

Texas Examinations of Educator Standards™ (TEExES™) Program

Preparation Manual

Technology Education 6–12 (171)



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About The Test

Test Name	Technology Education 6–12
Test Code	171
Time	5 hours
Number of Questions	100 multiple-choice questions
Format	Computer-administered test (CAT)

The TExES Technology Education 6–12 (171) test is designed to assess whether a test taker has the requisite knowledge and skills that an entry-level educator in this field in Texas public schools must possess. The 100 multiple-choice questions are based on the Technology Education 6–12 test framework. The test may contain questions that do not count toward the score.

The number of scored questions will not vary; however, the number of questions that are not scored may vary in the actual test. Your final scaled score will be based only on scored questions.

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The Domains

Domain	Domain Title	Approx. Percentage of Test	Standards Assessed
I.	Fundamentals of Technology Education	17%	Technology Education 6–12: I–VII
II.	Communication	14%	Technology Education 6–12: VI
III.	Manufacturing	17%	Technology Education 6–12: VI
IV.	Construction	17%	Technology Education 6–12: VI
V.	Energy, Power and Transportation	17%	Technology Education 6–12: VI
VI.	Biotechnology and Computer Technology	17%	Technology Education 6–12: II, VI

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The Standards

Technology Education 6–12 Standard I

The technology education teacher understands the philosophy of technology education.

Technology Education 6–12 Standard II

The technology education teacher understands the nature of technology.

Technology Education 6–12 Standard III

The technology education teacher understands the interactions between technology and society.

Technology Education 6–12 Standard IV

The technology education teacher understands technology and design processes.

Technology Education 6–12 Standard V

The technology education teacher understands the use, maintenance, and impact of technology.

Technology Education 6–12 Standard VI

The technology education teacher understands communication; manufacturing; construction; energy, power, and transportation; bio-related technology; and computer applications systems.

Technology Education 6–12 Standard VII

The technology education teacher understands instructional development and facilities management.

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Domains and Competencies

The content covered by this test is organized into broad areas of content called **domains**. Each domain covers one or more of the educator standards for this field. Within each domain, the content is further defined by a set of **competencies**. Each competency is composed of two major parts:

- The **competency statement**, which broadly defines what an entry-level educator in this field in Texas public schools should know and be able to do.
- The **descriptive statements**, which describe in greater detail the knowledge and skills eligible for testing.

Domain I – Fundamentals of Technology Education

Competency 001: *The Technology Education teacher demonstrates knowledge of the nature and philosophy of technology and technology education and the interactions between technology and society.*

The beginning teacher:

- A. Demonstrates knowledge of general characteristics of technology (e.g., technology involves innovation and creativity, technology products and systems alter the natural world and are designed to solve problems, there are limitations to technology’s ability to solve problems, new technologies are built on previous technologies) and of the history and evolution of technology.
- B. Understands how factors (e.g., scientific advances, access to capital, market demand) affect the rate of technological development and how technology makes it possible for scientists to extend research and explore new phenomena.
- C. Understands how technological systems and subsystems interact to achieve common goals and understands the role of control mechanisms and redundancy in technological systems.
- D. Identifies resources needed to develop and support a technological system, the properties of those resources, and how those resources are used in technological systems.
- E. Understands career opportunities, requirements, and expectations (e.g., teamwork, leadership, integrity, honesty) in technology and applies principles of career planning and skills for job seeking.
- F. Understands how ethical, economic, political, environmental and cultural considerations affect the development, selection and use of technologies.

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- G. Understands how technology affects humans in various ways (e.g., effects on safety, comfort, choices, attitudes; positive and negative social, cultural, political and economic influences; connections between technology and various societal institutions) and understands the importance of having a technologically literate society.
 - H. Understands the role of technology education in the world (e.g., how technology education helps students manage, use and understand technology; how technology education provides hands-on experience to students; the difference between technology education and career and workforce development education).

Competency 002: *The Technology Education teacher understands the design process and its application in technology.*

The beginning teacher:

- A. Understands the steps in the design process and recognizes the design process as a systematic, iterative method of solving problems.
- B. Understands factors (e.g., human and personal characteristics, principles of ergonomics, meeting specific needs such as those of people with special needs) that influence a design and factors (e.g., efficiency, reliability, functionality) that influence the quality of a product.
- C. Knows how to describe, develop and analyze technological products and systems that incorporate quality, reliability and safety using the universal systems model (i.e., input, process, output, feedback) and appropriate design processes and techniques.
- D. Knows how to evaluate a design in terms of given criteria (e.g., functionality, aesthetics, marketability) and recognizes trade-offs associated with technology and the need for compromises among competing factors in the design process.
- E. Knows how to use a variety of models (e.g., physical, mathematical, computer) and other methods to develop optimal designs for technological products.
- F. Understands methods for communicating designs to others.
- G. Identifies the chemical, mechanical and physical properties of materials.
- H. Applies mathematics, natural science and social science to analyze technology and applies processes and problem-solving methods (e.g., processes and methods from science, engineering, mathematics) to solve technological problems.

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Competency 003: *The Technology Education teacher demonstrates knowledge of the uses and impacts of technology and techniques for maintaining technology systems.*

The beginning teacher:

- A. Understands how technology systems may be used to meet specific goals.
- B. Demonstrates knowledge of appropriate codes, laws, standards and regulations related to technology (e.g., Occupational Safety and Health Administration, American Society for Testing and Materials, Environmental Protection Agency, National Electrical Code).
- C. Identifies emerging technologies and their characteristics and recognizes their role in the evolution of technology.
- D. Knows how to collect, use and evaluate manuals, protocols and other resources to learn and understand how technologies function.
- E. Knows how to create maintenance plans and programs and recognizes the importance of proper maintenance and the consequences of improper maintenance.
- F. Applies strategies and procedures for maintaining safe and proper functioning of tools, equipment and machines.
- G. Applies procedures for handling and storing tools and materials and for operating technological systems so that they function in the way they were designed.
- H. Knows how to troubleshoot technological systems and determine causes of failure in materials, tools, equipment and machines.
- I. Applies procedures for repairing systems that are malfunctioning.

