ELECTRONIC INSTALLATION AND MAINTENANCE TECHNOLOGY (DEMONSTRATION CONTEST)

PURPOSE
To evaluate each contestant’s preparation for employment and to recognize outstanding students for excellence and professionalism in the field of advertising design.

First, refer to General Regulations, Page 9.

CLOTHING REQUIREMENT
For men: Official white polo shirt with black dress slacks, black socks and black leather shoes.
For women: Official white polo shirt with black dress slacks or skirt, black socks or black or skin-tone seamless hose, and black leather shoes.

These regulations refer to clothing items that are pictured and described at: www.skillsusastore.org. If you have questions about clothing or other logo items, call 800-401-1560 or 703-956-3723.

Note: Contestants must wear their official contest clothing to the contest orientation meeting.

ELIGIBILITY
Open to active SkillsUSA members enrolled in career and technical programs with Electronics, appliance repair, computer networking or smart house technologies as the occupational objective.

EQUIPMENT AND MATERIALS
1. Supplied by the technical committee:
   All necessary information for the judges and technical committee
2. Supplied by the contestant:
   a. Multimeter
   b. Telephone buttset
   c. Toner
d. Signal generation
e. Cable tester
f. Laptop computer
g. All competitors must create a one-page résumé using a word processor and submit the résumé electronically at: www.skillsusa.org/compete/updates.shtml. Check the Website for further instructions.

SCOPE OF THE CONTEST
The contest is defined by industry standards as set by the current industry technical committee. The contest will be divided into two parts: general knowledge test, and a skilled performance.

Knowledge Performance
The contest will include a written exam assessing general knowledge of residential electronics installation and maintenance including smart house technologies. Written portions may also exist during the skills portion of the contest.

Skill Performance
The skills performance event assesses the ability of the contestant to install, maintain and troubleshoot a variety of devices encountered in a residential setting. A practical problem(s) will be given to evaluate the contestant’s ability to function on a basic entry level.

Contest Guidelines
1. The contests will have several hands-on skill scenarios that demonstrate one’s ability to perform jobs or skills selected from the list of competencies as determined by the SkillsUSA Championships technical committee. Scenarios may include any or several of the following:
   a. Diagnose and service personal residential electronic systems
   b. Diagnose and resolve operational and startup problems
   c. Locate and identify defective modules within residential electronic equipment
d. Demonstrate ability to use diagnostic utility software and equipment
e. Install, configure and demonstrate proper operations of devices within the residence.
The hardware problems will relate to any residential networked systems.

Contestants will be awarded points based on their ability to solve the provided problems within the allotted time. Partial points can be awarded for solving partial problems.

Competence in the provided tasks is considered when a contestant acquires 75 percent of the available points.

Contestants will be provided, as required, manufacturers' documentation of the devices to be installed and/or serviced.

Winners will be determined on the basis of their total scores (regardless of result on certification test), which includes diagnostic procedures, speed, standard industry procedures, accuracy of adjustments and correct component replacements.

Specific penalties will be assessed for the failure to properly utilize anti-static straps at all times when in contact with the computers and for the introduction of computer viruses into the contest computers. Penalties will be assessed at one point per occurrence, and notice of infractions will be communicated to the contestant when they occur.

Standards and Competencies

Networking

EIMT 1.0 — Identify basic networking protocols and their uses and know when / how to apply them

1.1 DHCP
1.2 UDP
1.3 DNS
1.4 TCP/IP
1.5 Subnet masks

EIMT 2.0 — Recognize and implement methods of network security

2.1 Personal Computer (PC) security
2.2 Antivirus
2.3 Home networking security
2.4 Firewall knowledge

EIMT 3.0 — Configure setup and maintain a residential LAN (Local Area Network)

3.1 Client Configuration

3.1.1 Resource sharing
3.1.2 Peer-to-Peer

3.2 Remote access setup

3.3 Network device setup and integration

3.3.1 Broadband configuration (e.g. DSL, Cable, and Satellite)
3.3.2 Routers
3.3.3 Hubs
3.3.4 Switches
3.3.5 PoE (Power over Ethernet)

EIMT 4.0 — Configure setup and maintain a secure wireless network

4.1 Differentiate applications of hardwired vs. wireless networks.
4.2 Assess networking security and encryption standards.
4.2.1 WEP
4.2.2 WPA
4.2.3 MAC filtering
4.2.4 SSID
4.2.5 WPA2
4.3 Wireless networking integration and troubleshooting
4.3.1 Frequency management
4.4 Wireless protocol standards
4.4.1 802.11 a/b/g/n

EIMT 5.0 — 1.5 Identify and define network cabling characteristics and performance

5.1 Cable types
5.1.1 CAT5
5.1.2 CAT5e
5.1.3 CAT6
5.1.4 Fiber
5.1.5 COAX
5.2 Cable length limitations
5.3 Protocols
5.3.1 10BaseT
5.3.2 100BaseT
5.3.3 1000BaseT
5.4 Shielded (STP) vs. Unshielded (UTP)
5.5 Plenum vs. Non-plenum
5.6 Importance of conductor colors

Audio/Video

EIMT 6.0 — Implement, maintain and troubleshoot multiroom audio systems. Identify common interference sources

6.1 Control devices
6.1.1 Keypads
6.1.2 Rotary volume controls
6.1.3 Sliders
6.1.4 Push button controls
6.1.5 Touch screen
6.1.6 Wireless keypads
6.1.7 Handheld devices

6.2 Differentiate and define single source, multi-source, and local source.
6.2.1 Analog audio system
6.2.2 Analog CAT5 audio system
6.2.3 Digital CAT5 audio system

6.3 Proper cable use
6.3.1 Line level vs. speaker level

6.4 Amplification
6.4.1 Ohm’s Law (e.g. Impedance matched or non-impedance matched)
6.4.2 Watts vs. dB
6.4.3 Local amplification
6.4.4 Centralized amplification

6.5 Speaker types
6.5.1 Inwall
6.5.2 Surface mounted
6.5.3 Ceiling mounted
6.5.4 Freestanding
6.5.5 Fixed
6.5.6 Animated

6.6 Speaker specifications
6.6.1 Frequency response
6.6.2 Efficiency
6.6.3 Power handling

7.1 Audio Components
7.1.1 Define basics of acoustics (e.g. Sound reflection, speaker placement, sound cancellation, sound balance)
7.1.2 Audio/Video components setup and integration (e.g. Digital signal cables and lengths, Legacy devices)
7.1.3 Multichannel Surround (e.g. SACD, DVDA, DTS, DTSES, DDEX, DD, etc.) (e.g. Crossovers and speaker setup)

7.2 Video components
7.2.1 Display types (e.g. Plasma, DLP, LCD, LCOS, CRT, Rear projection, Front projection, Direct view.)
7.2.2 Hi Definition resolutions options (e.g. 720p, 1080i, 1080p, etc.)

7.2.3 Tuner types (e.g. NTSC, PAL, ATSC, QAM, Cable card, VSB, NDVBT, DVBS)
7.2.4 Video Processing (e.g. Scalers, processors, up-conversion)
7.2.5 Aspect Ratios
7.2.6 Video setup (Calibration e.g. color balance, contrast, brightness, etc.)
7.2.7 Digital video cable and connector types (e.g. DVI and HDMI—compatibility and interoperability issues)

7.3 Use MRAV (Multi-Room Audio/Video) standards if/when applicable.

EIMT 7.0 — Install, configure and maintain a residential home theater system.

8.1 Describe typical applications and physical connections of sources
8.1.1 Media servers
8.1.2 Media PC
8.1.3 MP3 players
8.1.4 DVD players
8.1.5 Satellite
8.1.6 Cable
8.1.7 DVR
8.1.8 Gaming systems
8.1.9 Satellite radio
8.1.10 Legacy devices
8.1.11 Streaming media

8.2 Summarize types of media storage, methods to transfer and backup data.
8.2.1 Memory cards
8.2.2 NAS devices (Network Attached Devices)
8.2.3 Remote storage
8.2.4 Local storage
8.2.5 Frequency of backup

8.3 Other connection considerations
8.3.1 Digital Rights Management

EIMT 8.0 — Assess, install and configure content management systems and describe their applications in a residential environment.

9.1 Define signal types and their applications
9.1.1 Digital Distribution (e.g. Analog to IP converters, IP to Analog converters, Wireless distribution, IEEE 1394)
9.1.2 RF Distribution characteristics. Identify and troubleshoot noise and interference. (e.g. Splitters
and taps, active and passive, Attenuators, Bidirectional, Modulation and filtration, Amplification, IR over COAX.)

9.1.3 Analog Distribution (e.g. Composite, Component, and S-Video, Balun.)

9.2 Identify cable types and their applications
9.2.1 COAX (e.g. RG-59, RG-6, RG-6 QS, DV, Serial data, CCS, BC)
9.2.2 CAT5/5e/6

9.3 Termination (e.g. RCA, BNC, and F)

9.4 Satellite
9.4.1 Multi-switches
9.4.2 Diplexer
9.4.3 LNB (Low Noise Block Down Converter)

Telephony / VoIP

EIMT — 10.0 Differentiate and describe POTS vs. VoIP delivery. Identify and troubleshoot common issues.

10.1 VoIP
10.1.1 Compatibility issues
10.1.2 Whole house distribution of VoIP
10.1.3 Performance and Quality of Service (QoS)

10.2 POTS
10.2.1 Cross talk
10.2.2 Radio interference
10.2.3 Dead ports
10.2.4 REN (Ringer Equivalence Number)

EIMT 11.0 — Describe and define fundamentals of telephone systems.

11.1 Multi-line
11.2 Paging
11.3 Intercom
11.4 Voice messaging / Unified messaging
11.5 Door entry / gate entry
11.6 PBX
11.7 Key systems
11.8 Telecommunication services (e.g. caller ID, voice mail, Rollover)

Security and Surveillance Systems

EIMT 12.0 — Maintain, configure and troubleshoot basic security systems and applications.

12.1 Define monitored and notification methods.
12.1.1 Phone line
12.1.2 Cell phone
12.1.3 Radio frequency
12.1.4 IP based

EIMT 13.0 — Describe basic security terminology and apply installation procedures and methodologies.

13.1 Installation and configuration of security panel
13.1.1 Zone types
13.1.2 Delays
13.1.3 Battery backup and power supply requirements

13.2. Monitoring formats
13.2.1 SIA and Contact ID
13.2.2 4/2 and 3/1

13.3 Define types of peripherals and accessories.
13.3.1 Motion sensors
13.3.2 Glass break detectors
13.3.3 Magnetic contacts
13.3.4 Smoke fire (e.g. smoke detection, heat detection)
13.3.5 Environmental sensors (e.g. carbon monoxide, gas, water, temperature)
13.3.6 Vehicle detection
13.3.7 Photo-electric beam devices
13.3.8 Microwave beam devices
13.3.9 Pressure sensors
13.3.10 Sirens, strobes
13.3.11 Security keypads
13.3.12 Keyfobs
13.3.13 Panic buttons

13.4 Describe security infrastructure types.
13.4.1 Wired_22/4- standard power devices_22/2- Magnetic contacts_2 and 4 conductor fire wire (e.g. keypads, sounders, Power supplies, smoke and fire detectors). Power supervision relays_ Polarity reversal relays_ Line seizure_ End of line resistors.)
13.4.2 Wireless

13.5 Identify access control devices and protocols
13.5.1 Devices (e.g. Keypads, Card readers, Biometric readers, Proximity readers, Door strikes,
Electronic deadbolts, Magnetic Locks.)

13.5.2 Protocols (e.g., Weigand)

EIMT 14.0 — Identify, configure, install, maintain and troubleshoot security and surveillance cameras.

14.1 Camera Types
14.1.1 IP
14.1.2 Analog
14.1.3 Hybrid

14.2 Camera specifications
14.2.1 Lens type
14.2.2 Lux rating
14.2.3 Resolution
14.2.4 B&W vs. Color
14.2.5 IR illumination
14.2.6 Power consumption

14.3 Camera applications
14.3.1 Indoor/outdoor
14.3.2 Day/Night
14.3.3 Fixed vs. animated
14.3.4 Surveillance (e.g. door cams, nanny cams)
14.3.5 Recording (e.g. DVR, Triggers — internal vs. external detection)
14.3.6 Sequencing vs. multiplexing

Home Control and Management

EIMT 15.0 — Identify user interfaces and their appropriate applications

15.1 Device types
15.1.1 Remote controls
15.1.2 Keypads
15.1.3 Touchscreens
15.1.4 Keyfobs
15.1.5 Telephones
15.1.6 Smartphones
15.1.7 Cell phones
15.1.8 PDA’s
15.1.9 Web tablets
15.1.10 Personal computers
15.1.11 laptops

15.2 Describe the importance of simplicity and ease of use as it pertains to the end user.

EIMT 16.0 — Define and recognize control systems which integrate subsystems in the home. Describe their functionality, characteristics and purpose

16.1 Embedded control systems and Personal computer (PC) based control systems
16.1.1 Compatibility and interoperability issues

EIMT 17.0 — Identify commonly used communication protocols and their application

17.1 IR
17.2 Serial
17.3 IP
17.4 RF
17.5 Bluetooth
17.6 Contact closure
17.7 Inputs (zones)
17.8 Z-wave and Zigbee
17.9 ASCII
17.10 Proprietary protocols

EIMT 18.0 — Describe basic HVAC (Heating Ventilation and Air Conditioning) terminology and install peripheral control devices.

18.1 Control layer
18.1.1 Compatibility
18.2 Communication layer
18.2.1 Compatibility
18.2.2 IP based, wireless, serial and proprietary
18.3 Zones HVAC
18.3.1 Master slave configuration
18.3.2 Microprocessor controlled configuration
18.4 Programmable thermostats
18.5 Importance of referencing manufacturer specification and compatibility.

EIMT 19.0 — Describe basic lighting terminology and install peripheral control devices

19.1 Identify lighting control applications
19.1.1 Indoor and outdoor
19.1.2 Centralized and distributed
19.1.3 Dimming
19.1.4 Scenes
19.1.5 Relay/ switching
19.1.6 Occupancy / motion sensing
19.1.7 Time and event driven
19.1.8 Window treatments
19.1.9 Energy management
19.1.10 Security interface
19.1.11 Lighting connectivity
19.1.12 Motor speed control
19.2 Communication interface/bridge
19.2.1 Power line phase Couplers
19.3 Identify lighting control protocols (Open standards)
19.3.1 Z-wave
19.3.2 ZigBee
19.3.3 Powerline carrier (X10 protocol /PLC)
19.3.4 UPB (Universal Powerline Bus)
19.4 Proprietary RF and proprietary low voltage
19.4.1 Recognize compatibility issues

EIMT 20.0 — Identify and install component power protection devices
20.1 Identify whole house protection options
20.1.1 Surge Suppression
20.1.2 Power Conditioning
20.2 Identify and install point protection
20.2.1 Surge protectors (high voltage and ancillary low voltage devices: e.g. satellite, CATV, etc.)
20.2.2 UPS (Uninterruptible Power Supply)
20.2.3 Power Conditioning

Troubleshooting Methodology and Documentation

EIMT 21.0 — Identify and apply the fundamentals of troubleshooting and diagnostics
21.1 Use of testing equipment
21.1.1 Multimeter
21.1.2 Telephone butset
21.1.3 Toner
21.1.4 Signal generation
21.1.5 Cable tester
21.2 Refer to prior documentation
21.3 Demonstrate when to communicate with technical support and what information is relevant.
21.4 Troubleshoot common wireless interference issues: Infrared, Radio Frequency, etc.
21.5 Identify demarcation and responsibilities of associated trades and/or utilities.

