technology that are commonly seen every day in life."

Which of the following is the **best** revision for conciseness?  
A) Electric circuits are used in everyday technology.  
B) Electric circuits are commonly used in technology that people see daily.  
C) Many different types of technology make use of electric circuits that are used daily.  
D) Electric circuits are a thing that many types of technology commonly use every day.

**(Correct Answer: A – This is the most concise and clear version.)**

### **Question 2 (Grammar – Subject-Verb Agreement)**

**Original Sentence:**  
"The voltage in a parallel circuit, along with the current, determine the overall power consumption."

Which revision **corrects the subject-verb agreement error**?  
A) The voltage in a parallel circuit, along with the current, determines the overall power consumption.  
B) The voltage in a parallel circuit, along with the current, determining the overall power consumption.  
C) The voltage in a parallel circuit, along with the current, are determining the overall power consumption.  
D) The voltage in a parallel circuit, along with the current, have determined the overall power consumption.

**(Correct Answer: A – "determines" correctly agrees with "voltage.")**

### **Question 3 (Transitions & Organization)**

**Passage:**  
"Series circuits and parallel circuits are two different ways to connect electrical components. In a series circuit, components share a single path for current flow. If one component fails, the entire circuit stops working. However, in a parallel circuit, each component has its own path. As a result, if one component fails, the others continue to function."

Which of the following **best connects the two circuit types**?  
A) Furthermore, both series and parallel circuits have advantages.  
B) Similarly, series and parallel circuits operate in the same way.  
C) However, the main difference between them is how current flows.  
D) Therefore, a series circuit is better than a parallel circuit.

**(Correct Answer: C – This transition clearly contrasts series and parallel circuits.)**

### **Question 4 (Punctuation – Comma Usage)**

**Original Sentence:**  
"Ohm’s Law states that voltage equals current times resistance but if resistance increases current decreases."

Which revision **corrects the punctuation error**?  
A) Ohm’s Law states that voltage equals current times resistance, but if resistance increases, current decreases.  
B) Ohm’s Law states that voltage equals current times resistance but, if resistance increases current decreases.  
C) Ohm’s Law states that voltage equals current times resistance, but if resistance increases current, decreases.  
D) Ohm’s Law states, that voltage equals current times resistance, but if resistance increases current decreases.

**(Correct Answer: A – Proper commas set off the contrast between resistance and current.)**

### **Question 5 (Precision & Word Choice)**

**Original Sentence:**  
"The electrical engineer tested the circuit to make sure it was good."

Which of the following is the **best** revision for word choice and precision?  
A) The electrical engineer tested the circuit to ensure it functioned properly.  
B) The electrical engineer tested the circuit to make sure it was okay.  
C) The electrical engineer examined the circuit to see if it had problems.  
D) The electrical engineer looked at the circuit to make sure it was good.

**(Correct Answer: A – "Ensure it functioned properly" is precise and formal.)**

## **📖 Why These ACT English Exercises Matter in This Unit**

✅ **Improves technical writing** by reinforcing **clarity, conciseness, and structure**.  
✅ **Prepares students for ACT English** through **grammar, punctuation, and word choice practice**.  
✅ **Integrates STEM literacy**, helping students **explain electrical circuits clearly and effectively**.

**WRITING:**

**Potential ACT Writing Alignment – Electrical Circuits Unit**

In addition to science, math, and reading skills, our **electrical circuits unit** can also reinforces key **ACT Writing skills**. The ACT Writing section isn’t just about grammar—it’s about **building strong arguments, organizing ideas logically, and supporting claims with evidence**. These are essential skills for both **academic success and STEM careers**.

This unit can connect to ACT Writing in **three key areas**:

**1️ Ideas & Analysis – Constructing Logical Arguments**

First, focus on how students **develop and analyze arguments**.

* They’ll be asked to **construct well-reasoned positions** on circuit design, energy efficiency, and electrical safety.
* They’ll **analyze multiple perspectives** on how electricity impacts our world.

✔️ **Example Applications in Our Unit:**

* **Explaining the advantages and disadvantages** of series vs. parallel circuits.
* **Evaluating the role of resistance** in energy conservation.
* **Comparing multiple viewpoints** on renewable energy and electricity use.

**2️ Development & Support – Using Evidence Effectively**

Next, reinforce the importance of **supporting arguments with evidence**.

* Students will use **data, scientific principles, and real-world examples** to justify their claims.
* They’ll practice **technical explanations** that are clear, logical, and well-supported.