Competency 004: *The Technology Education teacher knows how to plan, produce and manage a technology systems project.*

The beginning teacher:

- A. Understands how to plan, produce, and manage a communication project using appropriate resources, technical processes and the basic communication model.
- B. Understands how to plan, produce and manage a manufacturing project using appropriate resources and technical processes.
- C. Understands how to plan, produce, and manage a construction project using appropriate resources and technical processes.
- D. Understands how to plan, produce and manage an energy, power and transportation project using appropriate resources and technical processes.

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- E. Understands how to plan, produce, and manage a bio-related technology project using appropriate resources and technical processes.
 - F. Understands how to plan, produce and manage a computer applications project using appropriate resources and technical processes.

Competency 005: *The Technology Education teacher demonstrates knowledge of the philosophy of technology education; knows how to develop and implement a technology education program; and knows how to plan, manage and maintain technology education facilities.*

The beginning teacher:

- A. Knows how to assess and prioritize the facility-related needs of a technology education program (e.g., solicit and evaluate input from stakeholders, ensure that the space and physical arrangement of instructional facilities are conducive to effective instruction).
- B. Identifies characteristics (including advantages and disadvantages) of a variety of layouts for instructional facilities.
- C. Applies procedures for ensuring that instructional facilities are accessible to individuals with special needs.
- D. Knows how to identify and use sources of information about regulations and guidelines (e.g., space requirements, environmental control, safety equipment) for the construction and use of instructional facilities in technology education.
- E. Knows how to maintain instructional facilities for the technology education program and how to develop schedules for inspecting tools and equipment and for performing routine maintenance.
- F. Knows how to access information pertaining to the installation, maintenance and repair of equipment used in technology education facilities.
- G. Knows how to identify, select and acquire tools, equipment and materials (e.g., computer hardware and software, multimedia equipment, power tools) used in the technology education program.
- H. Understands methods of effective financial planning and management (e.g., identifying funding sources; procedures related to accounting, auditing, reporting and keeping inventory records).
- I. Demonstrates knowledge of methods and procedures for maintaining a safe instructional facility (e.g., identifying sources of safety-related information, evaluating safety hazards, maintaining a safe and clean learning environment, providing safety instruction) and for responding to emergencies (e.g., recognizing appropriate responses to given emergencies, identifying procedures for using safety equipment).

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Domain II – Communication

Competency 006: *The Technology Education teacher demonstrates knowledge of drafting.*

The beginning teacher:

- A. Knows how to select and use tools and materials for sketching and for technical drawing.
- B. Applies technical drawing conventions to produce and interpret drawings (e.g., multiview drawings, sectional views, pictorial representations, detail and assembly drawings).
- C. Knows how to create working drawings, presentation drawings and models for residential, community, and business needs.
- D. Understands the use of scales and dimensioning skills in producing and interpreting technical drawings.
- E. Knows how to use software related to technical drawing.

Competency 007: *The Technology Education teacher demonstrates knowledge of equipment and techniques used in graphic design, photography and image transfer and reproduction.*

The beginning teacher:

- A. Understands principles (e.g., perspective, shading, balance, proportion, harmony), elements (e.g., line, form, color), and applications (e.g., architectural, engineering) of graphic design.
- B. Demonstrates knowledge of equipment (e.g., input devices, output devices) and software (e.g., common characteristics of desktop publishing software, issues related to compatibility between software packages) used in desktop publishing.
- C. Demonstrates knowledge of skills (e.g., word processing, illustrating, layout) used in desktop publishing.
- D. Understands principles of photographic composition (e.g., lighting, perspective, focus) and how to select and use photographic equipment and materials.
- E. Applies techniques and processes related to photography (e.g., computer manipulation of images, product finishing processes).
- F. Knows how to select and use materials related to image transfer and reproduction.
- G. Understands techniques and processes related to image carrier preparation, transfer and reproduction.

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Competency 008: *The Technology Education teacher demonstrates knowledge of video and audio systems (e.g., radio, television), production techniques (e.g., recording, editing) and equipment (e.g., amplifiers, video cameras).*

The beginning teacher:

- A. Demonstrates knowledge of equipment used in video and audio production (e.g., cameras, microphones, mixers, amplifiers, lighting equipment) and of how this equipment is interconnected in recording systems.
- B. Understands skills and techniques used in video and audio recording.
- C. Understands skills used to manipulate video and audio files (e.g., video and audio editing techniques; file compression schemes; procedures for integrating video, audio, animation and special effects) and techniques for maintaining image and sound integrity during postproduction).

Competency 009: *The Technology Education teacher demonstrates knowledge of electronic communication.*

The beginning teacher:

- A. Understands scientific and technological concepts related to electronic communication.
- B. Demonstrates knowledge of materials and components used in electronic communication systems (e.g., satellite dishes, transmitters, receivers, uplinks, downlinks).
- C. Understands processes involved in electronic communication (e.g., how electromagnetic, satellite, and laser communication technologies send, transmit and receive messages).

Domain III –Manufacturing

Competency 010: *The Technology Education teacher demonstrates knowledge of types of manufacturing systems and of the organization, structure and management of manufacturing enterprises.*

The beginning teacher:

- A. Demonstrates knowledge of types of manufacturing systems (e.g., custom, repetitive).
- B. Identifies types of organizational structures used in manufacturing enterprises and their characteristics.
- C. Understands how workforce organization and management structure can influence technological development.

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Competency 011: *The Technology Education teacher demonstrates knowledge of the principles of product development and of the application of economic and marketing principles to manufacturing.*

The beginning teacher:

- A. Understands marketing processes and techniques and their use in preparing a marketing plan for an idea, product, or service.
- B. Demonstrates knowledge of financial factors associated with starting and operating manufacturing enterprises.
- C. Understands how competition, economic investment, risk and the potential for economic reward influence the process of technological innovation and production.
- D. Applies economic and marketing principles (e.g., cost-price relationships, supply and demand) to manufacturing.
- E. Demonstrates knowledge of principles of product development (e.g., design, prototype construction, testing).