EIMT 22.0 — Given a scenario, demonstrate how to apply troubleshooting skills to integrate subsystems.
22.1 Networking
22.2 Audio/Video
22.3 Telephony
22.4 Security
22.5 Home control

EIMT 23.0 — List and describe the benefits of verification of installation.
23.1 Properly label wires
23.2 Wire mapping
23.3 Importance of documenting work upon completion
23.3.1 Input/Output verification for all systems
23.3.2 Document wire placement
23.4 Certification of cable installation

EIMT 24.0 — Deliver appropriate manuals and documentation to the end user upon completion of installation.
24.1 Select, archive and appropriately distribute critical system information: Passwords, access codes, user ID’s, credentials, etc.

EIMT 25.0 — Ability to safely measure AC and DC voltages
25.1 Measure AC and DC voltages using a digital multimeter (DMM).
25.2 Measure AC and DC current using a digital multimeter (DMM).
25.3 Measure the resistance of a circuit consisting of resistors using a digital multimeter (DMM).

EIMT 26.0 — Ability to test basic analog and digital circuits and repair them
26.1 Setup and operate test equipment for analog circuits
26.2 Troubleshoot switching power supplies
26.3 Analyze motor and phase control circuits
26.4 Apply logical and systematic approach to troubleshooting analog circuit devices

EIMT 27.0 — Ability to use multimeters, oscilloscopes, and interpret results
27.1 Solve basic trigonometric problems as applicable to electronics (prerequisite to AC)
27.2 Identify properties of an AC signal
27.3 Identify AC sources
27.4 Analyze and measure AC signals using oscilloscope, frequency meters and generators
27.5 Analyze, construct and troubleshoot AC capacitive circuits, AC inductive circuits, RLC circuits (Series, Parallel, Complex) series and parallel resonant circuits, filter circuits and polyphase circuits
27.6 Analyze basic motor theory and operation
27.7 Analyze basic generator theory and operation
27.8 Setup and operate oscilloscopes, frequency counters, signal generators, capacitor-inductor analyzers and impedance bridges for AC circuits
Analyze and apply principles of transformers to AC circuits

**Committee Identified Academic Skills**
The technical committee has identified that the following academic skills are embedded in this contest.

**Math Skills**
- Solve practical problems involving percents
- Solve single variable algebraic expressions
- Solve multiple variable algebraic expressions
- Make comparisons, predictions and inferences using graphs and charts

**Science Skills**
- Plan and conduct a scientific investigation
- Use knowledge of the particle theory of matter
- Describe characteristics of types of matter based on physical and chemical properties
- Use knowledge of physical properties (shape, density, solubility, odor, melting point, boiling point, color)
- Use knowledge of classification of elements as metals, metalloids and nonmetals
- Understand Law of Conservation of Matter and Energy
- Describe phases of matter
- Describe and identify physical changes to matter
- Use knowledge of potential and kinetic energy
- Use knowledge of mechanical, chemical, and electrical energy
- Use knowledge of heat, light and sound energy
- Use knowledge of temperature scales, heat and heat transfer
- Use knowledge of work, force, mechanical advantage, efficiency and power
- Use knowledge of simple machines, compound machines, powered vehicles, rockets and restraining devices
- Use knowledge of principles of electricity and magnetism
- Use knowledge of static electricity, current electricity and circuits
- Use knowledge of magnetic fields and electromagnets
- Use knowledge of motors and generators

**Language Arts Skills**
- Demonstrate comprehension of a variety of informational texts
- Use text structures to aid comprehension
- Demonstrate knowledge of appropriate reference materials
- Use print, electronic databases and online resources to access information in books and articles

**Connections to National Standards**
State-level academic curriculum specialists identified the following connections to national academic standards.

**Math Standards**
- Numbers and operations
- Algebra
- Geometry
- Measurement
- Data analysis and probability
- Problem solving
- Reasoning and proof

**Science Standards**
- Understands the structure and properties of matter
- Understands the sources and properties of energy
- Understands forces and motion
- Understands the nature of scientific knowledge
- Understands the nature of scientific inquiry

**Language Arts Standards**
- Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works
- Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies and their understanding of textual features (e.g., sound-
• Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
• Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
• Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language and genre to create, critique and discuss print and nonprint texts
• Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
• Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
• Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Source: IRA/NCTE Standards for the English Language Arts. To view the standards, visit: www.readwritethink.org/standards/index.html.
911 Emergency Dispatch

Purpose
To evaluate each contestant’s preparation for employment and to recognize outstanding students for excellence and professionalism in the field of Emergency Dispatch.

First, refer to General Regulations, Page 9.

Clothing Requirement
Official light blue SkillsUSA work shirt, navy pants, and black or brown leather work shoes. Skirts and high-heeled shoes are not permitted.

These regulations refer to clothing items that are pictured and described at: www.skillsusastore.org. If you have questions about clothing or other logo items, call 800-401-1560 or 703-956-3723.

Note: Contestants must wear their official contest clothing to the contest orientation meeting.

Eligibility
Open to active SkillsUSA members enrolled in programs for Emergency Dispatching.

Equipment and Materials
1. Supplied by the technical committee:
   All necessary materials for the contest
2. Supplied by the contestant:
   a. Small pocket notebook for notes
   b. Pens and pencils (two each)
   c. All competitors must create a one-page résumé using a word processor and submit the résumé electronically at: www.skillsusa.org/compete/updates.shtml. Check the Web site for further instructions.

Scope of the Contest
The contest is defined by industry standards as identified by SkillsUSA technical committee, which includes: APCO International, SAVE Corporation, Dispatching Personnel TBD

Knowledge Performance
The contest includes a written knowledge exam assessing general knowledge of Emergency Dispatching.

Skill Performance
Contest will include simulated activities encountered by Emergency Dispatch Personnel.

Contest Guidelines
1. Each contestant must work independently without assistance from instructors, other contestants or observers.
2. The judging criteria and points assigned will be determined by the difficulty of the tasks assigned.

Standards and Competencies
ED 1.0 — Explain concepts and applications of the major principles of Emergency Dispatching
1.1 Provide an understanding of agency terminology used in Dispatching
1.2 Explain Agency Codes and give examples
1.3 Identify Agency defined phonetic alphabet and International Telecommunications Union (ITU) phonetic alphabet
1.4 Explain the Americans with Disabilities ACT (ADA) in relation to (PSAP’s) Public Safety Answering Points responsibilities
1.5 Explain Incident Command Systems (ICS), National Incident Management Systems (NIMS), State and Local Emergency Operations Plans, Tactical Interoperable Communication Plan (TICP)
1.6 Explain Dispatcher Liability and give an example of how this could happen

ED 2.0 — Demonstrate adherence to standard dispatcher communication skills
2.1 Active Listening
2.2 Clear enunciation of caller and radio transmissions
2.3 Concise spoken and written communications
2.4 Understanding of Plain Speech
2.5 Demonstrate an awareness of and respect for diverse populations within the agency's service area
2.6 Use of generally accepted customer service skills

ED 3.0 — Demonstrate adherence to standard dispatcher operating procedures
3.1 Appropriate use of Agency terminology, codes, signals
3.2 Use of Agency defined phonetic alphabet
3.3 Ability to communicate with co-workers on a professional level
3.4 Demonstrate the ability to map field location assignments
3.5 Demonstrate comprehension of jurisdictional boundaries and geography
3.6 Demonstrate the ability to identify and properly utilize agency resources

ED 4.0 Demonstrate technical skills
4.1 Keyboarding-wpm/accuracy

ED 5.0 — Demonstrate ability to operate Computer Aided Dispatch, Phone and Radio systems
5.1 Demonstrate the ability to answer calls within agency expectation
5.2 Demonstrate the ability to answer calls for service applying agency procedures and projecting a professional demeanor
5.3 Demonstrate the ability to analyze calls for service and determine the appropriate response action
5.4 Demonstrate the ability to obtain, verify and analyze incident information to include location, reporting party contact information, nature and severity of the incident while applying effective communication skills to control the call
5.5 Demonstrate the ability to create and update Computer Aided Dispatch (CAD)incidents, maintain accurate call narrative or documentation, and prioritize calls for service
5.6 Demonstrate the ability to determine the nature and priority of incidents and assign available resources in accordance with agency directives
5.7 Demonstrate proficiency in assigning responders to incidents and obtaining acknowledgement of calls for service from responders
5.8 Demonstrate the ability to anticipate potential for escalation and perform status checks to determine scene and responder safety
5.9 Demonstrate the ability to evaluate and synthesize information, relay updates and broadcast BOLO (Be On the Look-Out) and Attempt to Locate information to responders, supervisors, and other resources as appropriate
5.10 Demonstrate comprehension of Agency notification guidelines and the ability to apply those guidelines to daily operations and special events in order to complete active incidents
5.11 Demonstrate the ability to coordinate interdepartmental activities as required.
5.12 Demonstrate the ability to activate Agency defined mutual aid procedures
5.13 Demonstrate the ability to identify and relay pertinent shift activities to a relief dispatcher at shift or position change
5.14 Demonstrate the ability to coordinate assigned radio channels
5.15 Demonstrate the ability to acknowledge radio traffic in accordance with Agency requirements.
5.16 Demonstrate the ability to synthesize all available information to identify conditions that may affect public and responder safety
5.17 Demonstrate the ability to accurately document all incident information including but not limited to incident urgency details, establish call priority and appropriately label call types
5.18 Demonstrate the ability to manage challenging callers including but not limited to communications impaired callers and callers with limited English language proficiency
5.19 Demonstrate the ability to verify, document and relay initial dispatch information and provide updates as necessary to process calls for service
5.20 Demonstrate the ability to provide callers with any agency approved pre-arrival instructions and inform callers of actions being taken to respond to the requests for service
5.21 Demonstrate the ability to complete telephone reports, provide appropriate referrals, transfer and terminate calls or
place outgoing calls in accordance with agency policy

Committee Identified Academic Skills
The technical committee has identified that the following academic skills are embedded in this contest.

Math Skills
- Measure angles
- Apply transformations (rotate or turn, reflect or flip, translate or slide, and dilate or scale) to geometric figures
- Construct three-dimensional models
- Organize and describe data using matrixes
- Find arc length and the area of a sector

Science Skills

Language Arts Skills
- Provide information in conversations and in group discussions
- Provide information in oral presentations
- Demonstrate use of verbal communication skills, such as word choice, pitch, feeling, tone and voice
- Demonstrate use of nonverbal communication skills, such as eye contact, posture and gestures using interviewing techniques to gain information
- Demonstrate comprehension of a variety of informational texts
- Use text structures to aid comprehension
- Organize and synthesize information for use in written and oral presentations
- Demonstrate knowledge of appropriate reference materials
- Use print, electronic databases and online resources to access information in books and articles
- Demonstrate narrative writing
- Demonstrate informational writing
- Edit writing for correct grammar, capitalization, punctuation, spelling, sentence structure and paragraphing

Connections to National Standards
State-level academic curriculum specialists identified the following connections to national academic standards.

Math Standards
- Geometry
- Measurement
- Data analysis and probability
- Problem solving
- Communication
- Connections
- Representation

Source: NCTM Principles and Standards for School Mathematics. To view high school standards, visit: standards.nctm.org/document/chapter7/index.htm/
Select “Standards” from menu.

Science Standards
- Understands biological evolution and the diversity of life
- Understands the nature of scientific knowledge
- Understands the nature of scientific inquiry

Source: McREL compendium of national science standards. To view and search the compendium, visit www.mcrel.org/standards-benchmarks/.

Language Arts Standards
- Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
- Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language and genre to create, critique and discuss print and nonprint texts
- Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their
discoveries in ways that suit their purpose and audience

- Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information)

Source: IRA/NCTE Standards for the English Language Arts. To view the standards, visit:
Industrial Maintenance  
(Demonstration Contest)

Purpose
To evaluate each team’s preparation for employment and to recognize outstanding students for excellence and professionalism in the field of Industrial Maintenance Technology. First, refer to General Regulations, Page 9.

Clothing Requirements
Official khaki work shirt and pants, black or brown leather work shoes, and safety glasses with side shields or goggles. (Prescription glasses can be used only if they are equipped with side shields. If not, they must be covered with goggles.)

These regulations refer to clothing items that are pictured and described at: www.skillsusastore.org. If you have questions about clothing or other logo items, call 800-401-1560 or 703-956-3723.

Note: Contestants must wear their official contest clothing to the contest orientation meeting.

Eligibility
Open to active SkillsUSA members enrolled in Industrial Maintenance technology programs as the occupational objective. Where this program is not yet available, students may compete if they are enrolled in a course of study that includes, industrial electricity, fluid power technology, programmable controls (PLC) technology or industrial automation programs and Mechatronics.

Equipment and Materials
1. Supplied by the technical committee:
   a. All specialized tools, materials and equipment needed to compete in contest
   b. All wires and hook up leads

2. Supplied by contestants:
   a. Tool box or tool pouch and belt
   b. Digital multimeter and test leads. (Probes are required, and alligator test leads may be useful as well. The device should be capable of checking continuity, measuring resistance, AC and DC voltage up to 300 Volts AC and 100 volts DC, and AC/DC current up to 10A)
   c. Hand held solid-state oscilloscope (Extech model 381295A or equivalent)
   d. Set of Phillips screwdrivers
   e. Set of slotted screwdrivers
   f. Allen (hex key) wrench set in both metric and English sizes
   g. Needle nose pliers
   h. Three each — clean cloth (wiping) shop towels
   i. Two sharpened pencils
   j. Hard Hat
   k. Leather Palm gloves
   l. Lock out tags
   m. Hand-held calculator
   n. Notepad
   o. All competitors must create a one-page résumé using a word processor and submit the résumé electronically at: www.skillsusa.org/compete/
updates.shtml. Check the Web site for further instructions.
Scope of the Contest

This career is a career and educational discipline that combines the industrial skills of mechanics, electronics and computer-based controls with a team-oriented approach to problem solving and troubleshooting. Skilled Industrial Maintenance technicians are required for the maintenance, repair and operation of modern industrial manufacturing systems.

Knowledge Performance
The contest will include a 10- to 50-question written knowledge exam assessing general knowledge of Industrial Maintenance technology. Questions pertaining to mechanics, industrial electricity, industrial electronics, fluid power systems (pneumatic and hydraulic), and programmable controllers will be included.

Skill Performance
The contest includes multiple troubleshooting of mechanical and electrical systems. Teams of two contestants, in a timed event, will accurately and neatly perform system troubleshooting and repair faulty mechanical and electrical systems. In this event, general interdisciplinary knowledge of the individual technologies and their applications will be assessed from the basic skills of blue print reading, mechanical measurement and quality control, lubrication, mathematics, as well as complex electromechanical systems.

