#  **INDIANA 4-H ELECTRIC**



 **Electric and Electronic Exhibit Skills and Knowledge Chart**

Youth and their mentor/volunteer leader/instructor should use this chart as a guide when deciding appropriate skills and knowledge to incorporate in an electricity or electronics exhibit. **While this list is a guide, it is not meant to be an all-inclusive list.** Youth in Level 2 might feel comfortable attempting Level 5 skills, but it is unlikely that a beginner exhibitor will be able to successfully master Level 5 skills. Youth are encouraged to utilize several resources such as websites, print material, social media, and television shows when acquiring electricity/electronic skills and knowledge. Skills and knowledge learned from other types of resources can be demonstrated provided they are age/grade appropriate.

The “**X**” indicates **suggested level** to acquire respective skill or knowledge. Exhibits must include a minimum of 5 techniques from their level indicated in the chart below. They may include additional techniques from other levels as deemed appropriate, but will be evaluated for quality. For example, Level 3 exhibitors may use any techniques found in Level 1 or 2 but the exhibit must include a minimum of 5 Level 3 techniques, either demonstrated or explained.

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| **Skills to be Attained** | **Level** | **1** | **2** | **3** | **4** | **5** |
| **Grade** | **3** | **4** | **5** | **6** | **7-12** |
|  Utilizes safety equipment | **X** |  |  |  |  |
| Demonstrate decision making | **X** |  |  |  |  |
| Identify electrical parts | **X** |  |  |  |  |
| Recognize potential dangers and how to avoid them | **X** |  |  |  |  |
| Explain the concept of circuits - series and parallel | **X** |  |  |  |  |
| Analyze function of electric parts | **X** |  |  |  |  |
| Diagnose problems and make basic repairs | **X** | **X** |  |  |  |
| Recognize electrical connection types and how to make them | **X** | **X** |  |  |  |
| Identify tools and their use | **X** | **X** |  |  |  |
| Recognize the relationship of electricity and magnetism | **X** | **X** |  |  |  |
| Soldering techniques | **X** | **X** |  |  |  |
| Understand volts | **X** | **X** |  |  |  |
| Strip wire properly | **X** | **X** |  |  |  |
| Recognize the polarity of components | **X** | **X** |  |  |  |
| Learn how to read pictorial diagram | **X** | **X** |  |  |  |
| Understand simple motors | **X** | **X** |  |  |  |
| Understand battery voltages | **X** | **X** |  |  |  |
| Identify diode rectification |  | **X** |  |  |  |
| Define and measure ohms |  | **X** |  |  |  |
| Clarify what components do |  | **X** |  |  |  |

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| Distinguish between alternating and direct currents |  | **X** |  |  |  |
| Understand conductors and insulators |  | **X** |  |  |  |
| Identify analog and digital multi-meter |  | **X** |  |  |  |
| Use multi-meter, etc. |  | **X** |  |  |  |
| Understand concept of transformer |  | **X** |  |  |  |
| Applying a wire nut |  | **X** | **X** |  |  |
| Understand amps and ampacity |  |  | **X** |  |  |
| Differentiate wire - sizes, types, uses, and colors |  |  | **X** |  |  |
| Identify a ground |  |  | **X** |  |  |
| Identify a neutral |  |  | **X** |  |  |
| Interpret circuits |  |  | **X** |  |  |
| Read simple schematics |  |  | **X** |  |  |
| Estimate budget |  |  | **X** |  |  |
| Execute project planning |  |  | **X** |  |  |
| Calculate circuit loads |  |  | **X** | **X** |  |
| Understand voltage drop in a conductor |  |  | **X** | **X** |  |
| Demonstrate mathematic concepts |  |  | **X** | **X** |  |
| Understand plug configurations |  |  | **X** | **X** |  |
| Use crimp-on terminals |  |  | **X** | **X** |  |
| Measure wattage of lighting |  |  | **X** | **X** |  |
| Identify polarized vs. Non-polarized plug configuration |  |  | **X** | **X** |  |
| Understand direct and reflected glare |  |  | **X** | **X** |  |
| Identify methods of lighting |  |  | **X** | **X** |  |
| Identify bulb types |  |  | **X** | **X** |  |
| Understand strain relief of cords |  |  | **X** | **X** |  |
| Understand kilowatt hour consumption |  |  | **X** | **X** |  |
| Identify circuit breaker concepts, overload devices |  |  | **X** | **X** |  |
| Identify underwriters knot |  |  |  | **X** |  |
| Identify and understand how outlets, switches, and lights work |  |  |  | **X** | **X** |
| Distinguish color of lighting |  |  |  | **X** | **X** |
| Analyze quality of lighting |  |  |  | **X** | **X** |
| Measure quantity of lighting |  |  |  | **X** | **X** |
| Understand electricity production - friction, heat, light, piezo, chemical, magnetic |  |  |  | **X** | **X** |
| Understand proper installation of outlets. |  |  |  | **X** | **X** |
| Understand proper installation of switches. |  |  |  | **X** | **X** |
| Understand proper installation of lighting. |  |  |  | **X** | **X** |
|  Understand proper routing & fastening of wire. |  |  |  | **X** | **X** |
| Understand use & securing of conduit. |  |  |  | **X** | **X** |
| Understand bonding of metal components. |  |  |  | **X** | **X** |
| Design a complete branch or feeder circuit. |  |  |  |  | **X** |
| Demonstrate/utilize use of specialized tools. (Knockout kit, Conduit bender, Rotary cutter, Cat 5/5E Crimp tool, Fiber splicer, etc.) |  |  |  |  | **X** |
| Research career opportunities in electric and electronics |  |  |  |  | **X** |
| Identify renewable energy types and how they work |  |  |  |  | **X** |
| Explain electron theory |  |  |  |  | **X** |
| Understand primary vs secondary electricity uses |  |  |  |  | **X** |
| Exhibit awareness and understanding of bouncing voltage (loose neutral) |  |  |  |  | **X** |
| Understand electronics coding, motherboard creating, etc. |  |  |  |  | **X** |
| Understand motors and generators |  |  |  |  | **X** |
| Understand single phase vs three phase |  |  |  |  | **X** |

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| Describe the difference between electric andelectronic |  |  |  |  | **X** |
| Understand what inverters are and how they work |  |  |  |  | **X** |
| Identify ground rods and their purpose |  |  |  |  | **X** |
| Understand misdirected neutral current |  |  |  |  | **X** |
| Complete basic home wiring |  |  |  |  | **X** |
| Demonstrate mathematics for doing circuits - Boolean algebra |  |  |  |  | **X** |
| Design schematics |  |  |  |  | **X** |
| Repair small appliances |  |  |  |  | **X** |
| Understand National Electrical Code |  |  |  |  | **X** |
| Understand ground fault circuit interrupters; why and how it works |  |  |  |  | **X** |
| Understand arc fault circuit interrupters; why and how it works |  |  |  |  | **X** |
| Explore the concept of engineering; how parts and pieces come together to make a whole |  |  |  |  | **X** |
| Understand small appliance wiring |  |  |  |  | **X** |
| Utilize heat shrink tubing - insulation |  |  |  |  | **X** |