Competency 012: *The Technology Education teacher understands how to use tools and equipment in manufacturing.*

The beginning teacher:

- A. Identifies types and characteristics of tools and equipment (e.g., micrometers, milling machines, lathes, jigs and fixtures, saws, drills, welding machines, computer numerical control machines) used in manufacturing.
- B. Knows how to use tools and equipment used in manufacturing.
- C. Knows how to maintain and adjust tools and equipment used in manufacturing.
- D. Understands safety issues related to the maintenance and use of tools and equipment used in manufacturing.

Competency 013: *The Technology Education teacher demonstrates knowledge of materials used in manufacturing.*

The beginning teacher:

- A. Identifies types and properties (e.g., elasticity, ductility, corrosion resistance) of raw materials used in manufacturing.
- B. Compares and contrasts the structure and properties of natural, synthetic and composite materials.

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- C. Knows how to select appropriate materials for a given manufacturing application.

Competency 014: *The Technology Education teacher demonstrates knowledge of manufacturing processes and quality control procedures.*

The beginning teacher:

- A. Demonstrates knowledge of processes used in manufacturing (e.g., casting, molding, forming, separating, conditioning, assembling, finishing).
- B. Demonstrates knowledge of the uses of automated systems (e.g., robotics, artificial intelligence, computer integrated manufacturing) in technology.
- C. Knows how to apply quality control procedures in manufacturing.

Domain IV – Construction

Competency 015: *The Technology Education teacher demonstrates knowledge of types of construction projects, procedures for planning, surveying and preparing sites for construction projects and postconstruction activities.*

The beginning teacher:

- A. Identifies types (e.g., residential, civil, commercial) and characteristics of construction projects.
- B. Understands how to plan, produce and manage a construction systems project.
- C. Understands how to prepare a site for a construction project.
- D. Demonstrates knowledge of surveying tools and equipment and their uses.
- E. Reads and interprets documents (e.g., survey reports, construction plans, zoning restrictions, building codes, environmental regulations) related to construction projects.
- F. Understands procedures related to postconstruction activities (e.g., site cleanup, waste disposal, landscaping) at a construction site.

Competency 016: *The Technology Education teacher knows how to apply engineering principles to construction projects.*

The beginning teacher:

- A. Identifies terms and concepts used in engineering.
- B. Applies engineering principles (e.g., tension, shear) to solve problems related to construction projects.

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- C. Analyzes the structural properties of construction designs (e.g., truss, cantilever, arch, suspension).

Competency 017: *The Technology Education teacher understands how to use hand and power tools in construction.*

The beginning teacher:

- A. Identifies types and characteristics of measuring devices, hand tools and power tools and equipment (e.g., rules, saws, drills, levels, cranes, backhoes) used in construction.
- B. Knows how to use measuring devices, tools and equipment used in construction.
- C. Knows how to maintain and adjust tools and equipment used in construction.
- D. Understands safety issues related to the maintenance and use of tools and equipment used in construction.
- E. Understands the safe and proper use of tools and equipment used in construction.

Competency 018: *The Technology Education teacher demonstrates knowledge of construction materials and their properties.*

The beginning teacher:

- A. Identifies types and properties (e.g., moisture content, strength, hardness, oxidation) of raw materials (e.g., wood, steel, concrete, masonry, glass) used in construction.
- B. Compares and contrasts the properties of materials used in construction.
- C. Knows how to select appropriate materials for a given construction application.

Competency 019: *The Technology Education teacher demonstrates knowledge of skills and techniques used for building, maintaining and repairing structures.*

The beginning teacher:

- A. Demonstrates knowledge of skills and techniques used for building structures.
- B. Demonstrates knowledge of skills and techniques used for maintaining and repairing structures.
- C. Demonstrates knowledge of skills and techniques related to framing (e.g., platform framing, post and beam) and roofing.

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- D. Demonstrates knowledge of subsystems (e.g., HVAC, plumbing, electrical) in construction projects.

Domain V — Energy, Power and Transportation

Competency 020: *The Technology Education teacher demonstrates knowledge of scientific concepts related to energy and power.*

The beginning teacher:

- A. Identifies scientific concepts and principles (e.g., conservation of energy, mechanical advantage, Pascal’s principle, Bernoulli’s principle) related to energy and power.
- B. Identifies types of energy (e.g., chemical, electrical) and methods of converting one form of energy to another (e.g., gas turbine, internal combustion engine, photovoltaic cell).
- C. Applies concepts and units of force, work, energy and power to solve problems in technology.
- D. Applies scientific concepts and principles to solve problems related to energy, power and transportation systems.

Competency 021: *The Technology Education teacher understands issues related to energy consumption and conservation.*

The beginning teacher:

- A. Identifies sources, availability and uses of renewable (e.g., solar, wind) and nonrenewable (e.g., coal, oil) energy.
- B. Understands issues (e.g., consumer choices, costs, impact on the environment) related to conserving natural resources and promoting sustainable development through techniques such as reusing, reducing and recycling.
- C. Demonstrates knowledge of processes used in extraction, production, transportation and storage of energy resources.

Competency 022: *The Technology Education teacher understands characteristics of thermal, electrical, fluid and mechanical power systems and methods of control, transmission and storage of energy and power.*

The beginning teacher:

- A. Identifies characteristics of thermal, electrical, fluid and mechanical power systems.

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- B. Demonstrates knowledge of methods of control, transmission and storage of energy and power (e.g., pneumatic and hydraulic systems, flywheels, batteries, dams).
 - C. Analyzes the design of thermal, electrical, fluid and mechanical power systems and recognizes advantages and disadvantages of systems designed for given functions.
 - D. Understands the role of mechanical parts such as levers, cams, gear trains, belts and pulleys in controlling and transmitting power.

Competency 023: The Technology Education teacher demonstrates knowledge of principles and applications of electronics.