Contest Guidelines
1. The contest will be a team-oriented event. Teams will consist of two contestants from the same school in the same division.
2. The contest will consist of various tasks selected from the following list of standards and competencies as determined by the SkillsUSA Championships technical committee. Committee membership includes Intelitek USA, Learning labs inc., Teaching systems Inc.
3. Teams can freely choose who does each task(s) separately or together.
4. Contestants will be rotated through identical stations with time limits determined by the national technical committee.
5. The judging criteria and the points assigned will be determined by the difficulty of the task assigned.
6. The stations will assess the team’s ability to effectively communicate the operation and behavior of electromechanical systems or sub-systems, diagnose and trouble shoot malfunctioning systems, and to analyze a circuit diagrams.
7. Contestants will be tested on familiarity with Standard Safety practices using lock out tag out, ISO symbols, interpretation of relationships between components, and ability to develop sequential operations.

Standards and Competencies

INDUST 1.0 – Basic Math for Maintenance Technicians
Solve problems using fractions and decimals
Solve measurement problems using both English and metric units
Perform geometric and trigonometric calculations

INDUST 2.0 – Advanced Math for Maintenance Technicians
2.1 Solve problems using measurement conversions
2.2 Solve problems using formulas
2.3 Perform math functions with a calculator
2.4 Solve in-plant applications problems requiring math skills

INDUST 3.0 – Safety:
3.1 Define lockout/tagout terms
3.2 Conduct energy control analysis
3.3 Perform lockout/tagout procedure
3.4 Perform lockout/tagout release

INDUST 4.0 – Mechanical Blueprint Reading for Maintenance Technicians
4.1 Identify lines and read views
4.2 Locate and read print dimensions
4.3 Determine tolerances
4.4 Read geometric dimensions and wear limits
4.5 Read assembly drawings and plot plans
4.6 Read welding symbols

INDUST 5.0 – Hand and Power Tools
5.1 Identify hand tools
5.2 Hand tool safety
5.3 Select hand tools for specific tasks
5.4 Identify power tools
5.5 Power tool safety
5.6 Select power tools for specific tasks

INDUST 6.0 – Mechanical Measurement and Quality Control
6.1 Measure mechanical component features with dial caliper
6.2 Measure mechanical component features with micrometer

INDUST 7.0 – Mechanical Systems: Belt Drive Systems
7.1 Install single belt drive
7.2 Laser align single belt drive
7.3 Tension single belt drive
7.4 Measure belt drive speed

INDUST 8.0 – Mechanical Systems: Gear Drives
8.1 Install and align spur gear drive
8.2 Measure axial run out and gear backlash
8.3 Troubleshoot gear drive

INDUST 9.0 – Industrial Power Electronics
9.1 Set-up and operate an oscilloscope
9.2 Measure AC voltage and frequency and DC voltage using an oscilloscope
9.3 Measure AC/DC voltage and current using a Digital Multi-meter
9.4 Perform continuity tests and test grounds
9.5 Troubleshoot DC power supply
9.6 Troubleshoot SCR motor Drive

INDUST 10.0 – Electrical Control Systems: Troubleshoot Electric Motors and Electro-magnetic starters
10.1 Troubleshoot capacitor-start motors
10.2 Troubleshoot three-phase motor
10.3 Test motor with adjustable motor load
10.4 Troubleshoot three-phase motor control circuit

INDUST 11.0 - Electrical Control Automated Systems: Troubleshoot Industrial Control Circuit
11.1 Troubleshoot control system pilot device
11.2 Troubleshoot time delay relay circuit
11.3 Troubleshoot PLC control system circuit

**Contest Scorecard**

<table>
<thead>
<tr>
<th>Items Evaluated/ Maximum Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Test 100</td>
</tr>
<tr>
<td>Safety and basic skills 100</td>
</tr>
<tr>
<td>Mechanical skills station 200</td>
</tr>
<tr>
<td>Basic electrical systems 200</td>
</tr>
<tr>
<td>Electronic systems 200</td>
</tr>
<tr>
<td>Motor Control and Automated System 200</td>
</tr>
</tbody>
</table>

**TOTAL 1000**
INFORMATION SECURITY (INFOSEC) (DEMONSTRATION CONTEST)

PURPOSE
To purpose of this event is to evaluate each contestant’s preparation for employment and to recognize outstanding students for excellence and professionalism in the field of Information Security (InfoSec).

First, refer to General Regulations, Page 9.

CLOTHING REQUIREMENT
For men: Official SkillsUSA white polo shirt with black dress slacks, black socks and black leather shoes.
For women: Official SkillsUSA white polo shirt with black dress slacks or skirt, black socks or black or skin-tone seamless hose and black leather shoes. All: Safety glasses with side shields or goggles. (Prescription glasses can be used only if they are equipped with side shields. If not, they must be covered with goggles.) These regulations refer to clothing items that are pictured and described at: www.skillsusastore.org. If you have questions about clothing or other logo items, call 800-401-1560 or 703-956-3723.

Note: Contestants must wear their official contest clothing to the contest orientation meeting.

ELIGIBILITY
Open to all active SkillsUSA members enrolled in a computer networking training program with Information Security (InfoSec) as the occupational goal.

EQUIPMENT AND MATERIALS
1. Supplied by the technical committee:
   a. Computer workstation for the written portion of the contest.
   b. Routers, Security Appliances, Servers and cabling
2. Supplied by contestant:
   a. All competitors must create a one-page résumé using a word processor and submit the résumé electronically at: www.skillsusa.org/compete/updates.shtml. Check the Website for further instruction.
   b. Laptop computer with Ethernet connection and COM port and wireless connection

SCOPE OF THE CONTEST
The contest is defined by industry standards as set by the current industry technical standards. The contest will consist of three parts: a design problem, an online written test and a hands-on evaluation.

Knowledge Performance
The contest will include an online written knowledge exam assessing knowledge of general InfoSec concepts.

Skill Performance
The contest includes a design problem and a hands-on evaluation to assess the student’s skill performance.

Design Problem
The purpose of the InfoSec design problem is to test a student’s ability to design a network with functionality, confidentiality, data integrity, and availability. The problem will also include risk assessment, demonstration of knowledge and ability to develop policies and procedures and threat abatement. The Center for System Security and Information Assurance (CSSIA) will design the problem annually.

Hands-on Evaluation
The purpose of the hands-on component of the contest will be to test a contestant’s ability to design, install, troubleshoot, and maintain a secure network infrastructure and critical information systems. Given a logical topology, networking equipment and a list of required services, students must, in a finite amount of time, install and secure both critical systems and the network infrastructure that meets or exceeds the documentation provided. Contestants will be provided several systems and devices that must be configured, interconnected and hardened in order to provide a functional enterprise network. This network will then be actively scanned by a judging team. The contestants will have time (determined by the judges) to harden systems before the scanning occurs. The network will be monitored for critical services after a predefined amount of setup time. The vision and context is that client companies and customers would request particular Internet services. The services will be tested and scored based on availability, confidentiality and level of service.
Standards and Competencies

1.0 General Security Concepts

- Recognize and be able to differentiate and explain the following access control models: MAC, DAC, RBAC
- Recognize and be able to differentiate and explain the following methods of authentication: Kerberos, CHAP, Certificates, Username / Password, Tokens, Multi-factor, Mutual, Biometrics
- Identify non-essential services and protocols and know what actions to take to reduce the risks of those services and protocols.
- Recognize the following attacks and specify the appropriate actions to take to mitigate vulnerability and risk: DOS / DDoS (Denial of Service), Back Door, Spoofing, Man in the Middle, Replay, TCP/IP Hijacking, Weak Keys, Mathematical, Social Engineering, Birthday, Password Guessing, Brute Force, Dictionary, Software Exploitation
- Recognize the following types of malicious code and specify the appropriate actions to take to mitigate vulnerability and risk: Viruses, Trojan Horses, Logic Bombs, Worms
- Understand the concept of and know how to reduce the risks of social engineering
- Understand the concept and significance of auditing, logging and system scanning.

2.0 Communication Security

- Recognize and understand the administration of the following types of remote access technologies: 802.1x, VPN (Virtual Private Network), RADIUS (Remote Authentication Dial-In User Service), TACACS (Terminal Access Controller Access Control System), L2TP / PPTP (Layer Two Tunneling Protocol / Point to Point Tunneling Protocol), SSH (Secure Shell), IPSEC (Internet Protocol Security), Vulnerabilities
- Recognize and understand the administration of the following email security concepts: S/MIME (Secure Multipurpose Internet Mail Extensions), PGP (Pretty Good Privacy) like technologies, Vulnerabilities, SPAM, Hoaxes
- Recognize and understand the administration of the following Internet security concepts: SSL / TLS (Secure Sockets Layer / Transport Layer Security), HTTP / S (Hypertext Transfer Protocol over Secure Sockets Layer)

3.0 Infrastructure Security

- Understand security concerns and concepts of the following types of devices: Firewalls, Routers, Switches, Wireless, Modems, RAS (Remote Access Server), Telecom / PBX (Private Branch Exchange), VPN (Virtual Private Network), IDS (Intrusion Detection System), Network Monitoring / Diagnostics, Workstations, Servers, Mobile Devices
- Understand the security concerns for the following types of media: Coaxial Cable, UTP / STP (Unshielded Twisted Pair / Shielded Twisted Pair), Fiber Optic Cable, Removable Media, Tape, CD-R (Recordable Compact Disks), Hard Drives, Diskettes, Flashcards, Smartcards
- Understand the concepts behind the following kinds of Security Topologies: Security Zones, DMZ (Demilitarized Zone), Intranet, Extranet, VLANs (Virtual Local Area Network), NAT (Network Address Translation), Tunneling
- Differentiate the following types of intrusion detection, be able to explain the concepts of each type and understand the implementation and configuration of each kind of intrusion detection system: Network Based, Active Detection, Passive Detection, Host Based, Active Detection, Passive Detection, Honey Pots, Incident Response
- Understand the following concepts of Security Baselines, be able to explain what a Security Baseline is, and understand the implementation and configuration of each kind of intrusion detection system: OS / NOS (Operating System /
Network Operating System) Hardening, File System, Updates (Hotfixes, Service Packs, Patches), Network Hardening, Updates (Firmware), Configuration, Enabling and Disabling Services and Protocols, Access Control Lists, Application Hardening, Updates (Hotfixes, Service Packs, Patches), Web Servers, E-mail Servers, FTP (File Transfer Protocol) Servers, DNS (Domain Name Service) Servers, NNTP (Network News Transfer Protocol) Servers, File / Print Servers, DHCP (Dynamic Host Configuration Protocol) Servers, Data Repositories, Directory Services, Databases.

4.0 Basics of Cryptography

- Be able to identify and explain the different kinds of cryptographic algorithms: Hashing, Symmetric, Asymmetric
- Understand how cryptography addresses the following security concepts: Confidentiality, Integrity, Digital Signatures, Authentication, Non-Repudiation, Digital Signatures, Access Control Protocols
- Understand and be able to explain the following concepts of PKI (Public Key Infrastructure): Certificates, Certificate Policies, Certificate Practice Statements, Revocation, Trust Models
- Identify and be able to differentiate different cryptographic standards and protocols
- Understand and be able to explain the following concepts of Key Management and Certificate Lifecycles: Centralized vs. Decentralized, Storage, Hardware vs. Software, Private Key Protection, Escrow, Expiration, Revocation, Status Checking, Suspension, Status Checking, Recovery, M-of-N Control (Of M appropriate individuals, N must be present to authorize recovery), Renewal, Destruction, Key Usage, Multiple Key Pairs (Single, Dual)

5.0 Operational / Access Security

- Understand the application of the following concepts of physical security: Access Control, Physical Barriers, Biometrics, Social Engineering, Environment, Wireless Cells, Location, Shielding, Fire Suppression
- Understand the security implications of the following topics of disaster recovery: Backups, Off Site Storage, Secure Recovery, Alternate Sites, Disaster Recovery Plan
- Understand the security implications of the following topics of business continuity: Utilities, High Availability / Fault Tolerance, Backups
- Understand the concepts and uses of the following types of policies and procedures: Security Policy, Acceptable Use, Due Care, Privacy, Separation of Duties, Need to Know, Password Management, q SLAs (Service Level Agreements), Disposal / Destruction, HR (Human Resources) Policy, Termination (Adding and revoking passwords and privileges, etc.), Hiring (Adding and revoking passwords and privileges, etc.), Code of Ethics, Incident Response Policy
- Explain the following concepts of privilege management: User / Group / Role Management, Single Sign-on, Centralized vs. Decentralized, Auditing (Privilege, Usage, Escalation), MAC / DAC / RBAC (Mandatory Access Control / Discretionary Access Control / Role Based Access Control)
- Understand the concepts of the following topics of forensics: Chain of Custody, Preservation of Evidence, and Collection of Evidence.
- Understand and be able to explain the following concepts of risk identification: Asset Identification, Risk Assessment, Threat Identification, Vulnerabilities
- Understand the security relevance of the education and training of end users, executives and human resources
- Understand and explain the following documentation concepts: Standards and Guidelines, Systems Architecture, Change Documentation, Logs and Inventories, Classification, Notification, Retention / Storage, Destruction
Committee Identified Academic Skills
The technical committee has identified that the following academic skills are embedded in this contest.

Math Skills
- Use fractions to solve practical problems
- Use proportions and ratios to solve practical problems
- Use scientific notation
- Solve practical problems involving percents
- Solve single variable algebraic expressions
- Find surface area and perimeter of two-dimensional objects
- Make predictions using knowledge of probability
- Make comparisons, predictions, and inferences using graphs and charts
- Organize and describe data using matrices
- Solve problems using proportions, formulas and functions
- Binary Number Systems
- Boolean Logic functions

Science Skills
- Plan and conduct a scientific investigation
- Describe characteristics of types of matter based on physical and chemical properties
- Understand the modern model of atomic structure
- Use knowledge of classification of elements as metals, metalloids and nonmetals
- Describe phases of matter
- Use knowledge of potential and kinetic energy
- Use knowledge of mechanical, chemical and electrical energy
- Use knowledge of heat, light and sound energy
- Use knowledge of sound and technological applications of sound waves
- Use knowledge of the nature and technological applications of light
- Use knowledge of principles of electricity and magnetism
- Use knowledge of static electricity, current electricity and circuits

Language Arts Skills
- Provide information in oral presentations
- Demonstrate use of verbal communication skills, such as word choice, pitch, feeling, tone and voice
- Demonstrate use of nonverbal communication skills, such as eye contact, posture and gestures using interviewing techniques to gain information
- Demonstrate comprehension of a variety of informational texts
- Understand source, viewpoint and purpose of texts
- Demonstrate knowledge of appropriate reference materials
- Use print, electronic databases and online resources to access information in books and articles
- Demonstrate informational writing
- Connections to National Standards
- State-level academic curriculum specialists identified the following connections to national academic standards
Connections to National Standards

State-level academic curriculum specialists identified the following connections to national academic standards.

**Math Standards**
- Numbers and Operations
- Problem Solving
- Reasoning and Proof
- Communication
- Connections
- Representation


**Science Standards**
- Understands the sources and properties of energy
- Understands forces and motion
- Understands the nature of scientific inquiry

*Source*: McREL compendium of national science standards. To view and search the compendium, visit: www.mcrel.org/standards-benchmarks/

**Language Arts Standards**
- Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
- Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
- Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information)

*Source*: IRA/NCTE Standards for the English Language Arts. To view the standards, visit: www.readwritethink.org/standards/index.html.

