



Student Electronics Technician (SET) Certification

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Test Type: The Student Electronics Technician Certification is a customized certification for the Electronics Technicians Association®- International. This certification measures technical skills at the occupational level and includes items which gauge factual and theoretical knowledge. This certification offers both a written and performance component and can be used at the secondary level and post-secondary levels. This certification can be delivered in an online or paper/pencil format.

Revision Team: This certification was developed by the Electronics Technicians Association®-International. Certification content is based on standards validated by industry professions throughout Arizona, California, Florida, Indiana, Kansas, Minnesota, New Jersey, New York, Ohio, South Dakota, Texas, Virginia, and Washington.



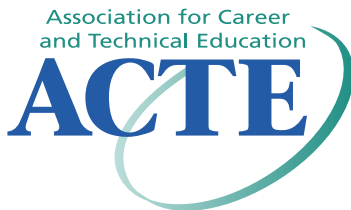
15.0303 -Electrical, Electronic
and Communications
Engineering
Technology/ Technician



Career Cluster 15-
Science, Technology,
Engineering & Mathematics



17-3023.01 – Electronics
Engineering Technicians



The Association for Career and Technical Education (ACTE), the leading professional organization for career and technical educators, commends all students who participate in career and technical education programs and choose to validate their educational attainment through rigorous technical assessments. In taking this assessment you demonstrate to your school, your parents and guardians, your future employers and yourself that you understand the concepts and knowledge needed to succeed in the workplace. Good Luck!



ETA® provides the Student Electronics Technician (SET) certification to allow high school students and entry-level technicians the opportunity to earn a basic beginner's certification. The SET provides a stepping stone certification leading to Associate, Journeyman, Senior and eventually Master CET status. This certification is for those who are new to electronics and with less than two years education and/or experience in the electronics field. This examination covers a variety of topics including: Electrical Theory, Electronics Components, Soldering, Block Diagrams, Cabling, Power Supplies, Test Equipment, Safety, Circuits, Amplifiers, Digital Concepts, Audio/Video Systems, Basic Telecommunications and more. An optional hands-on assessment is available.

Written


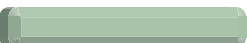








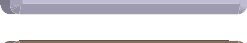









The written component consists of questions to measure an individual's factual theoretical knowledge.

Administration Time: 1 hour and 40 minutes

Number of Questions: 100

Number of Sessions: This certification may be administered in one or two sessions.

Areas Covered

Safety		5%
Electron Theory		5%
DC Basics		5%
AC Basics		5%
Wire and Cable		5%
Electronic Components		5%
Semiconductors		5%
Power Supplies		5%
Amplifiers		5%
Interfacing		5%
Digital		5%
Computer Electronics		5%
Computer Applications		5%
Audio and Video		5%
Optical Electronics		5%
Telecommunications		5%
Industrial and Automation		5%
Test and Measurement		5%
Soldering		5%
Troubleshooting		5%

Specific Standards and Competencies

Safety

- Explain where eye and ear protection are needed
- Describe lockout and tagging rules for unsafe electrical or mechanical hazards
- List safety concerns related to the National Electrical Code®
- Identify sources of static charges and its damage to sensitive components
- List the effects of electric current on the human body

Electron Theory

- Explain current flow and units of measure
- Explain static charges and coulombs
- Explain potential difference, voltage drop and units of measure
- Describe the action of electrons, protons, and neutrons

DC Basics

- State Ohm's law and Watt's power of laws
- List 12 common basic electronic formulas derived from Ohm's and Watt's laws
- Calculate power consumption, dissipation and energy units
- Identify circuit configurations of series, parallel and combination circuits

AC Basics

- List methods that produce alternating current
- Describe sine wave shapes and RMS values
- Describe magnetic flux and inductance and list its units of measure
- Compare reactance and resistance and describe current/voltage relationships
- Explain how inductance relates to magnetism and describe coil construction, cores and usages