The beginning teacher:

- A. Identifies types and characteristics of basic electronic components (e.g., resistors, inductors, transistors).
- B. Interprets schematic diagrams (e.g., determines function of a given circuit, determines the role of components in circuits) of AC and DC circuits and of analog and digital circuits.
- C. Analyzes voltage, resistance, current and power in series and parallel AC and DC circuits.
- D. Relates the operating principles of motors, meters, transformers and generators to basic principles of electricity and magnetism.

Competency 024: The Technology Education teacher demonstrates knowledge of the design and use of vehicles and vehicular subsystems and the characteristics of land, air, water and space transportation systems.

The beginning teacher:

- A. Identifies the characteristics of land, air, water and space transportation systems and their economic, safety and environmental impacts.
- B. Demonstrates knowledge of issues related to the design and use of vehicles (e.g., airplanes, trains, automobiles) and vehicular subsystems (e.g., powertrains, suspensions).
- C. Understands aerodynamic principles related to the design of transportation vehicles.

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Domain VI – Biotechnology and Computer Technology

Competency 025: *The Technology Education teacher understands the role of biotechnology in business, industry and society.*

The beginning teacher:

- D. Demonstrates knowledge of applications of bio-related technologies in business and industry.
- E. Demonstrates knowledge of ethical and legal considerations associated with the selection, development and use of bio-related technologies, including emerging and innovative technologies.
- F. Identifies the intended and unintended effects of bio-related technology (e.g., effect of hazardous waste on the environment, social and economic effects of bio-related technologies) and strategies for assessing risks and benefits of bio-related technologies.

Competency 026: *The Technology Education teacher demonstrates knowledge of principles of bio-related technologies.*

The beginning teacher:

- A. Understands the scientific principles of bio-related technologies.
- B. Demonstrates knowledge of principles and methods used in environmental engineering.
- C. Understands issues related to renewable and nonrenewable resources.
- D. Demonstrates knowledge of tools, equipment and materials used in bio-related technologies.

Competency 027: *The Technology Education teacher demonstrates knowledge of basic principles related to computer technology.*

The beginning teacher:

- A. Identifies types, characteristics and functions of computer hardware (e.g., server, router, video card, hub, modem), software applications (e.g., spreadsheets, firewall software, database management software, FTP client) and operating systems.
- B. Understands basic concepts of computer network architecture (e.g., LAN, WAN, Internet) and principles of data transfer within and between computer networks (e.g., role of network protocols such as TCP/IP).
- C. Knows how to perform routine installation, maintenance and troubleshooting procedures for stand-alone computers and computer networks.

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- D. Understands the role of computer programs and computer languages in computer technology.

Competency 028: *The Technology Education teacher understands appropriate and effective uses of computer technology.*

The beginning teacher:

- A. Understands computer system requirements for given applications.
- B. Identifies characteristics and uses of a variety of computer software applications (e.g., productivity, graphic design, modeling, multimedia, authoring).
- C. Demonstrates knowledge of issues (e.g., ethical, legal, commercial, privacy) related to security (e.g., use of firewalls and virus-protection software, passwords and log on procedures and protocols) and the use of computer technology to transfer and access information.

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Approaches to Answering Multiple-Choice Questions

The purpose of this section is to describe multiple-choice question formats that you will typically see on the Technology Education 6–12 test and to suggest possible ways to approach thinking about and answering them. These approaches are intended to supplement and complement familiar test-taking strategies with which you may already be comfortable and that work for you. Fundamentally, the most important component in assuring your success on the test is knowing the content described in the test framework. This content has been carefully selected to align with the knowledge required to begin a career as a Technology Education 6–12 teacher.

The multiple-choice questions on this test are designed to assess your knowledge of the content described in the test framework. In most cases, you are expected to demonstrate more than just your ability to recall factual information. You may be asked to think critically about the information, to analyze it, consider it carefully, and compare it with other knowledge you have or make a judgment about it.

Leave no questions unanswered. Questions for which you mark no answer are counted as incorrect. Your score will be determined by the number of questions you answer correctly.

The Technology Education 6–12 test is designed to include a total of 100 multiple-choice questions, out of which 80 are scored. The number of scored questions will not vary; however, the number of questions that are not scored may vary in the actual test. Your final scaled score will be based only on scored questions. The questions that are not scored are being pilot tested to collect information about how these questions will perform under actual testing conditions. These pilot questions are not identified on the test.

How to Approach Unfamiliar Question Formats

Some questions include introductory information such as a table, graph or reading passage (often called a stimulus) that provides the information the question asks for. New formats for presenting information are developed from time to time. Tests may include audio and video stimulus materials such as a movie clip or some kind of animation, instead of a map or reading passage. Other tests may allow you to zoom in on the details in a graphic or picture.

Tests may also include interactive types of questions. These questions take advantage of technology to assess knowledge and skills that go beyond what can be assessed using standard single-selection multiple-choice questions. If you see a format you are not familiar with, **read the directions carefully**. The directions always give clear instructions on how you are expected to respond.

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For most questions, you will respond by clicking an oval to choose a single answer choice from a list of options. Other questions may ask you to respond by:

- **Selecting all that apply.** In some questions, you will be asked to choose all the options that answer the question correctly.
- **Typing in an entry box.** When the answer is a number, you might be asked to enter a numeric answer or, if the test has an on-screen calculator, you might need to transfer the calculated result from the calculator into the entry box. Some questions may have more than one place to enter a response.
- **Clicking check boxes.** You may be asked to click check boxes instead of an oval when more than one choice within a set of answers can be selected.
- **Clicking parts of a graphic.** In some questions, you will choose your answer by clicking on location(s) on a graphic such as a map or chart, as opposed to choosing from a list.
- **Clicking on sentences.** In questions with reading passages, you may be asked to choose your answer by clicking on a sentence or sentences within the reading passage.
- **Dragging and dropping answer choices into “targets” on the screen.** You may be asked to choose an answer from a list and drag it into the appropriate location in a table, paragraph of text or graphic.
- **Selecting options from a drop-down menu.** This type of question will ask you to select the appropriate answer or answers by selecting options from a drop-down menu (e.g., to complete a sentence).