**CONTEST SCORECARD**

<table>
<thead>
<tr>
<th>Items Evaluated</th>
<th>/Possible Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Risk Assessment</td>
<td>100</td>
</tr>
<tr>
<td>Network Infrastructure &amp; System Hardening</td>
<td>100</td>
</tr>
<tr>
<td>VPN Design and Implementation</td>
<td>200</td>
</tr>
<tr>
<td>Implement Secure Wireless Environment</td>
<td>200</td>
</tr>
<tr>
<td>Network Incident Reporting</td>
<td>100</td>
</tr>
<tr>
<td>Online Written Test</td>
<td>200</td>
</tr>
<tr>
<td>Professionalism (Résumé Cover, Teamwork, Dress, Timesheet)</td>
<td>100</td>
</tr>
</tbody>
</table>

Sub Total 1,000

Résumé Penalty ______

Clothing Penalty ______

Safety Penalty ______

TOTAL ______
SkillsUSA Medical Terminology Test
Post-Secondary (College) Students

Contestant Number ____________

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. Which combining form means white?
   a. cyan/o
   b. erythr/o
   c. leuk/o
   d. melan/o

2. In the term pericardiectomy, the word part -ectomy is a ___.
   a. combining form
   b. prefix
   c. suffix
   d. word root

3. Which prefix means between or among?
   a. inter-
   b. intra-
   c. sub-
   d. supra-

4. Which term means inflammation of a nerve?
   a. neurectomy
   b. neuritis
   c. neuroplasty
   d. neurotomy

5. Which of these suffixes requires the use of the combining vowel?
   a. -algia
   b. -ologist
   c. -osis
   d. -stenosis

6. The term ___ means any pathologic change or disease in the spinal cord or bone marrow.
   a. myelopathy
   b. myelotomy
   c. myopathy
   d. myotomy

7. Which term means pain in the stomach?
   a. gastralgia
   b. gastritis
   c. gastrosis
   d. gastrotomy

8. Which term means the rupture of a muscle?
   a. myoplasty
   b. myorrhaphy
   c. myorrhaxis
   d. myotomy

9. The ___ is part of the hip bone.
   a. iliac
   b. ileum
   c. ileus
   d. ilium

10. Which combining form means fever?
    a. py/o
    b. pyel/o
    c. pyelor/o
    d. pyr/o

11. Which combining form means nerve?
    a. gastr/o
    b. hepato/o
    c. nephr/o
    d. neur/o

12. The processes through which the body maintains a constant internal environment are known as ____.
    a. hematostasis
    b. homeostasis
    c. homestasis
    d. homostasis
13. Which of the following is a characteristic of the anatomic position?
   a. extending the arms upward
   b. bending the knees
   c. standing up straight so the body is erect
   d. turning the palms of the hands toward the back

14. When a recessive gene for a disease is inherited from _____.
   a. both parents, the offspring will have a 50-50 chance of developing that condition
   b. both parents, the offspring will have that condition
   c. only one parent, the offspring will have that condition
   d. only one parent, the offspring will have a 50-50 chance of developing that condition

15. The term _____ is the opposite of anterior.
   a. dorsal  
   b. posterior
   c. superior
   d. ventral

16. The organs of reproduction are protected by the _____ cavity.
   a. abdominal
   b. dorsal  
   c. pelvic
   d. ventral

17. Which term means toward the lower part of the body?
   a. caudal
   b. cephalic
   c. distal
   d. proximal

18. Which term refers to an outbreak of a disease occurring over a large geographic area, possibly worldwide?
   a. endemic
   b. epidemic
   c. geodemic
   d. pandemic

19. Which term means the study of the functions of body structures?
   a. anatomy
   b. cytology
   c. histology
   d. physiology

20. A/An _____ disorder, such as a panic attack, produces symptoms for which no physiological or anatomical cause can be identified.
   a. functional
   b. infectious
   c. idiopathic
   d. organic

21. _____ is a genetic disorder in which an essential digestive enzyme is missing.
   a. Hemophilia
   b. Huntington's disease
   c. Phenylketonuria
   d. Tay-Sachs

22. A genome is _____.
   a. also known as a gamete
   b. made up of 46 chromosomes arranged in 23 pairs
   c. the complete set of an individual's genetic information
   d. the genetic structures located within the nucleus of each cell

23. The ____ is also known as the hip socket.
   a. acetabulum
   b. clavicle
   c. olecranon process
   d. Patella
24. Which bone tissue functions as a fat-storage area and is located in the medullary cavity?
   a. compact
   b. endosteum
   c. red bone marrow
   d. yellow bone marrow

25. Which term describes the surgical repair or replacement of a damaged joint?
   a. arthrodesis
   b. arthrolysis
   c. arthroplasty
   d. arthrotomy

26. The surgical procedure for loosening an ankylosed joint is known as ___.
   a. ankylosis
   b. arthrosis
   c. arthrolysis
   d. spondylolyis

27. Which procedure is the surgical repair of cartilage?
   a. bursectomy
   b. chondroplasty
   c. osteoplasty
   d. synovectomy

28. When a bone is splintered or crushed, this is known as a/an ___.
   a. closed fracture
   b. comminuted fracture
   c. compound fracture
   d. spiral fracture

29. Which bone tissue is hemopoietic?
   a. endosteum
   b. periosteum
   c. red bone marrow
   d. yellow bone marrow

30. Which of the following is the most accurate test for osteoporosis?
   a. bone marrow biopsy
   b. bone scan
   c. dual x-ray absorptiometry
   d. ultrasonic bone density testing

31. ___ is a relatively rare malignant tumor that originates in a bone.
   a. An osteochondroma
   b. A myeloma
   c. Primary bone cancer
   d. Secondary bone cancer

32. The attempted realignment of the bone involved in a fracture or joint dislocation is known as ___.
   a. closed reduction
   b. immobilization
   c. stabilization
   d. traction

33. A/An ___ is a physician who specializes in diagnosing and treating diseases and disorders involving the bones, joints, and muscles.
   a. chiropractor
   b. orthopedic surgeon
   c. osteopath
   d. podiatrist

34. Which condition is a congenital defect in which the spinal canal fails to close around the spinal cord?
   a. hallux valgus
   b. spina bifida
   c. spondylolisthesis
   d. talipes

35. Which motion turns the palm of the hand downward or backward?
   a. abduction
   b. adduction
   c. pronation
   d. supination

36. The term ___ means to bend the foot upward at the ankle.
   a. dorsiextension
   b. dorsiflexion
   c. plantar extension
   d. plantar flexion
37. Which of these muscles is formed from three divisions?
   a. biceps
   b. quadriceps
   c. triceps
   d. uniceps

38. Which term describes an abnormal condition of muscle tone that causes the impairment of voluntary muscle movement?
   a. dystonia
   b. hypertonia
   c. hypotonia
   d. myotonia

39. Which condition is the total paralysis of one side of the body?
   a. hemiparesis
   b. hemiplegia
   c. paraplegia
   d. quadriplegia

40. Which term means abnormally decreased motor function or activity?
   a. bradykinesia
   b. dyskinesia
   c. hyperkinesia
   d. hypokinesia

41. ______ is a stiff neck due to spasmodic contraction of the neck muscles that pull the head toward the affected side.
   a. contracture
   b. intermittent claudication
   c. myasthenia gravis
   d. spasmodic torticollis

42. Which diagnostic test records the strength of muscle contractions?
   a. electrocardiography
   b. electromyography
   c. electroneuromyography
   d. tonometry

43. Which term describes the protrusion of a muscle through its ruptured sheath?
   a. myocoele
   b. myorrhaphy
   c. myorhesis
   d. myotony

44. Which specialist treats diseases and disorders of the blood and blood-forming tissues?
   a. cardiologist
   b. hematologist
   c. histologist
   d. pathologist

45. The ______ are only one cell in thickness and are the smallest blood vessels in the body.
   a. arterioles
   b. capillaries
   c. coronary arteries
   d. venules

46. The condition of having an abnormally slow resting heartbeat is known as ______.
   a. atrial fibrillation
   b. bradycardia
   c. palpitation
   d. tachycardia

47. The highest pressure against the artery walls, which occurs when the ventricles contract, is known as ______.
   a. diastolic pressure
   b. hypertension
   c. prehypertension
   d. systolic pressure

48. The term ______ describes any situation in which the total number of leukocytes in the circulating blood is less than normal.
   a. leukopenia
   b. polycythemia
   c. thrombocytopenia
   d. thrombocytosis

49. Which medication controls irregularities of the heartbeat?
   a. antiarrhythmic
   b. thrombolytic
   c. vasoconstrictor
   d. vasodilator
50. A/An _____, which is designed for use by nonprofessionals, externally shocks the heart to restore a normal cardiac rhythm.
   a. automated external defibrillator  
   b. defibrillator  
   c. implantable cardioverter defibrillator  
   d. pacemaker

51. Which of the following are the smallest formed elements of the blood? These cells play an important role in the clotting of blood.
   a. basophils  
   b. erythrocytes  
   c. monocytes  
   d. thrombocytes

52. A tissue plasminogen activator is administered to _____.
   a. control irregularities of the heartbeat  
   b. dissolve damaging blood clots  
   c. ease the pain of angina pectoris  
   d. reduce the size of an aneurysm

53. A/An _____ is a foreign object, such as a blood clot, that is circulating in the blood.
   a. embolism  
   b. embolus  
   c. thrombosis  
   d. thrombus

54. Acyclovir is an example of a/an _____.
   a. antibiotic  
   b. antifungal  
   c. antiviral  
   d. vaccine

55. Which type of bacteria form chains?
   a. rickettsia  
   b. spirochetes  
   c. staphylococci  
   d. streptococci

56. Which of these autoimmune disorders attacks the digestive system?
   a. Crohn's disease  
   b. Graves' disease  
   c. lupus erythematosus  
   d. multiple sclerosis

57. A _____ is a malignant tumor that arises from connective tissues, including hard tissues, soft tissues, and liquid tissues.
   a. carcinoma  
   b. lymphoma  
   c. melanoma  
   d. sarcoma

58. _____ mark(s) these foreign invaders and attracts phagocytes to destroy these antigens.
   a. Complement  
   b. Interferon  
   c. Lymphocytes  
   d. Plasma cells

59. A/An _____ occurs when the immune response is weakened, reduced, absent, or not functioning properly.
   a. autoimmunity  
   b. immunodeficiency disorder  
   c. immunosuppressant  
   d. transfusion reaction

60. _____ is the general term applied to malignancies affecting lymphoid tissues.
   a. Adenocarcinoma  
   b. Lymphadenitis  
   c. Lymphoma  
   d. Lymphedema

61. Which organ or structure has a major hemolytic function?
   a. bone marrow  
   b. liver  
   c. spleen  
   d. Thymus
62. _____ is a fungal infection.
   a. Candidiasis  
   b. Lyme disease  
   c. Malaria  
   d. Tinea pedis

63. Which of these viral diseases is commonly known as chickenpox?
   a. cytomegalovirus  
   b. herpes zoster  
   c. rubella  
   d. varicella

64. Which term describes the exchange of gases within the cells of all the body organs and tissues?
   a. alveolar exchange  
   b. external respiration  
   c. intercellular exchange  
   d. internal respiration

65. Which diagnostic test measures the oxygen saturation level in the blood?
   a. pulmonary function test  
   b. peak flow meter  
   c. pulse oximeter  
   d. spirometry

66. What structure, commonly known as the Adam's apple, protects the larynx?
   a. epiglottis  
   b. mediastinum  
   c. thyroid cartilage  
   d. trachea

67. A pattern of alternating periods of hypopnea or apnea, followed by hyperpnea is known as _____.
   a. Cheyne-Stokes respiration  
   b. dyspnea  
   c. hyperventilation  
   d. hypoxemia

68. Which upper respiratory bacterial infection is characterized by a paroxysmal cough?
   a. croup  
   b. diphtheria  
   c. influenza  
   d. pertussis

69. The term _____ describes paralysis of the larynx.
   a. dysphonia  
   b. laryngitis  
   c. laryngoplegia  
   d. laryngospasm

70. Which of the following surrounds each lung?
   a. parietal pleura  
   b. pleural cavity  
   c. pleural space  
   d. visceral pleura

71. _____ is the abnormal buildup of carbon dioxide in the blood.
   a. Anoxia  
   b. Hypercapnia  
   c. Hyperpnea  
   d. Hypoxemia

72. In _____ the airways have become inflamed and thickened, and there is an increase in the number and size of mucus-producing cells.
   a. asthma  
   b. chronic bronchitis  
   c. chronic obstructive pulmonary disease  
   d. emphysema

73. A/An _____ is a collection of pus within a body cavity.
   a. empyema  
   b. emphysema  
   c. hemoptysis  
   d. pleural effusion

74. In which condition does a portion of the stomach protrude upward into the chest through an opening in the diaphragm?
   a. esophageal reflux  
   b. esophageal varices  
   c. gastroesophageal reflux disease  
   d. hiatal hernia
75. Which condition is the earliest stage of periodontal disease and only affects the gums?
   a. acute necrotizing ulcerative gingivitis  
   b. bruxism  
   c. dental caries  
   d. gingivitis

76. Which structure secretes bile?
   a. gallbladder  
   b. liver  
   c. pancreas  
   d. spleen

77. The ____ is the ringlike muscle that controls the flow from the stomach to the duodenum of the small intestine.
   a. cardiac sphincter  
   b. ileocecal valve  
   c. pyloric sphincter  
   d. pyloric valve

78. A ____ is a single pouch or sac occurring in the lining or wall of a tubular organ such as the colon.
   a. diverticula  
   b. diverticulitis  
   c. diverticulosis  
   d. diverticulum

79. ____ is the twisting of the intestine on itself that causes an obstruction. This condition usually occurs in infancy.
   a. Inguinal hernia  
   b. Intussusception  
   c. Strangulated hernia  
   d. Volvulus

80. Which term means difficulty in swallowing?
   a. anorexia  
   b. dyspepsia  
   c. dysphagia  
   d. pyrosis

81. A ____ is the surgical fixation of the rectum to an adjacent tissue or organ.
   a. proctectomy  
   b. proctopexy  
   c. proctoplasty  
   d. proctostomy

82. Which surgical procedure is the creation of a connection between two hollow or tubular structures?
   a. anastomosis  
   b. diverticulectomy  
   c. gastric bypass  
   d. ostomy

83. Which term describes the breaking down of body cells or substances?
   a. absorption  
   b. anabolism  
   c. catabolism  
   d. metabolism

84. A/An ____ is an endoscopic procedure that allows direct visualization of the upper GI tract.
   a. esophagogastroduodenoscopy  
   b. esophagoscopy  
   c. gastroscopy  
   d. sigmoidoscopy

85. A bolus is ____.
   a. a mass of fecal material that is ready to be expelled  
   b. a mass of food that has been chewed and is ready to be swallowed  
   c. food as it passes from the stomach to the small intestine  
   d. food in the mouth that is ready to be chewed

86. The symptoms of botulism include ____.
   a. headache, delirium, cough, watery diarrhea, rash, and a high fever  
   b. loose stools, stomach pain, and stomach cramping  
   c. paralysis and sometimes death  
   d. profuse diarrhea, vomiting, and rapid dehydration
87. Which condition involves yellow discoloration of the skin caused by excessive bilirubin in the blood?
   a. cirrhosis
   b. cyanosis
   c. hepatomegaly
   d. jaundice