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Specific Standards and Competencies (continued)

Wire and Cable

- Describe types and testing of splices
- Explain the American Wire Gauge (AWG) sizes of conductors
- List wire types, purpose of insulation and construction
- List common uses for copper cables in electrical and telecommunications applications

Electronic Components

- Describe fuses and circuit breakers
- Explain where passive components are used in circuits
- Identify inductive components, core materials and how coil diameter and wire size affect values
- Identify capacitor types, ratings and use in circuits
- Identify common types of transformers and explain step-up/step-down in relation to turns ratio

Semiconductors

- Explain P-N junction theory
- Identify PNP and NPN transistors as to type and usage
- Describe FET, MOSFET and CMOS types of components
- Compare thyristors with other semiconductors
- Identify other semiconductors and symbols and explain their uses

Power Supplies

- Describe types of batteries and common usage including primary, secondary and rechargeable cells
- Describe the differences between half wave and full wave power supply types
- Identify components that determine output voltage and power
- Explain the reasons for regulation in an electronic power supply

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Specific Standards and Competencies (continued)

Amplifiers

- List common amplifier devices
- Identify causes of distortion in amplifiers and list ways to reduce or eliminate it
- Explain the uses of operational amplifiers and how they differ from discrete amplifiers
- Describe decibel (dB) measurements, voltage and power gain
- List the usages and classes of amplifiers

Interfacing

- Explain the importance of impedance matching and list causes of mismatches
- Describe power transfer between circuits, components used and problems of mismatch
- List anticipated signal or voltage levels for output circuits in audio and video equipment

Digital

- Describe the use of binary numbers and math, converting between binary and decimal
- Explain truth tables for basic gates
- Identify symbol and function of digital logic gates: (AND, OR, NOT, NAND, NOR, XOR and XNOR)

Computer Electronics

- Explain Operating System functions and common types
- List various types of peripherals, USB and other connector usage
- Describe how microprocessors function and identify internal sections
- Describe the major components of a computer
- Describe different types of computer memory and how storage is accomplished

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Specific Standards and Competencies (continued)

Computer Applications

- List ways to backup data and the importance of daily back-ups
- Explain major components and use of the Internet, browsers and IP addressing
- List commonly used software application programs
- Explain basic computer operation

Audio and Video

- Explain speaker construction, usage and precautions
- Describe microphone types, construction and usage
- List the types of cables and connectors used in audio and video applications
- Describe distorted sound and electronic/acoustical causes of distortion

Optical Electronics

- Describe how LED devices function
- Explain where charge-coupled devices (CCD) are found
- List products where lasers are used
- Explain where and how LCD displays are used
- List applications of opto-isolators

Telecommunications

- Explain the common connectors, plugs and jacks used in communications
- Describe copper and fiber telephone local loop circuits
- Explain half duplex and full duplex communications
- List common RF (Radio Frequency) bands

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Specific Standards and Competencies (continued)

Industrial and Automation

- Describe the common uses of AC motors
- Identify types of DC motors
- Describe the use and programming of major types of control panels
- Explain how microcontrollers and PLCs function
- Explain the use of ladder logic and control devices

Test and Measurement

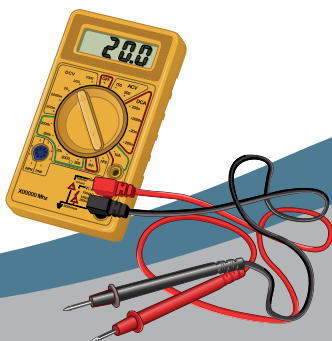
- Describe how a Digital Multimeter (DMM) and related meters operate
- Describe oscilloscope usage and explain the purposes of front panel controls
- List the uses and precautions for logic tracer test probes
- Identify meter protection, safety and usage
- List the purposes and types of signal generators

Soldering

- Explain solder flux usage and describe types
- List types of solder and reasons for choosing each
- Describe the differences between good and bad mechanical and electrical solder connections
- Describe various types of desoldering equipment and how it is used
- Describe how to use of braid-wick solder removers

Troubleshooting

- Explain how block diagrams are used for troubleshooting and maintenance of electronics products
- Explain the order of the troubleshooting process and techniques to find problems
- Describe the purpose and use of test points including their likely placement on schematics
- Explain the methods of using flow diagrams/charts
- Describe how to locate/cross reference parts and products in catalogs and online



Sample Questions

The power transformer in a power supply _____.