Remember that with every question, you will get clear instructions on how to respond.

Question Format

You may see the following types of multiple-choice questions on the test:

- Single Questions
- Clustered Questions

On the following pages, you will find descriptions of these commonly used question formats, along with suggested approaches for responding to each type.

Single Questions

The single-question format presents a direct question or an incomplete statement. It can also include a reading passage, graphic, table or a combination of these. Four or more answer options appear below the question.

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The following question is an example of the single-question format. It tests knowledge of Technology Education 6–12 Competency 010: *The teacher demonstrates knowledge of types of manufacturing systems and of the organization, structure and management of manufacturing enterprises.*

Example 1

1. Which of the following is an important advantage of the total quality management (TQM) system in manufacturing?
 - A. The decision process is made more efficient by its being centralized in a small group of individuals.
 - B. Workers in all departments take responsibility for quality assurance issues and design changes.
 - C. Quality control is monitored by specialists who are authorized to make managerial decisions.
 - D. Every aspect of manufacturing and design is closely monitored by sensors and other recording equipment.

Suggested Approach

Read the question carefully and critically. Think about what it is asking and the situation it is describing. Eliminate any obviously wrong answers, select the correct answer choice and mark your answer.

This question requires knowledge of the use of total quality management (TQM) in manufacturing. TQM emphasizes continuous improvement in all areas of a company's operation by integrating systems, decentralizing decision making, and empowering employees at all levels of the company. Now look at the response options and consider which of them best describes one advantage of the total quality management system in manufacturing.

Option A suggests that one advantage of total quality management is centralized decision making. Total quality management, however, relies on decentralized decision making by encouraging the active participation of all employees at all levels to ensure quality control. Therefore, option A is not an advantage of the total quality management system and is not the best response for this item.

Option B suggests that one advantage of total quality management is allowing employees in all departments to take responsibility for decisions about quality issues. Decentralized decision making and employee empowerment are important goals of the total quality management system because quality control problems can often be more effectively identified and corrected by nonmanagers who are most familiar with the production processes in their departments. Thus option B would correctly identify one advantage of the total quality management system.

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Option C suggests that one advantage of total quality management is the use of specialists who are authorized to make management decisions. This centralization of the decision-making process is contrary to the use of decentralized decision making and employee empowerment characteristic of total quality management systems. Therefore, option C is not an advantage of the total quality management system and is not the best response for this item.

Option D suggests that one advantage of total quality management is the use of sensors and recording equipment to monitor quality. While such devices may be used to help ensure quality control, total quality management is primarily a system for encouraging the participation of all employees in ensuring quality at all levels of the operation. Therefore, option D is not an advantage of the total quality management system and is not the best response for this item.

Of the alternatives offered, only allowing workers in all departments to take responsibility for quality assurance issues and design changes is an advantage of the total quality management system in manufacturing. Therefore, **the correct response is option B.**

Clustered Questions

Clustered questions are made up of a stimulus and two or more questions relating to the stimulus. The stimulus material can be a reading passage, description of an experiment, graphic, table or any other information necessary to answer the questions that follow.

You can use several different approaches to respond to clustered questions. Some commonly used strategies are listed below.

Strategy 1 Skim the stimulus material to understand its purpose, its arrangement and/or its content. Then read the questions and refer again to the stimulus material to obtain the specific information you need to answer the questions.

Strategy 2 Read the questions *before* considering the stimulus material. The theory behind this strategy is that the content of the questions will help you identify the purpose of the stimulus material and locate the information you need to answer the questions.

Strategy 3 Use a combination of both strategies. Apply the “read the stimulus first” strategy with shorter, more familiar stimuli and the “read the questions first” strategy with longer, more complex or less familiar stimuli. You can experiment with the sample questions in this manual and then use the strategy with which you are most comfortable when you take the actual test.

NOTE: After clicking on a link, right click and select “Previous View” to go back to original text.

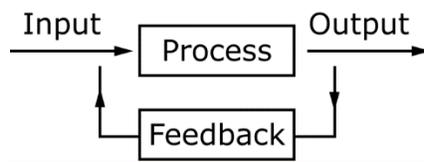
Whether you read the stimulus before or after you read the questions, you should read it carefully and critically. You may want to note its important points to help you answer the questions.

As you consider questions set in educational contexts, try to enter into the identified teacher’s frame of mind and use that teacher’s point of view to answer the questions that accompany the stimulus. Be sure to consider the questions only in terms of the information provided in the stimulus — not in terms of your own experiences or individuals you may have known.

Example 1

First read the stimulus (a diagram of the universal systems model).

Use the diagram below to answer the question that follows.



Now you are prepared to address the question associated with this stimulus. This question measures the knowledge of Technology Education 6–12 Competency 002: *The teacher understands the design process and its application in technology.*

1. The diagram above best represents which of the following systems?

- A. An electric fan that has two speeds: high and low.
- B. A security camera that films video on a continuous loop.
- C. A windmill with a fantail that turns the rotor into the wind.
- D. An outdoor light with a timer that turns on and off at preset times.

Suggested Approach

Read the question carefully and critically. Think about what it is asking and the situation it is describing. Eliminate any obviously wrong answers, select the correct answer choice and mark your answer.

Consider carefully the diagram of the universal systems model presented in the stimulus. Then read the question that asks you to identify which of four systems is best represented by the model shown in the diagram. Now look at the response options.

Option A suggests that the model best represents an electric fan that has two speeds. An electric fan has input (e.g., electricity), process (e.g., the action of the motor to rotate the blades of the fan) and output (e.g., moving air), but lacks a

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

feedback device (e.g., a thermostat). Therefore, option A is not the best response to this question.

Option B suggests that the model best represents a security camera that films video on a continuous loop. Such a system has input (e.g., light), process (e.g., converting the light to images on the film), and output (e.g., images on the film), but lacks a feedback device (e.g., a motion sensor that turns the film on and off). Therefore, option B is not the best response to this question.