88. Which term describes pain in the gallbladder?
   a. cholecystalgia
   b. cholecystic
   c. cholecystitis
   d. cholelithiasis

89. ______ is an inflammation of both the renal pelvis and the kidney. This is usually caused by a bacterial infection that has spread upward from the bladder.
   a. Cystitis
   b. Nephritis
   c. Pyelitis
   d. Pyelonephritis

90. Which term describes the outer layer of the kidney?
   a. Bowman's capsule
   b. cortex
   c. medulla
   d. nephron

91. Which sudden onset condition is characterized by uremia?
   a. acute renal failure
   b. chronic renal failure
   c. end-stage renal disease
   d. nephrotic syndrome

92. Which of the following signs is not characteristic of nephrotic syndrome?
   a. edema
   b. hyperproteinuria
   c. hypolipidemia
   d. pyelitis

93. Which condition is a chronic inflammation within the walls of the bladder?
   a. cystalgia
   b. cystodynia
   c. cystitis
   d. interstitial cystitis

94. Which condition is the formation or discharge of pus in the kidney?
   a. hydrenephrosis
   b. nephrolisis
   c. nephroptosis
   d. nephropyrosis

95. Which term describes the presence of abnormally high concentrations of protein in the urine?
   a. hyperlipidemia
   b. hypolipidemia
   c. hyperproteinuria
   d. hypoproteinemia

96. ______ refers to the late stages of chronic renal failure, in which there is irreversible loss of function in both kidneys.
   a. Acute renal failure
   b. End-stage renal disease
   c. Hemolytic uremic syndrome
   d. Uremia

97. The congenital abnormality in which the urethral opening is on the upper surface of the penis is known as
   a. epispadias
   b. hyperspadias
   c. hypospadias
   d. paraspadias

98. Which term describes a radiographic study of the kidneys, ureters, and bladder without the use of a contrast medium?
   a. intravenous urography
   b. IVP
   c. KUB
   d. retrograde urography
99. The complete suppression of urine formation by the kidneys is known as ____.
   a. anuria
   b. diuresis
   c. oliguria
   d. polyuria

100. ____ is an excessive fear of spiders.
   a. Acrophobia
   b. Agoraphobia
   c. Arachnophobia
   d. Claustrophobia

101. A generalized anxiety disorder is characterized by ____.
   a. a person acting sick when he or she is not really sick
   b. exaggerated worry and tension even when there is little or nothing to provoke these feelings
   c. multiple cognitive defects, including memory impairment
   d. persistent, intrusive, excessive worry about multiple topics

102. A ____ is a condition in which an individual acts as if he or she has a physical or mental illness when he or she is not really sick.
   a. conversion disorder
   b. factitious disorder
   c. hypochondriasis
   d. somatoform disorder

103. A/An ____ is administered to temporarily relieve anxiety and to reduce tension.
   a. antipsychotic drug
   b. anxiolytic drug
   c. mood-stabilizing drug
   d. psychotropic drug

104. Which part of the brain is responsible for the highest level of thought?
   a. brainstem
   b. cerebellum
   c. cerebrum
   d. medulla

105. Which structure consists of the medulla, midbrain, and pons?
   a. brainstem
   b. hypothalamus
   c. medulla
   d. pons

106. The inner surface of the skull is lined with ____.
   a. arachnoid membrane
   b. dura mater
   c. meninges
   d. pia mater

107. A/An ____ is a noncancerous growth that develops on the cornea and can become large enough to distort vision.
   a. adnexa
   b. anisocoria
   c. pterygium
   d. synechiae

108. Which term describes the simultaneous inward movement of both eyes toward each other to maintain single binocular vision?
   a. accommodation
   b. convergence
   c. emmetropia
   d. refraction

109. Which term describes a condition in which central vision is lost and peripheral vision may remain?
   a. cataract
   b. glaucoma
   c. macular degeneration
   d. papilledema

110. ____ is a disease in which the amount of fluid in the inner ear increases intermittently, producing attacks of vertigo, a fluctuating hearing loss (usually in one ear), and ringing of the ears.
   a. Eustachitis
   b. Labyrinthitis
   c. Ménière's disease
   d. Tinnitus
111. Which laser treatment is used to reattach a detached retina?
   a. laser iridotomy                      c. laser trabeculoplasty
   b. laser retinopexy                     d. LASIK

112. The ____ is the opaque middle layer of the eyeball.
   a. choroid                           c. retina
   b. conjunctiva                      d. sclera

113. The abbreviation ____ means left eye.
   a. AU                                 c. OS
   b. OD                                d. OU

114. Which term describes the surgical incision of the eardrum to create an opening for the placement of tympanostomy tubes?
   a. myringoplasty                     c. otoplasty
   b. myringotomy                      d. tympanoplasty

115. A ____ test is performed to determine losses in peripheral vision.
   a. refraction                         c. visual acuity
   b. tonometry                          d. visual field testing

116. Which condition is also known as night blindness?
   a. diplopia                          c. monochromatism
   b. nyctalopia                        d. scotoma

117. The partial or complete suturing together of the upper and lower eyelids to provide temporary protection when the eyelids are paralyzed is known as ____.
   a. keratoplasty                    c. tarsorrhaphy
   b. radial keratotomy              d. vitrectomy

118. Which hearing loss is a gradual loss of sensorineural hearing that occurs as the body ages?
   a. conductive                        c. presbyopia
   b. presbycusis                      d. sensorineural

119. The flow of pus from the ear is known as ____.
   a. otalgia                          c. otopyorrhea
   b. otomycosis                       d. otorrhagia

120. ____ is the ankylosis of the bones of the middle ear resulting in a conductive hearing loss.
   a. Labyrinthitis                    c. Otorrhagia
   b. Osteosclerosis                   d. Otosclerosis

121. Which condition is also known as nearsightedness?
   a. ametropia                          c. hyperopia
   b. exotropia                         d. myopia

122. Which term describes a torn or jagged wound, or an accidental cut wound?
   a. contusion                           c. lesion
   b. laceration                         d. Ulcer
123. Which procedure is the replacement of damaged skin with healthy tissue taken from a donor site on the patient's body?
   a. dermatoplasty  
   b. lipectomy  
   c. rhytidectomy  
   d. sclerotherapy

124. Which condition involves tissue death that is usually associated with a loss of circulation?
   a. decubitus ulcer  
   b. gangrene  
   c. necrotizing fasciitis  
   d. purpura

125. Which abnormal sac contains fluid or semisolid material?
   a. abscess  
   b. cyst  
   c. macule  
   d. nodule

126. Which condition is a precancerous skin lesion caused by excessive exposure to the sun?
   a. actinic keratosis  
   b. erythroderma  
   c. folliculitis  
   d. psoriasis

127. The condition known as ____ is excessive sweating in one area or over the whole body.
   a. diaphoresis  
   b. hidrosis  
   c. hyperhidrosis  
   d. malaria

128. Which term means an infestation with head lice?
   a. pediculosis capitis  
   b. pediculosis corporis  
   c. pediculosis pedis  
   d. pediculosis pubis

129. Which anticoagulant substance is released in response to injury?
   a. collagen  
   b. heparin  
   c. histamine  
   d. mast cells

130. Which substance is administered to suppress inflammation and as an immunosuppressant?
   a. anabolic steroids  
   b. cortisone  
   c. cortisol  
   d. thyroid-stimulating hormone

131. Which hormone is produced by the pituitary gland?
   a. adrenocorticotropic hormone  
   b. calcitonin  
   c. cortisol  
   d. epinephrine

132. The ____ hormone stimulates ovulation in the female.
   a. estrogen  
   b. follicle-stimulating  
   c. lactogenic  
   d. luteinizing

133. Which hormone stimulates the conversion of excess glucose to glycogen for storage?
   a. calcitonin  
   b. glucagon  
   c. insulin  
   d. thymosin

134. Which hormones influence some sex-related characteristics?
   a. androgens  
   b. corticosteroids  
   c. growth hormone  
   d. norepinephrine

135. The ____ gland is located near the midline in the anterior portion of the thoracic cavity.
   a. pineal  
   b. pituitary  
   c. thymus  
   d. Thyroid
136. The thymus secretes the hormone _____, which plays an important role in the immune system.
   a. thymosin   c. thyroxine
   b. thyrocalcitonin d. triiodothyronine

137. The autoimmune insulin deficiency disorder caused by the destruction of pancreatic islet beta cells is known as _____.
   a. diabetes insipidus c. type 1 diabetes mellitus
   b. gestational diabetes d. type 2 diabetes mellitus

138. Which hormone stimulates the development of the secondary male sex characteristics?
   a. estrogen c. progesterone
   b. human chorionic gonadotropin d. testosterone

139. A pheochromocytoma is a benign tumor of the _____ that causes the gland to produce excess epinephrine.
   a. adrenal cortex c. pineal gland
   b. adrenal medulla d. posterior lobe of the pituitary gland

140. Which term describes the excessive hunger associated with diabetes insipidus?
   a. dysuria c. polyphagia
   b. polydipsia d. polyuria

141. When the ovum leaves the ovary, it is caught by the _____.
   a. fallopian tube c. oviducts
   b. fimbrae d. uterus

142. The thick fluid that aids the motility of the sperm is secreted by the _____.
   a. Bartholin's glands c. Cowper's glands
   b. bulbourethral glands d. prostate gland

143. The complication of pregnancy that is characterized by convulsions and sometimes coma is known as _____.
   a. eclampsia c. pregnancy-induced hypertension
   b. preeclampsia d. toxemia of pregnancy

144. Which of these sexually transmitted diseases is caused by a virus?
   a. chlamydia c. gonorrhea
   b. genital herpes d. syphilis

145. _____ is an abnormal absence of menstrual periods for 3 or more months.
   a. Amenorrhea c. Oligomenorrhea
   b. Hypomenorrhea d. Polymenorrhea

146. Which condition is a difficult or painful monthly flow?
   a. dysmenorrhea c. menometrorrhagia
   b. hypermenorrhea d. premenstrual dysphoric disorder

147. The condition known as _____ is characterized by severe itching of the external female genitalia.
   a. leukorrhea c. pruritus vulvae
   b. perineurium pruritis d. vaginal candidiasis

148. Which diagnostic test is based on a specimen that is obtained between the 8th and 10th weeks of pregnancy?
   a. amniocentesis c. endometrial biopsy
   b. chorionic villus sampling d. fetal monitoring
149. Which procedure is performed to facilitate a vaginal delivery?
   a. cesarean section  
   b. conization  
   c. episiorrhaphy  
   d. episiotomy

150. The condition ____, where the ovaries cease functioning before the age of 40, is due to disease, a hormonal disorder, or surgical removal.
   a. menarche  
   b. menopause  
   c. perimenopause  
   d. premature menopause

151. Torsion of the testis is ____.
   a. a fluid-filled sac in the scrotum along the spermatic cord  
   b. a knot of varicose veins on one side of the scrotum  
   c. cancer of the testis  
   d. pain caused by the twisting of the vas deferens and the blood vessels leading into the testis

152. A woman who has given birth two or more times is known as ____.
   a. a gravida II  
   b. multiparous  
   c. a nulligravida  
   d. postpartum

153. ____ is the presence of the protein albumin in the urine and is a sign of impaired kidney function.
   a. Albuminuria  
   b. Calciuria  
   c. Glycosuria  
   d. Hematuria

154. ____ means listening for sounds within the body, and it is usually performed through a stethoscope.
   a. Auscultation  
   b. Palpation  
   c. Palpitation  
   d. Percussion

155. Which term reflects the amount of wastes, minerals, and solids in the urine?
   a. acetone  
   b. calcitria  
   c. specific gravity  
   d. urochrome

156. Which term describes a very low body temperature?
   a. afebrile  
   b. hyperthermia  
   c. hypothermia  
   d. hypothermic

157. A ____ is an abnormal rattle or cracklelike respiratory sound heard during inspiration (breathing in).
   a. bruit  
   b. rale  
   c. rhonchus  
   d. stridor

158. A/An ____ is the result of medical treatment that yields the exact opposite of normally expected results.
   a. adverse drug reaction  
   b. idiosyncratic reaction  
   c. paradoxical drug reaction  
   d. synergistic response

159. An elevated ____ indicates the presence of inflammation in the body.
   a. blood urea nitrogen  
   b. erythrocyte sedimentation rate  
   c. platelet count  
   d. total hemoglobin test

160. A/An ____ reaction is an undesirable reaction that accompanies the principal response for which the drug was taken.
   a. adverse  
   b. idiosyncratic  
   c. palliative  
   d. Placebo
161. Which type of fracture is associated with osteoporosis?
   a. Colles' fracture
   b. oblique fracture
   c. spiral fracture
   d. transverse fracture

162. Which procedure is performed to affix sagging breasts in a more elevated position?
   a. breast augmentation
   b. breast reduction
   c. mammoplasty
   d. mastopexy

163. ______ is an autoimmune disorder that causes well-defined bald areas on the scalp or elsewhere on the body.
   a. Alopecia areata
   b. Alopecia universalis
   c. Hirsutism
   d. Male-pattern baldness

164. Which condition is a degenerative disease of the liver?
   a. cirrhosis
   b. hepatomegaly
   c. hepatitis
   d. jaundice

165. Which type of skin cancer occurs in the melanocytes?
   a. actinic keratosis
   b. basal cell carcinoma
   c. malignant melanoma
   d. squamous cell carcinoma

166. The term ______ describes the simultaneous inward movement of both eyes toward each other.
   a. astigmatism
   b. convergence
   c. nystagmus
   d. strabismus

167. A/An ______ is a localized balloon-like enlargement of an artery.
   a. aneurysm
   b. arteriostenosis
   c. embolus
   d. thrombus

168. Which condition is an inflammation of the tissues surrounding the brain?
   a. encephalitis
   b. encephalomeningitis
   c. meningitis
   d. poliomyelitis

169. ______ is a surgical puncture of the joint space to remove synovial fluid.
   a. Abdominocentesis
   b. Amniocentesis
   c. Arthrocentesis
   d. Arthroscopy

170. The blockage of a blood vessel by a foreign object circulating in the blood is known as a/an ______.
   a. embolism
   b. embolus
   c. thrombosis
   d. thrombus

171. The condition known as ______ is characterized by hypertension, edema, and proteinuria.
   a. abruptio placenta
   b. eclampsia
   c. placenta previa
   d. preeclampsia

172. A/An ______ is a surgical procedure to create an opening between an organ and the body surface.
   a. anastomosis
   b. diverticulectomy
   c. gastric bypass
   d. ostomy

173. Which condition is an accumulation of pus in the pleural cavity?
   a. atelectasis
   b. empyema
   c. pneumothorax
   d. Pyoderma
174. A/an ____ is a flat, persistent, dark red birthmark made of pigmented cells.
   a. ecchymosis  
   b. hematoma  
   c. port-wine stain  
   d. strawberry hemangioma

175. ____ is a gradually progressive condition in which the macula is damaged.
   a. Amblyopia  
   b. Hemianopia  
   c. Macular degeneration  
   d. Scotoma

176. Which term describes an excessive sensitivity to stimuli?
   a. causalgia  
   b. hyperesthesia  
   c. paresthesia  
   d. peripheral neuropathy

