



American Samoa Technician Education Readiness Pathway Project (TERPP)
STEM Guitar Building
Lesson Plan



Instructor: Kenneth L. Jagon

Subject: Woodworking

Guitar Electronics Activity

Description of Activity

This activity will engage students in the design and function of an electric guitar control circuit. Students will learn about individual electronic components and understand how to Assemble an electric guitar control circuit according to a circuit diagram. Proper wire Stripping, grounding, and soldering techniques will also be highlighted.

Learning Objectives:

(List measurable objectives)

1. Students will plan the assembly of components according to a wiring diagram.
2. Students will properly solder components together into a wiring harness.
3. Students will use Ohm’s law to quantify the effect of a resistor on voltage and current within a circuit.
4. Students will use Ohm’s Law to estimate values in a voltage divider circuit using a potentiometer.
5. Students will utilize proper wire stripping, soldering, and grounding techniques.

Standards:

STANDARD: 6	Students will use the tools correctly and know how to use hand and power tools.
BENCHMARK: 6.1	Students demonstrate that they can use all the tools safely and correctly.
BENCHMARK: 6.2	Given a job, the student will be observed on how they use tools accordingly.

SME Skill Gaps

Oral communication and listening
Specific manufacturing processes

Materials Required:

1. Pencil and calculator to complete Ohm's Law calculations
2. Digital Multimeter with leads
3. Two (2) .022 μ F capacitors
4. Two pickups (neck and bridge)
5. One (1) 3 way toggle switch
6. Four (4) potentiometers (500k Ω)
7. Jumper wires (18 AWG)
8. One (1) 1/4 inch female jack

Safety:

When soldering, wear eye protection and work in a well-ventilated area. Be careful to avoid inhaling fumes/smoke. Wash your hands immediately after soldering.

References:

- Website: www.guitarbuilding.org
ASDOE Curriculum
- 1. Electrical/ Electronic Schematic Symbols - www.rapidtables.com/electric/electrical_symbols.htm
- 2. Wiring a Guitar - www.stewmac.com/freeinfo/i-4000.html
- 3. Wiring Diagrams - www.stewmac.com/freeinfo/i-1217.html
- 4. Linear vs. Audio Pots - www.fretnotguitarrepair.com/repair/electric-guitar/electronics.php
- 5. Ohm's Law - www.hamuniverse.com/ohmslaw.html
- 6. Ohm's Law - www.allaboutcircuits.com/vol_6/chpt_2/5.html
- 7. Guitar Pickups - www.wisegeek.com/what-are-guitar-pickups.htm
- 8. Soldering - www.americanautowire.com/view-faq/guide-to-proper-soldering-of-terminals/
- 9. Google Slide Presentation: Electric Guitar Controls by D. Hunt (guitarbuilding.org)
https://docs.google.com/presentation/d/1Fb7aqZR7mpcUFopm5DSWB_OQ66e1rERqQ_6nWmPofQ/edit#slide=id.p17

Activity:

This two-part activity is designed to teach the design and function of an electric guitar control circuit. In part one, you will learn about individual electronic components and Ohm's law for Voltage, resistance, and current. In part two, you will learn how to assemble an electric guitar control circuit according to a circuit diagram, write a circuit diagram of your own, and demonstrate proper soldering and grounding techniques for an electric guitar control circuit.

Name:

Date:

Guitar Electronics

Part One: Electrical Circuit Terminology

Define the related terminology for this lesson:

1. Volts

2. Ohms

3. Amps

4. Ground

5. Conductor

6. Insulator

7. Potentiometer

8. Capacitor

9. Pickup

10. Ohm's Law

Name:

Date:

Assessment

Guitar Electronics

1. When measuring continuity, which value is being tested?

- A. Volts
- B. Ohms
- C. Amps
- D. Watts

2. Continuity is directional; be careful when placing the leads as it will affect the outcome of the test.

True -or- False

3. After connecting the electrical system you notice a hum. This is likely due to:

- A. The wrong size capacitor was in the circuit
- B. The pickup connection is loose
- C. The ground wire(s) are not connected properly
- D. The selector switch is stuck in the wrong position

4. The ground wire should be connected to the exposed metal case of the potentiometer.

True -or- False

5. The capacitors being used with the potentiometers are set up to create a(n) _____.

- A. Hi pass filter
- B. Equalizer
- C. Low pass filter
- D. None of the above

6. Potentiometer + capacitor = _____

- A. Volume
- B. Vibrato
- C. Tone
- D. None of the above

7. The 1/4" jack has two leads. One lead is the ground and the other lead is the signal out. The sleeve or inner cylinder of the jack is the ground.

True -or- False

8. What type of pickups are installed in our electric guitar?

- A. Contact ribbon
- B. Electromagnetic
- C. Piezoelectric
- D. Dynamic condenser

9. A common term for a poor solder joint is _____

- A. Grounded Solder Joint
- B. Slipped Solder Joint
- C. Cold Solder Joint
- D. None of the above

10. This term refers to melting solder on both contacts before you attempt to solder them. This coats or fills the wires or connector contacts with solder so you can easily melt them together.

- A. Brazing
- B. Tinning
- C. Grounding
- D. Desoldering

Assessment Key:

1. B - Ohms
2. False
3. C - The ground wire(s) are not connected properly
4. True
5. C - Low pass filter
6. C - Tone
7. True
8. B - Electromagnetic
9. C - Cold Solder Joint
10. B - Tinning

Reviewing Faculty Cohort Members:

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