4-H Electric

Electric and Electronics Skills & 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.

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**			

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
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

Describe the difference between electric and electronic					**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**