177. Which imaging system combines tomography with radionuclide tracers?
   a. fluoroscopy  
   b. magnetic resonance imaging  
   c. positron emission tomography  
   d. ultrasonography

178. Which procedure is used in the treatment of spider veins?
   a. dermatoplasty  
   b. lipectomy  
   c. rhytidectomy  
   d. sclerotherapy

179. Which condition is characterized by binge eating?
   a. aerophagia  
   b. anorexia nervosa  
   c. borborygmus  
   d. bulimia nervosa

180. ____ is the study of the human factors that affect the design and operation of tools and the work environment.
   a. Ergonomics  
   b. Kinesiology  
   c. Myology  
   d. Physiology

181. A percutaneous nephrolithotomy is the ____.
   a. endoscopic surgical repair of a kidney  
   b. endoscopic placement of a donor kidney  
   c. removal of a kidney stone with a nephroscope  
   d. use of sound waves to crush a kidney stone

182. ____ is the condition of having abnormally high concentrations of calcium in the blood.
   a. Hypercalcemia  
   b. Hypocalcemia  
   c. Hyperthyroidism  
   d. Hypothyroidism

183. The term ____ means any interruption of breathing that may result in death.
   a. anoxia  
   b. asphyxiation  
   c. cyanosis  
   d. hypercapnia

184. ____ originates as a malignant tumor of the thin, scaly squamous cells of the epithelium; however, it can quickly spread to other body systems.
   a. Actinic keratosis  
   b. Basal cell carcinoma  
   c. Malignant melanoma  
   d. Squamous cell carcinoma

185. Which of these diseases is caused by pathogenic yeast?
   a. candidiasis  
   b. malaria  
   c. rubella  
   d. syphilis

186. Rocky Mountain spotted fever is caused by a ____.
   a. rickettsia  
   b. spirochete  
   c. staphylococcus  
   d. virus
187. The term ___ describes drooping of the upper eyelid.
   a. blepharoptosis
   b. scleritis
   c. synechia
   d. uveitis

188. Which condition is also commonly known as farsightedness?
   a. exotropia
   b. hyperopia
   c. myopia
   d. nyctalopia

189. A ___ is an abnormal sound due to a partially blocked, narrowed, or diseased artery that is heard during auscultation of an artery.
   a. bruit
   b. rale
   c. rhonchus
   d. stridor

190. The transition phase between regular menstrual periods and no periods at all is known as ___.
   a. menarche
   b. menopause
   c. perimenopause
   d. puberty

191. Which of the following is a hospital-acquired infection?
   a. iatrogenic
   b. idiopathic
   c. nosocomial
   d. somatic

192. The specialized form of milk produced by the mammary glands immediately after birth is ___.
   a. colostrum
   b. vernix
   c. meconium
   d. lochia

193. Which condition is commonly known as a clubfoot?
   a. hallux valgus
   b. lordosis
   c. talipes
   d. scoliosis

194. The medical term for the condition is commonly known as low back pain is ___.
   a. kyphosis
   b. lumbago
   c. scoliosis
   d. spondylolisthesis

195. The hormone ___ works with the parathyroid hormone to regulate calcium levels in the blood and tissues.
   a. aldosterone
   b. calcitonin
   c. glucagon
   d. luteotropin

196. The term ___ describes the absence of urine formation by the kidneys.
   a. anoxia
   b. anuria
   c. aphasia
   d. aplasia

197. Which hearing condition is associated with aging?
   a. nystagmus
   b. presbycusis
   c. presbyopia
   d. vertigo

198. Which term describes abnormally frequent menstruation?
   a. ammenorrhea
   b. hypomenorrhea
   c. oligomenorrhea
   d. polymenorrhea

199. The term ___ means abnormally decreased motor function or activity.
   a. bradykinesia
   b. dyskinesia
   c. hyperkinesia
   d. Hypokinesia
200. Which condition is commonly known as hiccups?
   a. intermittent claudication  
   b. spina bifida  
   c. singultus  
   d. syncope

201. A pathologic change of the tissues due to disease or injury is known as a/an _____.
   a. fissure  
   b. fistula  
   c. laceration  
   d. lesion

202. The medical term for heartburn is ____. 
   a. paresthesia  
   b. pruritis  
   c. purulent  
   d. pyrosis

203. The term ____ means a change in the structure of cells and in their orientation to each other.
   a. anaplasia  
   b. aplasia  
   c. carcinoma  
   d. sarcoma

204. Which condition is the loss of transparency of the lens of the eye?
   a. cataracts  
   b. glaucoma  
   c. macular degeneration  
   d. retinopathy

205. A/An ____ is a band of fibrous tissues that holds structures together abnormally.
   a. adhesion  
   b. claudication  
   c. contracture  
   d. stricture

206. ____ is the death of bone tissue caused by an insufficient blood supply, infection, malignancy, or trauma.
   a. Osteoclasia  
   b. Osteolysis  
   c. Osteonecrosis  
   d. Osteosarcoma

207. Which condition is caused by greater-than-normal amounts of bilirubin in the blood?
   a. ascites  
   b. cirrhosis  
   c. hepatitis  
   d. jaundice

208. Which term means harmful, tending to spread, becoming progressively worse, and life threatening?
   a. benign  
   b. congenital  
   c. hereditary  
   d. malignant

209. The medical term for the condition commonly known as swollen glands is _____.
   a. lymphangitis  
   b. lymphedema  
   c. lymphadenitis  
   d. lymphoma

210. ____ is an excessive discharge of mucus from the bronchi.
   a. Bronchitis  
   b. Bronchiectasis  
   c. Bronchorrhagia  
   d. Bronchorrhea

211. Which condition is the hardening of arteries due to a buildup of cholesterol plaque?
   a. arterionecrosis  
   b. arteriostenosis  
   c. arthrosclerosis  
   d. atherosclerosis

212. Which term means pain or discomfort in digestion?
   a. dyspepsia  
   b. dysphagia  
   c. dyspnea  
   d. Pyrosis
213. The surgical removal of the membrane that lines the interior of a joint is known as a _____.
   a. chondrectomy  
   b. diskectomy  
   c. laminectomy  
   d. synovectomy

214. Which term means abnormal softening of cartilage?
   a. chondritis  
   b. chondromalacia  
   c. chondroma  
   d. osteochondroma

215. Which condition is a malignant tumor derived from muscle tissue?
   a. myeloma  
   b. myelosis  
   c. myoma  
   d. myosarcoma

216. The medical term describing an abnormal enlargement of the heart is _____.
   a. carditis  
   b. cardiomalacia  
   c. cardiomegaly  
   d. cardiolsclerosis

217. The term _____ describes a prediction of the probable course and outcome of a disorder.
   a. differential diagnosis  
   b. prognosis  
   c. remission  
   d. syndrome

218. A/an _____ is a surgical incision into the chest wall.
   a. thoracostomy  
   b. thoracotomy  
   c. tracheostomy  
   d. tracheotomy

219. Which region of the thorax and abdomen is located below the stomach?
   a. epigastric  
   b. hypochondriac  
   c. hypogastric  
   d. umbilical

220. Tuberculosis is spread by _____ transmission.
   a. airborne  
   b. bloodborne  
   c. contact  
   d. waterborne

221. Which term describes the study of the functions of the structures of the body?
   a. anatomy  
   b. histology  
   c. pathology  
   d. physiology

222. A _____ is a plant or animal that lives on or within another living organism at the expense of that organism.
   a. pathogen  
   b. spirochete  
   c. parasite  
   d. macrophage

223. Which term describes the new site that is formed when a cancer spreads?
   a. metastases  
   b. metastasis  
   c. metastasize  
   d. metastasized

224. The process of building up of body cells and substances from nutrients is known as _____.
   a. anabolism  
   b. catabolism  
   c. digestion  
   d. metabolism

225. Which term describes an abnormal condition of muscle tone that causes the impairment of voluntary muscle movement?
   a. dystonia  
   b. hypertonia  
   c. hypotonia  
   d. myotonia
Completion
Complete each statement.

226. The screening of patients to determine their priority of need and the proper place of medical treatment is called ____________________.

227. The enlargement in the bulk of an organ that is not due to tumor formation is known as ____________________.

228. A/An ____________________ is also known as a clot-busting drug.

229. A fast heartbeat of sudden onset is known as paroxysmal ____________________.

230. A/An ____________________ is a physician specializing in diagnosing and treating malignant disorders such as tumors and cancer.

231. A lymph node ____________________ is a surgical procedure in which all of the lymph nodes in a major group are removed to determine or slow the spread of cancer.

232. Rod-shaped, spore-forming bacteria, such as those that cause tetanus, are known as ____________________.

233. ____________________ is the condition characterized by the progressive loss of lung function due to a decrease in the total number of alveoli, the enlargement of the remaining alveoli, and the progressive destruction of their walls.

234. A bluish discoloration of the skin caused by a lack of adequate oxygen is known as ____________________.

235. A/An ____________________ is a contraction of the smooth muscle in the walls of the bronchi and bronchioles that tighten and squeeze the airway shut.

236. ____________________ is a progressive degenerative disease of the liver that is often caused by excessive alcohol use or by viral hepatitis B or C.

237. The condition of an abnormal enlargement of the liver is ____________________.

238. The freeing of a kidney from adhesions is known as ____________________.

239. A/An ____________________ accident (CVA) is damage to the brain that occurs when the blood flow to the brain is disrupted because a blood vessel is either blocked or has ruptured.

240. A/An ____________________ is a pus-filled lesion on the eyelid resulting from an infection in a sebaceous gland.

241. The surgical removal of the stapes of the middle ear is a/an ____________________.

242. The perception of two images of a single object is known as ____________________ or double vision.

243. An inflammation of the eustachian tube is known as ____________________.
244. The benign skin growth that has a waxy or "pasted-on" look and occurs more commonly among the elderly is known as seborrheic ________________.

245. A lesion formed by the buildup of sebum and keratin in a hair follicle is known as a/an ________________.

246. The primary function of the parathyroid glands is to regulate ________________ levels throughout the body.

247. ________________ syndrome is a disorder of the adrenal glands due to excessive production of aldosterone.

248. Premenstrual ________________ disorder is a condition associated with severe emotional and physical problems that are closely linked to the menstrual cycle.

249. The abnormal production of breast milk in a woman who is not breastfeeding is known as ________________.

250. The technique used to visualize body parts in motion by projecting x-ray images on a luminous fluorescent screen is known as ________________.
SkillsUSA Medical Terminology Test
Answer Section

MULTIPLE CHOICE

1. ANS: C  PTS: 1
2. ANS: C  PTS: 1
3. ANS: A  PTS: 1
4. ANS: B  PTS: 1
5. ANS: D  PTS: 1
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20. ANS: A  PTS: 1
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173. ANS: B  PTS:  1
174. ANS: C  PTS:  1
175. ANS: C  PTS:  1
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177. ANS: C  PTS:  1
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179. ANS: D  PTS:  1
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181. ANS: C  PTS:  1
182. ANS: A  PTS:  1
183. ANS: B  PTS:  1
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185. ANS: A  PTS:  1
186. ANS: A  PTS:  1
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189. ANS: A  PTS:  1
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191. ANS: C  PTS:  1
192. ANS: A  PTS:  1
193. ANS: C  PTS:  1
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195. ANS: B  PTS:  1
196. ANS: B  PTS:  1
197. ANS: B  PTS:  1
198. ANS: D  PTS:  1
199. ANS: D  PTS:  1
200. ANS: D  PTS:  1
201. ANS: D  PTS:  1
202. ANS: D  PTS:  1
203. ANS: A  PTS:  1
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229. ANS: tachycardia
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233. ANS: Emphysema
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234. ANS: cyanosis
    PTS: 1
235. ANS: bronchospasm
    PTS: 1
236. ANS: Cirrhosis
    PTS: 1
237. ANS: hepatomegaly
    PTS: 1
238. ANS: nephrolysis
    PTS: 1
239. ANS: cerebrovascular
    PTS: 1
240. ANS: Hordeolum
    PTS: 1
241. ANS: stapedectomy
PTS: 1
242. ANS: diplopia

PTS: 1
243. ANS: eustachitis

PTS: 1
244. ANS: keratosis

PTS: 1
245. ANS: comedo

PTS: 1
246. ANS: calcium

PTS: 1
247. ANS: Conn's

PTS: 1
248. ANS: dysphoric

PTS: 1
249. ANS: galactorrhea

PTS: 1
250. ANS: fluoroscopy

PTS: 1
MOBILE ELECTRONICS INSTALLATION (DEMONSTRATION CONTEST)

PURPOSE
To evaluate each contestant’s preparation for employment and to recognize outstanding students for excellence and professionalism in the field of mobile electronic installation.

First, refer to General Regulations, Page 9.

CLOTHING REQUIREMENT
For men: Official SkillsUSA white polo shirt with black dress slacks, black socks and black leather shoes. For women: Official SkillsUSA white polo shirt with black dress slacks or skirt, black socks or black or clear seamless hose and black leather shoes. All: Safety glasses with side shields or goggles. (Prescription glasses can be used only if they are equipped with side shields. If not, they must be covered with goggles.)

These regulations refer to clothing items that are pictured and described at: www.skillsusastore.org. If you have questions about clothing or other logo items, call 800-401-1560 or 703-956-3723.

ELIGIBILITY
Open to active SkillsUSA members enrolled in technology programs that include mobile electronics installations.

EQUIPMENT AND MATERIALS
1. Supplied by the technical committee:
   a. All necessary tools, materials, schematics and equipment required for the contest
2. Supplied by the contestant:
   a. Pencils
   b. Safety glasses
   c. Calculator
   d. All competitors must create a one-page résumé using a word processor and submit the résumé electronically at: www.skillsusa.org/compete/

updates.shtml. Check the Web site for further instructions.

SCOPE OF THE CONTEST
1. The scope of the contest will be consistent with the industry standards outlined in the competencies listed for the Mobile Electronics Certified Professional Basic Installation Technician exam produced by the Consumer Electronics Association (CEA). See www.mecp.com. Following are the major skills areas:

Section 1 — BASIC AND ADVANCED ELECTRICAL
   a. Electrical Laws And Formulas For The Mobile Electronics Environment
   b. Electrical Components
   c. Basic Electrical Troubleshooting
   d. Filters
   e. Relays, Batteries And Cable
   f. Semiconductors
   g. Automotive, Electrical and Charging Systems
   h. Troubleshooting

Section 2 — MOBILE ELECTRONICS INSTALLATION KNOWLEDGE AND TECHNIQUES
   a. Basic Installation Practices
   b. Noise Troubleshooting
   c. Battery Troubleshooting
   d. Meters And Test Equipment
   e. General Installation & Equipment
   f. Shop Safety
   g. Troubleshooting Guide

Section 3 — INTRODUCTION TO AUTOSOUND, SECURITY, WIRELESS & NAVIGATION
   a. Introduction To Audio - Autosound Basics
   b. Introduction To Security
   c. Wireless Communications: The Basics Of Installation
   d. Navigation Basics
   e. Satellite Radio

The current MECP Basic Mobile Electronics Installer competency standards are available on the Web at www.mecp.com.
2. Contestants will demonstrate their ability to perform jobs or skills selected from the competencies listed below as determined by the SkillsUSA Championships technical committee.