- A. will always step-up voltages
- B. will always step-down voltages
- C. might step-up or step-down voltages
- D. rectifies the AC voltage to produce DC voltage.

A group of microchips that helps the CPU do its job is a _____ set.

- A. Dip Set
- B. Marquee Set
- C. Chip Set
- D. Fly Set

RAM memory is much like the _____ term memory in your brain.

- A. Short
- B. High
- C. Long
- D. Low

Electronically, UPS stands for _____.

- A. Underwriters Printed Software
- B. Under Power Standard
- C. Universal Postal Service
- D. Uninterruptible Power Supply

A fuse that has its internal fusible wire wrapped around an insulator is _____.

- A. a Slo-Blo fuse
- B. an inductive fuse
- C. a capacitive fuse
- D. intended for high-voltage use



Sample Questions (continued)

The power transformer in a power supply _____.

- A. will always step-up voltages
- B. will always step-down voltages
- C. might step-up or step-down voltages
- D. might step-up or step-down current

Moving one plate of a capacitor further away from the other will _____.

- A. decrease capacitance
- B. increase capacitance
- C. decrease voltage rating
- D. increase mutual transconductance

Connecting a Zener diode across the power supply load will _____.

- A. protect the power transformer
- B. regulate the input DC
- C. eliminate ripple
- D. limit the output DC

Soldering irons used for PCB (printed circuit board) type work should be approximately _____ watts.

- A. 30
- B. 90
- C. 150
- D. 250

A PLL (phase-locked-loop) circuit, contains a VCO (voltage-controlled-oscillator). The output of the VCO is a(n) _____ voltage.

- A. AC
- B. Digital
- C. Input
- D. DC



Performance

The performance component allows individuals to demonstrate their acquired skills by completing actual jobs using the tools, materials, machines, and equipment related to the technical area.

Administration Time: 3 hours and 10 minutes

Number of Jobs: 5

Areas Covered:

12% IC Identification

Participants will use the reference sheet, and identify digital functions.

26% DC Circuit Construction and Analysis

Participants will choose components correctly, construct protoboards, complete calculations and measurements.

21% Power Supply Construction and Analysis

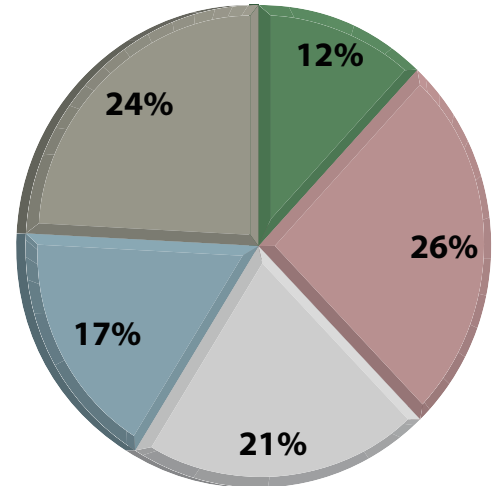
Participants will construct power supply, complete measurements and calculations.

17% De-Soldering and Soldering

Participants will de-solder, solder (re-solder), and identify components.

24% CE Amplifier Construction and Analysis

Participants will construct the CE amplifier, complete calculations, and measure voltage.



Sample Job

IC Identification

Maximum Time: 10 minutes

Participant Activity: The participant will go to the designated station and use the manual that is provided to identify integrated circuits provided.