Option C suggests that the model best represents a windmill with a fantail that turns the rotor into the wind. Such a windmill has input (e.g., wind), process (e.g., turning of the rotor by the wind), and output (e.g., electrical or mechanical energy). In addition, the fantail is a feedback device that adjusts input by turning the rotor into the wind when wind direction changes. Therefore, option C correctly identifies a system that is represented by the model presented in the diagram.

Option D suggests that the model best represents an outdoor light with a timer that turns on and off at preset times. Such a light has input (e.g., electricity), process (e.g., the production of light from electricity), and output (e.g., light), but lacks a feedback device (e.g., a light sensor that turns the light on or off at dusk or dawn regardless of the time). The timer is not a feedback device because it adjusts input according to a predetermined period of time rather than to variations in environmental conditions. Therefore, option D is not the best response to this question.

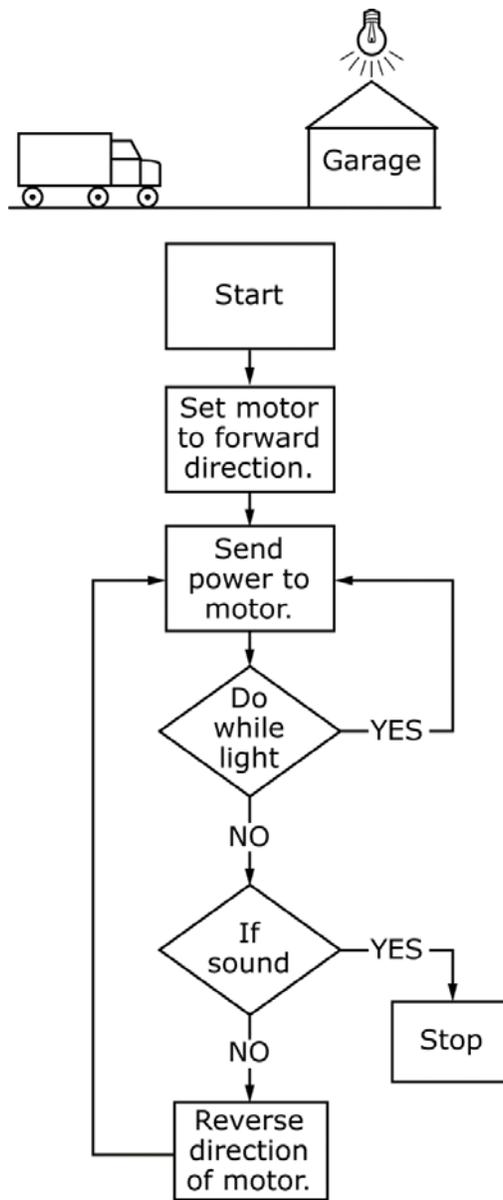
Of the four options offered, option C identifies a system that is best represented by the model presented in the diagram. Consequently, **option C is the correct response.**

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Example 2

Now read the stimulus of this item (a diagram and flowchart of the response of a robotic truck to light and sound).

Use the diagram and flowchart below to answer the question that follows.



Now you are prepared to address the question associated with this stimulus. This question measures the knowledge of Technology Education 6–12 Competency 027: *The teacher demonstrates knowledge of basic principles related to computer technology.*

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

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2. The robotic truck in the diagram contains a sound sensor and a light sensor. The table on which the truck is placed is well lit by a light bulb. The garage, which has an opening through which the truck can enter, is dark inside. The operator of the robotic truck has a whistle that can be used to activate the truck's sound sensor. The truck begins in the position shown in the diagram. Which of the following should occur if the operator blows the whistle continuously?
- A. The truck will go forward, enter the garage, reverse direction, then run backwards indefinitely.
 - B. The truck will go forward, enter the garage, then stop.
 - C. The truck will go a short distance forward, then stop without reaching the garage.
 - D. The truck will remain in its starting position without moving.

Suggested Approach

Read the question carefully and critically. Think about what it is asking and the situation it is describing. Eliminate any obviously wrong answers, select the correct answer choice and mark your answer.

Consider carefully the diagram and flowchart presented in the stimulus. Then read the question which asks you to correctly identify how the truck will act if the operator blows the whistle continuously. Now look at the response options.

Option A suggests that the truck will go forward, enter the garage, reverse direction, then run backwards indefinitely. According to the flowchart, the truck motor will first be set to the forward direction and power will be sent to the motor. This will cause the truck to move forward and enter the garage. Since the garage is dark, power is no longer sent to the motor. According to the flow chart, the truck will only reverse direction if there is no sound. Since the whistle is blowing continuously, the truck will not reverse direction. Therefore, response A is incorrect.

Option B suggests that the truck will go forward, enter the garage, and then stop. As in response A, the truck motor will first be set to the forward direction, power will be sent to the motor, and the truck will move forward and enter the garage. Since the garage is dark, power will no longer be sent to the motor. According to the flowchart, the truck will stop with the whistle blowing continuously. Therefore, response B correctly describes the action of the truck according to the diagram and flowchart, with the whistle blowing continuously.

Option C suggests that the truck will go a short distance forward, then stop without reaching the garage. As in response A, the truck motor will first be set to the forward direction and power will be sent to the motor. According to the flowchart, the truck will continue to move forward until it is dark. Since it is not dark until the truck enters the garage, the truck will not stop before it enters the garage. Therefore, response C is incorrect.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Option D suggests that the truck will remain in its starting position without moving. According to the flowchart, however, power will be sent to the motor and the truck will move forward if there is light. Since there is light outside the garage, the truck will move forward until it is in the garage. Therefore, response D is incorrect.

Of the four options offered, option B best describes the action of the truck according to the diagram and flowchart, with the whistle blowing continuously. Therefore, **the correct response is option B.**

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Multiple-Choice Practice Questions

This section presents some sample test questions for you to review as part of your preparation for the test. To demonstrate how each competency may be assessed, each sample question is accompanied by the competency that it measures. While studying, you may wish to read the competency before and after you consider each sample question. Please note that the competency statements do not appear on the actual test.