3. Installing, Diagnosing and Servicing: This section of the competition consists of several test-station activities. Contestants must successfully complete assigned tasks at each station. The tasks are designed to provide a variety of challenges based on the MECPrecommended practices. Approximately 45 minutes are allowed at each station.

**Scope of the Contest**

**Knowledge Performance**
The written test is based on the Mobile Electronics Certified Professional Basic Installation Technician exam produced by the Consumer Electronics Association (CEA). See www.mecp.com.

**Skill Performance**
The event includes a professional interview and five hands-on applications that include taking electrical measurements, installing consumer electronic equipment in a mobile environment, soldering, working with relay circuits and troubleshooting electronic circuitry.

**Standards and Competencies**

**MEI 1.0 — Charging and Electrical System Measurements**
Contains one task associated with using standard test instruments to establish a State of Health report for a given vehicle.

**MEI 2.0 — Removing and Replacing Headunits**
Contains one task related to removing an existing headunit and replacing it with an OEM upgrade head unit.

**MEI 3.0 — Installing Audio Amplifiers**
Contains one task related to physically adding an audio amplifier to an existing mobile audio installation and configuring it for safe usage by the customer.

**MEI 4.0 — Using Relays**
Contains one task requiring the contestant to design and configure a relay based circuit to perform the requested mobile installation-related to upgrading consumer electronic systems in a vehicle.

**MEI 5.0 — Locating and Diagnosing Open and Short Circuits**
Contains one task related to locating and repairing an open circuit and/or a short circuit condition and will be judged on ability to locate, identify and repair all malfunctions; and adherence to safety and ESD procedures.

**MEI 6.0 — Electronics Installer Theory Exam**
Contestants will take an examination covering their knowledge of basic and advanced electrical theory, installation knowledge and techniques, and mobile consumer electronics systems. Questions cover basic 12-volt circuits and devices, mobile consumer electronics systems and subsystems (sound, security, wireless and navigation), and basic mobile electronics diagnostic and troubleshooting questions. The exam consists of multiple-choice questions and lasts up to two hours.

**MEI 7.0 — Customer Service**
Contestants will respond to questions related to providing professional customer service techniques.

**MEI 8.0 — Personal Interview**
A business/industry preliminary interview will be conducted with an industry professional focusing on the customer service culture.

**MEI 9.0 — Winners will be determined on the basis of total scores, including diagnosis and troubleshooting, soldering, assembly, customer service and personal interview interaction, and theory exam.**

**MEI 10.0 — Items Evaluated: Relative point values for each item below will be determined by the technical committee.**

10.1 Installing, Diagnosing and Service Scoring

10.1.1 Read and understand the manufacturer's training literature about the device.
10.1.2 Use test equipment to make specified measurements.
10.1.3 Follow recommended manufacturer’s sequence of installation procedures and troubleshooting practices.
10.1.4 Identify the scope of the task or problem.
10.1.5 Identify any defective component.

10.2 Practical Skills
10.2.1 Soldering and desoldering techniques
10.2.2 Workmanship and assembly techniques
10.2.3 Final operation of installations tasks
10.2.4 Ability to locate, identify and/or repair malfunctions
10.2.5 Safety and ESD procedures

10.3 Customer Service
10.4 Personal Interview
10.5 Written Exam
SCORECARD Mobile Electronics Technology

<table>
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<th>Items Evaluated</th>
<th>Possible Points</th>
<th>1</th>
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<th>3</th>
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<td>Professionalism</td>
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| Total Possible Points                | 1000             |   |   |   |   |   |   |   |

Table: Mobile Electronics Technology Contestant Number
Mobile Robotic Technology
(Demonstration Contest)

PURPOSE:
To evaluate each contestant’s preparation for employment in the field of robotics with emphasis on the team approach to problem solving in a work environment. To recognize outstanding students for their excellence and professionalism in the emerging field of mobile robotics.

First, refer to General Regulations, Page 9 of the technical standards.

CLOTHING REQUIREMENT
For men: Official SkillsUSA white polo shirt with black dress slacks, black socks and black leather shoes.
For women: Official SkillsUSA white polo shirt with black dress slacks or skirt, black socks or black or skin-tone seamless hose, and black leather shoes. All: Safety glasses with side shields or goggles. (Prescription glasses can be used only if they are equipped with side shields. If not, they must be covered with goggles.)

These regulations refer to clothing items that are pictured and described at: www.skillsusastore.org. If you have questions about clothing or other logo items, call 800-401-1560 or 703-956-3723.

Note: Contestants must wear their official contest clothing to the contest orientation meeting.

ELIGIBILITY:
Open to a team of two active SkillsUSA members enrolled in programs in a career and technical education engineering program or program that integrates robotics, engineering or pre-engineering techniques as an integral component of the instructional program.

EQUIPMENT AND MATERIALS:

Supplied by the Technical Committee:
• All necessary information for judges and technical committee
• A space 10x10 space for working and displaying the robot
• One standard 120 – volt electrical outlet
• One standard 8ft conference table
• Description of robotic challenge
• All the necessary tools and equipment for the contest
• Vex Robotic Starter Kit or Festo Robotino
Supplied by the contestant:
- Computer with Programming software installed and licensed
- Programming Cable or other connection devices
- Engineering Notebook
- All competitors must create a one-page résumé using a word processor and submit the résumé electronically at: www.skillsusa.org/compete/updates.shtml. Check the Web site for further instructions.

SCOPE OF THE CONTEST:

The contest will test the ability to perform, exhibit and compile skills and knowledge from the following list of competencies determined by the SkillsUSA Mobile Robotic technical committee. Committee membership includes intelitek Inc., Festo Didactic, Innovation FIRST and AZTECH Educational Resources.

Knowledge Performance
The contest will include a written exam assessing general knowledge of robotics operations and programming. Written portions may also exist during the skills portion of the contest.

Skill Performance
The contest will include activities that simulate situations encountered by robotic programmers and support professionals.

Contest Guidelines

1. Teams must be composed of two members.
2. Teams are given a task that they will solve using a mobile robotic system provided by the technical committee.
3. During the orientation session each team will have 10 minutes to present their Engineering Notebook to the judges.
4. Teams can only use an Engineering Notebook during the contest as a reference tool in the construction and programming of their robot.
5. The Engineering Notebook is a tool for students to document their designs prior to the competition. It can include pictures, printed out sections of code, detailed assembly instructions etc. All pages must be bound and numbered.
6. Robot(s) can only be constructed by the materials supplied by the technical committee.
7. Once a team has performed the required task or set of tasks, a design change may be introduced.
8. Contestants are required to adhere to industry safety standards using the hardware
and software provided.
9. All team members are responsible for double-checking each other’s work and quality control.
10. All engineering notebooks, forms, documentation and programs must be turned in to the judges at the end of the competition.
11. All team members and advisors are required to attend a debriefing session after the competition has concluded.
Process Technology Skills (Demonstration Contest)

**Purpose**
To evaluate each student's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of Process Technology.

**Clothing Requirement**
For men: Official SkillsUSA white polo shirt with black dress slacks, black socks and black leather shoes.
For women: Official SkillsUSA white polo shirt with black dress slacks or skirt, black socks or black or skin-tone seamless hose and black leather shoes.

These regulations refer to clothing items that are pictured and described at: [www.skillsusastore.org](http://www.skillsusastore.org). If you have questions about clothing or other logo items, call 800-401-1560 or 703-956-3723.

*Note:* Contestants must wear their official contest clothing to the contest orientation meeting.

**Eligibility**
Open to active SkillsUSA members with components of process technology in the course of study.

**Observer Rule**
Observers will be allowed to observe the demonstration part of the contest. No talking or gesturing will be permitted. No audio or video recording is allowed by members of the audience.

**Equipment and Materials**

1. Supplied by the technical committee:
   a. Stopwatch
   b. Computer
   c. Software containing troubleshooting scenarios or hands-on model.
   d. All necessary information and tools for judges.

2. Supplied by the Contestant:
   a. All competitors must create a one-page résumé using a word processor and submit the résumé electronically at: [www.skillsusa.org/compete/updates.shtml](http://www.skillsusa.org/compete/updates.shtml). Check the Website for further instruction.

**SCOPE OF CONTEST**
Process Technology is a career and educational discipline that combines the industrial skill needed to safely operate plant manufacturing processes with electronics and computer-based controls, problem solving, and operation of modern automated manufacturing systems.

**Knowledge Performance**
There will be a skill-related written test.
Questions will be similar to the questions on the PTEX - CR written exit exam.
There will be a (60) minute time limit on the written test.

**Skill Performance**
The contest is designed to assess the ability of the competitor to safely operate a manufacturing plan. This portion of the competition will be evaluated by oral professional assessment and via simulations. Contestants will participate in an oral professional assessment scheduled for 20 minutes per student.

Demonstrate professionalism at all times.

Simulations
Be prepared to troubleshoot and solve plant upsets presented via simulation software or hands-on model.

The maximum time to troubleshoot and solve the plant upset is 120 minutes per each scenario.

Standards and Competencies

PT 1.0 Safety, Health and Environment
1.1 Maintain Safety, Health and Environmental Standards in a Plant
1.2 Understand and follow established procedures to operate safely and in an environmentally sound manner.
1.3 Understand and follow Federal Regulations
1.4 Use Personal Protective Equipment
1.5 Knowledge of Emergency Response
1.6 Identify Workplace Hazards

PT 2.0 Handling, Storing & Transporting Plant Materials
2.1 Understand and follow Federal Regulations
2.2 Knowledge of Material Hazards
2.3 Transport material from one location to another
2.4 Ensure appropriate storage container, for material being stored/transported

PT 3.0 Operating, Monitoring and Controlling Continuous & Batch Processes
For the following systems – Heat Exchange, Separation, Reaction, Generation, Waste Treatment & Utilities – be able to demonstrate knowledge of:
3.1 Process Variables
3.2 Operating Parameters
3.3 Safety Components
3.4 Process Drawings
3.5 Instrumentation

PT 4.0 Providing Routine and Preventive Maintenance and Services, to Processes, Equipment and Instrumentation
4.1 Plant Maintenance – Processes and Strategies
4.2 Proper use of Hand Tools
4.3 Plant Maintenance Procedures
4.4 Preparing Equipment for Maintenance Activities
4.5 Lubricants and Lubrication System

PT 5.0 Troubleshooting Process Abnormalities & Equipment Malfunctions
For the following systems – Heat Exchange, Separation, Reaction, Generation, Waste Treatment & Utilities – be able to:
5.1 Recognize an Abnormality
5.2 Collect and Analyze Information
5.3 Define Root Cause & Take Appropriate Action
5.4 Maintain Safe Operation
PT 6.0 Demonstrate Workplace Behaviors Necessary for Success
6.1 Communication
6.2 Teamwork
5.3 Adaptability
6.4 Leading Self and Others

Committee Identified Academic Skills
The SkillsUSA national technical committee has identified that the following academic skills are embedded in the process technology training program and assessment:

Math Skills
Use fractions to solve practical problems
Use proportions and ratios to solve practical problems
Solve practical problems involving percents
Solve single variable algebraic expressions
Solve multiple variable algebraic expressions
Measure angles
Find surface area and perimeter of two-dimensional objects
Construct three-dimensional models
Apply Pythagorean Theorem
Make comparisons, predictions and inferences using graphs and charts
Organize and describe data using matrixes
Find slope of a line
Solve practical problems involving complementary, supplementary and congruent angles
Find arc length and the area of a sector

Science Standards
Plan and conduct a scientific investigation
Use knowledge of the particle theory of matter
Describe and recognize elements, compounds, mixtures, acids, bases and salts
Describe and recognize solids, liquids and gases
Describe characteristics of types of matter based on physical and chemical properties
Use knowledge of physical properties (shape, density, solubility, odor, melting point, boiling point, color)
Use knowledge of classification of elements as metals, metalloids and nonmetals
Describe and identify physical changes to matter
Use knowledge of potential and kinetic energy
Use knowledge of mechanical, chemical and electrical energy
Use knowledge of heat, light and sound energy
Use knowledge of temperature scales, heat and heat transfer
Use knowledge of speed, velocity and acceleration
Use knowledge of Newton’s laws of motion
Use knowledge of work, force, mechanical advantage, efficiency and power
Use knowledge of simple machines, compound machines, powered vehicles, rockets and restraining devices
Use knowledge of principles of electricity and magnetism
Use knowledge of static electricity, current electricity and circuits
Use knowledge of magnetic fields and electromagnets

Language Arts Skills

DOW RESTRICTED - For internal use only
Demonstrate comprehension of a variety of informational texts
Use text structures to aid comprehension
Demonstrate knowledge of appropriate reference materials
Use print, electronic databases and online resources to access information in books and articles

Connections to National Standards
State-level academic curriculum specialists identified the following connections to national academic standards:
Math Standards
Numbers and operations
Algebra
Geometry
Measurement
Data analysis and probability
Problem solving
Communication
Connections
Representation


Science Standards
Understands the structure and function of cells and organisms
Understands relationships among organisms and their physical environment
Understands biological evolution and the diversity of life
Understands the structure and properties of matter
Understands the sources and properties of energy

Understands forces and motion
Understands the nature of scientific inquiry
Understands the scientific enterprise

Source: McREL compendium of national science standards. To view and search the compendium, visit: www.mcrel.org/standards-benchmarks/.

Language Arts Standards
• Students read a wide range of print and non-print texts to build an understanding of texts, of themselves and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works
Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language and genre to
create, critique and discuss print and non-print texts
Students conduct research on issues and interests by generating ideas and questions and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
Students use a variety of technological and information resources (e.g., libraries, databases, computer networks and video) to gather and synthesize information and to create and communicate knowledge
Students participate as knowledgeable, reflective, creative and critical members of a variety of literacy communities
Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information)

Source: IRA/NCTE Standards for the English Language Arts. To view the standards, visit: www.readwritethink.org/standards/index.html.
Structural Steel Drafting (Demonstration Contest)

Purpose
To evaluate each contestant’s preparation for employment and to recognize outstanding students for excellence and professionalism in the field of structural steel drafting.

First, refer to General Regulations, Page 9 of the technical standards.

Clothing Requirement
For men: Official white polo shirt with black dress slacks, black socks and black leather shoes.
For women: Official white polo shirt with black dress slacks or skirt, black socks or black or skin tone seamless hose and black leather shoes.

These regulations refer to clothing items that are pictured and described at: www.skillsusastore.org. If you have questions about clothing or other logo items, call 800-401-1560 or 703-956-3723.

Note: Contestants must wear their official contest clothing to the contestant orientation meeting.

Eligibility
Open to active SkillsUSA members enrolled in programs with drafting as the occupational objective.

Equipment and Materials
1. Supplied by the technical committee:
   a. The architectural drafting workstation will be equipped with a standard folding table, a work area for reference material, a space for a personal computer and a chair.
   b. 110-volt electrical outlet
   c. One formatted IBM-compatible diskette
   d. Output hardware - plotter or printer
   e. Drafting paper/ vellum
   f. All necessary information and furnishings for judges and technical committees.