✔️ **Example Applications in Our Unit:**

* **Citing scientific principles** to explain the role of resistance in a circuit.
* **Providing real-world applications** of electrical circuits in electric vehicles and smart grids.
* **Using case studies** to support arguments about power distribution and energy conservation.

**3️ Organization & Clarity – Structuring Ideas Logically**

Finally, focus on **clear, well-organized writing**.

* Students will refine their ability to **logically sequence their ideas** when explaining electrical concepts.
* They’ll learn how to **use transitions effectively** to connect ideas smoothly.

✔️ **Example Applications in Our Unit:**

* **Writing a structured explanation** of Ohm’s Law.
* **Comparing and contrasting** series vs. parallel circuits in an organized essay.
* **Developing a persuasive argument** about energy conservation in circuit design.

**Why This Matters for ACT Success**

By incorporating **structured writing, logical arguments, and real-world applications**, this unit builds essential **ACT Writing skills** while strengthening **STEM communication**. These skills will help students not only on the ACT but also in **college, technical careers, and beyond**.

**WRITING PROMPTS / ACT-STYLE ESSAY ASSIGNMENT**

### **ACT-Style Writing Prompts & Essay Assignment – Electrical Circuits Unit**

These **writing prompts** and an **ACT-style essay assignment** will help students **develop arguments, use evidence, and practice structured writing**—all essential for **ACT Writing success** while reinforcing concepts from your **electrical circuits unit**.

## **Writing Prompts – Argumentation & Analysis**

### **Prompt 1: Series vs. Parallel Circuits**

"Series and parallel circuits serve different purposes in electrical engineering. Some argue that series circuits are more efficient due to their simplicity, while others believe parallel circuits are superior because they provide reliability. Which type of circuit is better for practical use? Defend your position with scientific reasoning and real-world examples."

✔ **ACT Writing Skills Practiced:** Argumentation, Evidence Use, Organization

### **Prompt 2: Renewable Energy & Electrical Circuits**

"Renewable energy sources like solar and wind power rely on well-designed electrical circuits for energy storage and distribution. However, critics argue that renewable energy systems are unreliable due to fluctuations in power supply. Should the U.S. invest more in renewable energy infrastructure despite these challenges? Develop an argument using scientific principles and real-world applications."

✔ **ACT Writing Skills Practiced:** Critical Thinking, Persuasive Writing, Scientific Analysis

### **Prompt 3: The Role of Electrical Resistance**

"Electrical resistance plays a key role in circuit efficiency. High resistance can lead to energy loss, while low resistance allows for better current flow. Should engineers prioritize reducing electrical resistance in all circuits, or are there cases where higher resistance is beneficial? Develop an argument and support your claim with scientific reasoning."

✔ **ACT Writing Skills Practiced:** Analytical Thinking, Evidence-Based Writing, Technical Explanation

## **📝 ACT-Style Essay Assignment: Electrical Circuits & Society**

### **Assignment Overview**

In this ACT-style essay, students will analyze **three perspectives** on the role of electrical circuits in modern technology. They will **develop their own perspective**, evaluate the given viewpoints, and support their argument with evidence.

### **Prompt:**

"Electrical circuits are at the core of modern technology, powering everything from household appliances to advanced medical devices. Some argue that innovation in circuit design should focus on increasing efficiency, while others believe reliability and cost-effectiveness should be the priority. A third perspective suggests that circuit technology should evolve primarily to support renewable energy systems. In your essay, develop your own perspective on the future of electrical circuits and analyze how it compares to at least one of the provided viewpoints. Use reasoning and evidence to support your argument."

### **Perspectives for Analysis**

🔹 **Perspective 1 – Efficiency First:**  
"The future of electrical circuits should focus on increasing efficiency. By minimizing resistance and maximizing energy transfer, we can reduce energy waste and improve performance across all technologies."

🔹 **Perspective 2 – Reliability & Cost:**  
"Circuits must be designed with reliability and affordability in mind. The most important goal is to create stable, long-lasting electrical systems that are accessible and cost-effective."

🔹 **Perspective 3 – Renewable Energy Priority:**  
"Advancements in electrical circuits should prioritize renewable energy applications. The global shift toward sustainability depends on circuits that efficiently store and distribute solar and wind power."

### **Essay Structure & Expectations**

✔ **Introduction**

* Introduce the topic and the three perspectives.
* Clearly state your own perspective.