For each sample test question, there is at least one correct answer and a rationale for each answer option. Please note that the sample questions are not necessarily presented in competency order.

The sample questions are included to illustrate the formats and types of questions you will see on the test; however, your performance on the sample questions should not be viewed as a predictor of your performance on the actual test.

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 004

1. A technology education class is planning the design and production of an all-in-one remote control for the home. The teacher wants the class to understand the importance of considering human factors in the project. Which of the following is the best first activity to assign the students?
 - A. Explaining the importance of ergonomics as it relates to the target design
 - B. Sketching prototypes of the remote control that will work with various sizes of human hands
 - C. Determining the dimensions and sizes of input mechanisms, such as keyboards
 - D. Defining which areas of the home will be controlled by the remote

Answer and Rationale

COMPETENCY 017

2. Which of the following types of tools is powered by compressed air?
 - A. Powder-actuated
 - B. Pneumatic
 - C. Hydraulic power
 - D. Electric

Answer and Rationale

COMPETENCY 005

3. Which of the following is a primary advantage of using a horseshoe layout in a computer classroom?
 - A. It saves space.
 - B. It encourages discussion.
 - C. It allows students to work in groups.
 - D. It allows easy access to individual students.

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 022

4. A wheelbarrow is an everyday example of which of the following types of levers?
- A. Class-1
 - B. Class-2
 - C. Class-3
 - D. Class-4

Answer and Rationale

COMPETENCY 001

5. Which of the following companies developed the first single-chip microprocessor?
- A. Intel
 - B. Motorola
 - C. Texas Instruments
 - D. Advanced Micro Devices

Answer and Rationale

COMPETENCY 016

6. Which of the following methods best improves surface density when pouring concrete?
- A. Covering the concrete with protective plastic
 - B. Vibrating the concrete once poured
 - C. Adding extra water to the concrete
 - D. Adding cement powder to the concrete

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 027

7. Which of the following is the fastest type of cache memory in a computer?
- A. L1
 - B. L2
 - C. RAM
 - D. ROM

Answer and Rationale

COMPETENCY 004

8. Designing a logo to accurately communicate a company's message is an example of which of the following steps of the communication model?
- A. Encoding
 - B. Transmitting
 - C. Decoding
 - D. Evaluating

Answer and Rationale

COMPETENCY 007

9. Which of the following actions will best enable viewers of a Web site to process written information?
- A. Using multiple fonts
 - B. Leaving white space
 - C. Using multiple colors
 - D. Maintaining consistent styles

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 018

10. Which of the following is the strongest alloy?

- A. Steel
- B. Tungsten
- C. Chromium
- D. Titanium

Answer and Rationale

COMPETENCY 017

11. Which TWO of the following saws are best suited for cutting an eight-foot two-by-four board in half?

- A. Band saw
- B. Table saw
- C. Circular saw
- D. Jigsaw
- E. Handsaw

Answer and Rationale

COMPETENCY 003

12. Which of the following statements about the National Electric Code (NEC) is true?

- A. Jurisdictions that adopt the NEC must adopt installation codes at the same time.
- B. The NEC ensures that the same electric codes are enforced across the United States.
- C. The NEC is more effective when jurisdictions adopt it as law.
- D. Amendments to the NEC are primarily made at local, not state, levels.

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 025

13. Which of the following topics best addresses a primary ethical concern of biofuel production?
- A. Biofuel production often uses bioremediation to stimulate bacteria that turns waste into harmless by-products.
 - B. Biofuel production often causes food and energy to compete for limited agricultural resources.
 - C. Biofuel production can lead to unintentional cross-pollination of weeds and wild relatives of the crop species.
 - D. Biofuel production can create a carbon-monoxide-infused slurry that requires special care and disposal.

Answer and Rationale

COMPETENCY 020

14. Which of the following types of energy is primarily created by electromagnetic waves?
- A. Chemical energy
 - B. Sound energy
 - C. Nuclear energy
 - D. Radiant energy

Answer and Rationale

COMPETENCY 013

15. Which of the following is a key weakness of composite decking?
- A. It requires sanding or using chemical strippers for surface preparation.
 - B. It is susceptible to load failure if there are incorrectly formed joints.
 - C. It easily degrades in the absence of proper drainage and airflow.
 - D. It is vulnerable to sagging when temperatures soar.

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 002

16. If a car has cruise control, which of the following aspects is removed from the feedback loop?
- A. Speed
 - B. Engine
 - C. Speedometer
 - D. Driver

Answer and Rationale

COMPETENCY 011

17. During which of the following processes does a product go through a promotional stage before being moved into full production?
- A. Commercialization
 - B. Test marketing
 - C. Product development
 - D. Product screening

Answer and Rationale

COMPETENCY 026

18. Which of the following pieces of equipment is used to view internal structures without the use of radiation?
- A. CT scan
 - B. Mammography
 - C. Ultrasound
 - D. X-ray

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 023

19. Rising temperature in a copper wire has which of the following effects on the flow of electricity?
- A. Electrical flow increases.
 - B. Electrical flow decreases.
 - C. Electrical flow does not change.
 - D. Electrical flow is not carried.

Answer and Rationale

COMPETENCY 009

20. Which of the following statements about electronic communication is true?
- A. One-way transmissions are also known as full or half duplex.
 - B. Digital signals are often broad, continuous codes.
 - C. Messages are converted to analog signals before being sent over cable.
 - D. Electronic signals repeatedly switch from digital to analog.

Answer and Rationale

COMPETENCY 015

21. Which of the following tools is best for a surveyor to use to measure both horizontal and vertical angles?
- A. Compass
 - B. Level
 - C. Chain
 - D. Transit

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 024

22. A teacher asks an eighth-grade class to design a paper airplane that can fly high on a windy day. The assigned activity best teaches students the principle of
- A. thrust.
 - B. force.
 - C. lift.
 - D. gravity.