2. Supplied by the contestant:
   a. PC-type computer, monitor and input devices. Computers may be obtained from any source. To have access to the most current technology, contestants and their schools are encouraged to develop a relationship with a hometown computer/ software dealer who can serve as a contestant sponsor.
   b. Removable data storage device (flash drive) or recordable CD.
   c. Architectural software of choice. Proof of licensing for every software program installed on the contestant’s computer must be provided to the technical committee at the contestant orientation meeting.
d. Students may bring published reference books, tables and software manuals.
e. Typical personal drafting supplies desired for board drafting and freehand sketching, subject to the approval of the technical committee.
f. Battery-operated calculator
g. Multi-receptacle power strip
h. Students choosing to use board drafting equipment must bring their own drawing board, equipment and drafting supplies. Tables with drafting boards will be provided, but will not be installed with the Vemco Drafting Machines.
i. All competitors must create a one-page résumé using a word processor and submit the résumé electronically at: www.skillsusa.org/compete/updates.shtml. Check the Website for further instructions.

Note: The setup configuration and the teardown of all contestant-provided equipment will be the responsibility of the contestant.

Scope of the Contest

Knowledge Performance

The contest will include a written knowledge test assessing general knowledge of structural steel. Written portions may also exist during the skills portion of the contest. Knowledge of terms and principles used in the structural steel profession will be required for the skill demonstration portion of the contest.

Skill Performance

The contest will assess skill performance by providing a computer-generated problem that may be solved using either board drafting or CAD.

Contest Guidelines

1. Preparation of drawings will include proper dimensions and line type selection according to current drafting standards.

2. During the contest, the contestants will work independently; no assistance from other contestants, instructors or observers is allowed.

3. Limited technical assistance for computer or software malfunction may be given by appropriate manufacturer’s representatives or members of the technical committee.

4. Contestants will each be given the same amount of time to resolve the problem.

Everyone will begin at the same time and take the required lunch break, and no one will be allowed to work past the contest conclusion (additional time may be granted for equipment malfunction).

5. Each contestant will be responsible for establishing plotting procedures at the computer and for plotting his or her work to a plot file on a floppy disk, flash drive or CD.
6. Criteria to evaluate skill performance are general in nature and will be done from plotted drawings or manual drawings. Specific criteria will be based on the demonstration of competency in those elements of accuracy and productivity included in the contest problem.

7. Competencies to be demonstrated may be selected from the Standards and Competencies below.

**Standards and Competencies**

**SSD 1.0 - Demonstrate understanding of terms and principles used in the structural steel profession**

1.1 Define and use terms commonly used in the architectural profession

1.2 Define the different profiles of material used in structural steel

1.2.1 Define the different properties of wide flange material

1.2.2 Define the different properties of channel material

1.2.3 Define the different properties of angle material

1.2.4 Define the different properties of plate material

1.2.5 Define the different properties of pipe material

1.2.6 Define the different properties of tube steel material

1.3 Define the different connections used in the structural steel profession

1.3.1 Define a clip angle connection

1.3.2 Define a shear tab connection

1.3.3 Define an end plate connection

**SSD 2.0 - Interpret and apply conventional General Drafting Standards to structural steel drafting situations**

2.1 Explain the terms and definitions used in detail drawings, working drawings and drafting

2.2 Define and describe the components that comprise structural steel drawings

2.2.1 Necessary multiviews

2.2.2 Dimensional information

2.2.3 Specified materials

2.2.4 Revision block, title block and sheet size

2.2.5 Enlarged views and sections showing detail

2.2.6 General notes with construction information

2.2.7 Bill of material information

2.3 Define and describe the components that comprise structural steel drawings

2.3.1 Use standard drafting techniques to create section views in order to improve the visualization of new designs
2.3.2 Clarify multiview drawings and facilitate the dimensioning of drawings

2.3.3 Draw and label erection plans, elevation plans, anchor bolt plans, schedules and necessary multiviews.

Committee Identified Academic Skills

The technical committee has identified that the following academic skills are embedded in this contest.

Math Skills

• Use fractions to solve practical problems
• Use proportions and ratios to solve practical problems
• Simplify numerical expressions
• Solve practical problems involving percents
• Solve single variable algebraic expressions
• Solve multiple variable algebraic expressions
• Measure angles
• Construct three-dimensional models
• Make predictions using knowledge of probability
• Organize and describe data using matrices
• Graph linear equations

• Solve problems using proportions, formulas and functions
• Find slope of a line
• Solve practical problems involving complementary, supplementary and congruent angles
• Solve problems involving symmetry and transformation
• Use measures of interior and exterior angles of polygons to solve problems

Science Skills

• Describe and recognize solids, liquids and gases
• Describe characteristics of types of matter based on physical and chemical properties
• Use knowledge of physical properties (shape, density, solubility, odor, melting point, boiling point, color, etc.)
• Use knowledge of classification of elements as metals, metalloids and nonmetals
• Use knowledge of mechanical, chemical and electrical energy
• Use knowledge of heat, light and sound energy
• Use knowledge of temperature scales, heat and heat transfer
• Use knowledge of sound and technological applications of sound waves
• Use knowledge of simple machines, compound machines, powered vehicles, rockets and restraining devices

• Use knowledge of principles of electricity and magnetism

• Use knowledge of static electricity, current electricity and circuits

• Use knowledge of motors and generators

Language Arts Skills

• Provide information in conversations and in group discussions

• Provide information in oral presentations

• Demonstrate use of verbal communication skills, such as word choice, pitch, feeling, tone and voice

• Demonstrate use of nonverbal communication skills, such as eye contact, posture and gestures, using interviewing techniques to gain information

• Analyze mass media messages

• Demonstrate comprehension of a variety of informational texts

• Use text structures to aid comprehension

• Identify words and phrases that signal an author’s organizational pattern to aid comprehension

• Understand source, viewpoint and purpose of texts

• Organize and synthesize information for use in written and oral presentations

• Demonstrate knowledge of appropriate reference materials

• Use print, electronic databases and online resources to access information in books and articles

• Demonstrate narrative writing

• Demonstrate expository writing

• Demonstrate persuasive writing

• Demonstrate informational writing

• Edit writing for correct grammar, capitalization, punctuation, spelling, sentence structure and paragraphing

Connections to National Standards

State-level academic curriculum specialists identified the following connections to national academic standards.

Math Standards

• Numbers and operations
• Algebra
• Geometry
• Measurement
• Problem solving
• Communication
• Connections
• Representation

**Source:** NCTM Principles and Standards for School Mathematics. To view high school standards, visit: [www.standards.netm.org/document/chapter7/index.htm](http://www.standards.netm.org/document/chapter7/index.htm) and select “Standards” from menu.

**Science Standards**

• Understands forces and motion

• Understands the nature of scientific inquiry

**Source:** McREL Compendium of National Science Standards. To view and search the compendium, visit: [www.mcrel.org/standardsbenchmarks/](http://www.mcrel.org/standardsbenchmarks/).

**Language Arts Standards**

• Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes

• Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language and genre, to create, critique, and discuss print and non-print texts

• Students conduct research on issues and interests by generating ideas and questions and by posing problems; they gather, evaluate and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience

• Students use a variety of technological and information/resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge

• Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

**Source:** IRA/NCTE Standards for the English Language Arts. To view the standards, visit: [www.readwritethink.org/standard/index.html](http://www.readwritethink.org/standard/index.html)

**Contest Scorecard**

**Items Evaluated/ Possible Points**

Erection Views.................300
Anchor Bolt Plan...........100
Elevation Plan............100
Plan View...................100
Detail Drawings......... .400
Beam Detail...............150
Column Detail.............150
Part Details...............100
Revision...................100
Drafting Technique.......100
Layout and Balance....... 50
Written Test...............50

Total 1000
Sustainability Solutions (Demonstration Contest)

Purpose
To recognize outstanding Green technology innovation projects that have been developed by a two-member team of students. The student team will present its innovative idea along with a display and live model.

First refer to the general regulations on Page 9.

Clothing Requirement
For Men: SkillsUSA official attire: Official red blazer or jacket, black dress slacks, white dress shirt, plain black tie with no pattern or SkillsUSA black tie, black socks, and black shoes.

For Women: Official red blazer or jacket, black dress slacks or skirt, with businesslike white, collarless blouse or white blouse with small, plain collar that may not extend onto the lapels of the blazer, black sheer or skin-tone hose, and black shoes.

These regulations refer to clothing items that are pictured and described at: www.skillsusastore.org. If you have questions about clothing or other logo items, call 800-401-1560 or 703-956-3723.

Eligibility
Open to a team of two active SkillsUSA members enrolled in a career and technical education program that integrates Green technology techniques as an integral component of the instructional program.

Observer Rule
No observers will be permitted during the judging phase of the team presentation. Live models and presentation displays may be viewed on the day of the competition. All teams will be invited to repeat the team presentation to the public following the judging phase.

Equipment and Materials
1. Supplied by the technical committee:
   a. A space for the live model no bigger than 10' x 10'
   b. A space for the storyboard
   c. One standard 120-volt electrical outlet
   d. One standard 6' conference table

2. Supplied by the contestant team:
   a. Live model (Live model cannot be hazardous in any way. Live models must be transported and set up in the contest area by the contestant team. No help will be provided by SkillsUSA.
   b. All competitors must create a one-page résumé using a word processor and submit the résumé electronically at: www.skillsusa.org/compete/updates.shtml. Check the Web site for further instructions.

Scope and Contest
The sustainability team is comprised of 2 students. Projects must involve the following components:

Locally, the team would meet and generate ideas for a sustainability project. The team would be required to document the idea generation process and be prepared to present
the idea as well as the need for the project chosen. All team meetings would be documented in team reports. The purpose of the team reports is to allow judges to see the team process and evolution of the project.

The team would agree on a sustainability project. The project should be built around the need for a sustainability process, concept, device or structure. Research should be documented to show the need for the project concept. Connection to the community and/or business and industry in the research, planning and building process is encouraged.

The project can be built around any sustainability concept. Examples include, but are not limited to the following: Green building processes, alternative fuels, recycling, energy savings processes/systems, alternative energy (i.e. solar, wind, etc.).

The project should be built as a tabletop display and should be no larger than 24” x 72”. The student project can also be a concept built around creative ideas that generate networking or discussions that lead to a sustainability/green idea and proposed solution (for example, the student team could create and manage a blog that gathers opinions from a wide audience around a green initiative. The “project” would then be demonstrated with the use of computer technology – LCD projection of the process on screen, etc. with a presentation and explanation of the process, outreach and results achieved.)

Teams will construct a notebook (3-ring official SkillsUSA notebook) that will use photos, news articles, etc. to tell the story of the evolution of the project. The notebook will be organized in the following order:

Table of contents
Reports of team planning meetings. Each report should include: date of team meeting, persons attending, items discussed and decisions reached.

Research information used by the team in developing the project

A narrative describing the evolution and construction or development of the project.

A report on results achieved. Example: How many people were exposed to the project, impact on the school and/or community.

Projected future impact the project could have on the community, environment, school, etc.

Photo documentation of the full process – from design to completion

Appendix. The appendix will be no more than ten pages and can include news articles and other publicity, letters of commendation, other backup materials that document community and business support or team recognition.

At the competition, teams will make a professional presentation to
the judges. The purpose of the presentation is to allow students to explain their project and the team should utilize some form of audiovisual media. A/V could include flip charts, computer generated presentations, etc. The presentation will be no less than seven and no more than ten minutes in length. Both team members must be a part of the presentation.
Welding Sculpture (Demonstration Contest)

Purpose

To evaluate each contestant’s preparation for employment and to recognize outstanding students for excellence and professionalism in the field of Welding or Metal Trades.

Clothing Requirements

For men: Official SkillsUSA white polo shirt with black dress slacks, black socks and black leather shoes.

For women: Official SkillsUSA white polo shirt with black dress slacks or skirt, black socks or black or skin-tone seamless hose and black leather shoes.

These regulations refer to clothing items that are pictured and described at: www.skillsusastore.org. If you have questions about clothing or other logo items, call 800-401-1560 or 703-956-3723.

Note: Contestants must wear their official contest clothing to the contest orientation meeting.

Eligibility:

Open to active SkillsUSA members enrolled in career and technical programs with Welding or Metal Trades as the occupational objectives.

Equipment and Materials:

Supplied by the Technical Committee:

- All necessary information for the judges and technical committee.
- One 4-foot table

Supplied by the contestant:

- All competitors must create a one-page résumé using a word processor and submit the résumé electronically at: www.skillsusa.org/compete/updates.shtml. Check the Website for further instruction.
- Student designed and produced sculpture

Scope of the Contest

The contest consists of two parts:

1. Evaluation of the Sculpture

2. Oral presentation and questions and answers session. All contestants will be asked the same questions, determined by the judges, before the start of the contest

Knowledge Performance

There will be no skill-related written test.

Skill Performance

The contest is designed to assess the ability of the competitor to design and produce a sculpture of
that design, as well as give a presentation regarding all aspects of his or her creation of the design.

**Contest Guidelines**

Sculpture Design and Workmanship: Materials used must be ferrous or non-ferrous metals. The sculpture must be an original and creative work of the student.

Sculptures may be welded, brazed, or soldered, depending on the material used.

Projects are to be left unpainted, including primers and other coatings.

All copyright laws must be followed in the creation of the design.

The sculpture must be one continual piece, not multiple pieces unconnected.

The sculpture cannot exceed the maximum size of 18” tall x 12” wide x 18” long and cannot exceed a weight of 250 lbs.

**Notebook** – A notebook must be placed with the sculpture prior to judging. It must contain pictures and supporting evidence (i.e. receipts). It must include a brief description of the project and processes used to develop the sculpture. The first page of the notebook must include a letter certifying that the sculpture was designed and constructed by the student. The letter must contain an itemized list of all expenses. The letter must identify the school, city, state and local advisor. The letter must identify the student to be interviewed, division (high school or post-secondary), and the letter must be signed by the local administrator.

**Presentation** – The student will participate in a 3 to 5 minute presentation. Elements of the presentation should include: 1. General information (Individual’s name, school, and title of project). 2. Discuss elements of the notebook. 3. Inspiration for project design. 4. Details of processes and workmanship in the sculpture.

**Question and Answer Session** – After each presentation the individual will be asked questions from the judges. Questions will be about the sculpture, presentation, materials, processes and workmanship.

**CONTEST SCORECARD**

<table>
<thead>
<tr>
<th>Items Evaluated/Maximum Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sculpture:</strong></td>
</tr>
<tr>
<td>Workmanship</td>
</tr>
<tr>
<td>Design</td>
</tr>
<tr>
<td><strong>Notebook:</strong></td>
</tr>
<tr>
<td>Verification letter</td>
</tr>
<tr>
<td>Photos</td>
</tr>
<tr>
<td>Receipts for materials</td>
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<tr>
<td>Drawings drafts and finals</td>
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<tr>
<td>Other supporting documents</td>
</tr>
<tr>
<td><strong>Presentation:</strong></td>
</tr>
<tr>
<td>Verbal techniques and poise</td>
</tr>
<tr>
<td>Introduction and Closing</td>
</tr>
<tr>
<td>Self confidence</td>
</tr>
<tr>
<td><strong>Q &amp; A:</strong></td>
</tr>
</tbody>
</table>
Adherence to guidelines 0 to -50
Résumé penalty 0 or -50 only
Clothing penalty 0 to -50
Time penalty (-3 or +5) -25 per 30 sec.

Total 1000