✔ **Body Paragraphs**

* **Develop your argument**, supporting it with scientific reasoning and real-world examples.
* **Compare and contrast** your view with at least one of the provided perspectives.

✔ **Conclusion**

* Summarize your argument.
* Explain the broader implications of circuit advancements in society.

## **🌟 Why This Writing Assignment Matters**

✅ **Prepares students for ACT Writing** by teaching **argumentation, organization, and analysis**.  
✅ **Encourages STEM literacy** by requiring students to defend positions using **scientific evidence**.  
✅ **Strengthens real-world writing skills**—essential for **college, technical careers, and engineering fields**.

### **📊 ACT-Style Essay Rubric – Electrical Circuits & Society**

This **grading rubric** aligns with the ACT Writing scoring criteria, assessing **argumentation, evidence, organization, and clarity**. Use this rubric to evaluate student essays based on a **6-point scale**.

## **🔹 Scoring Categories & Criteria**

| **Score** | **Ideas & Analysis** | **Development & Support** | **Organization** | **Language Use & Conventions** |
| --- | --- | --- | --- | --- |
| **6** (Excellent) | Presents a **clear, insightful perspective** with **strong engagement** in the issue. Analyzes multiple perspectives effectively. | Develops ideas with **compelling, well-integrated evidence** and detailed reasoning. Demonstrates **depth of thought**. | **Logically structured** with smooth transitions. Argument flows **cohesively**. | Uses **precise, sophisticated language**. Virtually **free of grammatical errors**. |
| **5** (Strong) | Offers a **well-developed argument**, addressing multiple perspectives. | Supports claims with **strong examples and relevant evidence**. Demonstrates **logical reasoning**. | Well-organized with **clear topic sentences and transitions**. | Uses **varied sentence structures** with minor grammatical errors. |
| **4** (Proficient) | States a **clear argument**, but may not fully address other perspectives. | Includes **adequate evidence** but lacks **depth or specificity** in examples. | Generally **organized**, though some transitions may be abrupt. | Uses **mostly clear language** with occasional wordiness or errors. |
| **3**(Developing) | Presents an argument but **lacks clarity or depth**. May oversimplify perspectives. | Uses **limited or unclear** evidence; reasoning is **inconsistent**. | Organization is **inconsistent**; paragraphs may lack clear focus. | Language is **somewhat unclear**; grammatical errors may distract from meaning. |
| **2** (Weak) | Argument is **unclear or unfocused**. May misinterpret perspectives. | Provides **minimal or weak evidence** with little analysis. | **Disorganized**, lacks logical flow. | Frequent grammatical errors and **awkward phrasing**. |
| **1** (Minimal) | Lacks a **coherent argument**; does not engage with perspectives meaningfully. | **Little to no evidence** or reasoning provided. | Essay is **unstructured** and lacks coherence. | **Severe grammar and sentence structure issues** make understanding difficult. |

## **🔹 Explanation of Scoring Categories**

### **1️ Ideas & Analysis (Depth of Argument)**

* Does the essay **present a clear argument**?
* Does the student **engage with multiple perspectives**?
* Are the ideas **insightful and well-explained**?

### **2️ Development & Support (Use of Evidence & Reasoning)**

* Are claims **supported with strong evidence**?
* Are examples **relevant and well-integrated**?
* Does the student demonstrate **depth of thought**?

### **3️ Organization (Logical Flow & Structure)**

* Is the essay **logically structured**?
* Are **topic sentences and transitions** used effectively?
* Does each paragraph **contribute to the overall argument**?

### **4️ Language Use & Conventions (Grammar, Word Choice, & Style)**

* Is the language **precise and clear**?
* Are there **minimal grammar, punctuation, and spelling errors**?
* Does the essay use **varied sentence structures** to enhance readability?

## **🌟 Additional Notes for Teachers**

✔ **Encourage students to engage with at least one of the provided perspectives**, comparing it to their own.  
✔ **Challenge students to use real-world examples** (e.g., renewable energy circuits, smart grids, electric vehicles) to support their claims.  
✔ **Remind students to focus on clarity and conciseness**—excessive wordiness weakens arguments.

## **📌 How to Use This Rubric**

✅ **Before Writing:** Share the rubric with students so they understand expectations.  
✅ **During Peer Review:** Have students score each other’s essays and provide feedback.  
✅ **After Grading:** Offer specific comments based on the rubric categories to guide improvement.