Answer and Rationale

COMPETENCY 006

23. Which THREE of the following tabs are used exclusively in the 3-D work space of AutoCAD?
- A. Solid
 - B. Layout
 - C. Surface
 - D. Mesh
 - E. Parametric

Answer and Rationale

COMPETENCY 028

24. Which of the following types of software is best for gathering data and presenting an analysis?
- A. System
 - B. Educational
 - C. Multimedia
 - D. Productivity

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 008

25. A student who is filming a scene moves the camera from the first floor to the second floor of the school along a constant vertical axis. The student is primarily using which of the following camera moves?
- A. Tilt
 - B. Pan
 - C. Pedestal
 - D. Zoom

Answer and Rationale

COMPETENCY 011

26. Which of the following strategies is the best approach in developing a successful marketing plan?
- A. Focusing efforts on new customers instead of returning customers
 - B. Having a general idea of what customers want
 - C. Developing a unique selling proposition that sets the company apart
 - D. Creating an advertising plan using minimal research

Answer and Rationale

COMPETENCY 025

27. The United States government currently regulates food produced from genetically modified crops by
- A. treating it like any other food, irrespective of production method.
 - B. requiring labels to identify it as genetically modified.
 - C. delaying approval while testing for long-term side effects.
 - D. banning it for human consumption through legislation.

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 014

28. Which of the following power tools is best used to finish edges of metal after cutting or welding?

- A. Lathe
- B. Deburring and polishing machine
- C. Drill press
- D. Sheet metal shear machine

Answer and Rationale

COMPETENCY 021

29. Which of the following is the most common type of active solar collector?

- A. Flat-plate
- B. Direct gain
- C. Parabolic dish
- D. Linear-concentrating parabolic

Answer and Rationale

COMPETENCY 011

30. A technology education teacher is planning an activity that asks students to create a marketing plan. Which of the following is the best first step for the students to take?

- A. Determine the product being marketed.
- B. Identify the ideal customer.
- C. Create materials to educate the market.
- D. Develop an overarching plan.

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

COMPETENCY 019

31. Which of the following is the main advantage of using roof trusses when building houses?
- A. Trusses expedite the building process.
 - B. Trusses prevent rainwater from damaging the roof decking.
 - C. Trusses provide a strong and secure cover for the house.
 - D. Trusses create a moisture barrier to protect the wooden framing.

Answer and Rationale

COMPETENCY 027

32. Which of the following is a unique numerical identifier assigned to computers that are networked on an intranet or through the Internet?
- A. MAC address
 - B. ISSN
 - C. IP address
 - D. SSID

Answer and Rationale

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Acknowledgements

Practice Questions

1. Intel
2. Motorola
3. Texas Instruments
4. Advanced Micro Devices
5. National Electric code

NOTE: After clicking on a link, right click and select "Previous View" to go back to original text.

Answer Key and Rationales

Question Number	Competency Number	Correct Answer	Rationales
1	004	A	<p>Option A is correct because in order for students to begin considering design implications and use, they must first understand the principles of ergonomics, which studies how the interactions between humans and the elements of a system can optimize humans' well-being. Options B, C and D are incorrect because they should be introduced only after some foundational knowledge has been introduced and understood.</p> <p>Back to Question</p>
2	017	B	<p>Option B is correct because pneumatic tools are powered by compressed air. Option A is incorrect because powder-actuated tools are powered by gunpowder. Option C is incorrect because hydraulic power tools are powered by fluids. Option D is incorrect because electric tools are powered by electricity.</p> <p>Back to Question</p>
3	005	D	<p>Option D is correct because horseshoe positioning has an opening that allows the instructor to have easy access to students. Option A is incorrect because the horseshoe requires a large room; therefore, saving space is not a benefit. Option B is incorrect because the horseshoe only allows interaction between students on either side of the table. Option C is incorrect because the horseshoe does not allow students to communicate easily in groups.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
4	022	B	<p>Option B is correct because a class-2 lever has the load between the effort and the fulcrum, as on a wheelbarrow. Option A is incorrect because a class-1 lever has the fulcrum between the load and the effort, as on a pair of scissors. Option C is incorrect because a class-3 lever has the effort between the fulcrum and the load, as on a shovel. Option D is incorrect because there are only three classes of levers.</p> <p>Back to Question</p>
5	001	A	<p>Option A is correct because Intel produced the 4004 chip, the first single-chip microprocessor. Options B, C and D are incorrect because these companies created their processors after Intel.</p> <p>Back to Question</p>
6	016	B	<p>Option B is correct because vibrating the concrete once poured eliminates small bubbles and holes that can appear on the surface of the concrete when dry. Option A is incorrect because covering concrete with plastic will keep excess water off, not improve surface density. Option C is incorrect because adding extra water will make the concrete soft and weak. Option D is incorrect because while adding cement powder will increase the overall strength of the concrete, the surface density will not be affected.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
7	027	A	<p>Option A is correct because the L1 cache works at the speed of the processor. Option B is incorrect because the L2 cache is generally two to three times slower than the L1 cache. Option C is incorrect because RAM is six times slower than the L1 cache. Option D is incorrect because ROM is not a type of cache memory.</p> <p>Back to Question</p>
8	004	A	<p>Option A is correct because encoding is the process of translating an idea into symbols that receivers can understand. In this case, the logo is the visual symbol used to encode the company's image. Option B is incorrect because transmission is the process of sending the message through various channels. In this case, transmission may occur when the logo is printed and distributed on a business card. Option C is incorrect because decoding is the processing stage in which the receiver interprets the message. In this case, decoding takes place when a customer sees the logo and forms an opinion about the company based on the logo. Option D is incorrect because evaluating is what happens at the end of the process to determine if receivers (customers) got the intended message.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
9	007	B	<p>Option B is correct because leaving white space focuses the viewer’s attention and gives the opportunity to take a break from all the information provided. Option A is incorrect because when fonts vary too much, it can be distracting and can disrupt the viewer's understanding. Option C is incorrect because colors provide emphasis but don’t necessarily help the viewer understand the intended message. Option D is incorrect because consistency of style must be used when creating a project, but it does not play as big a part in helping the viewer process information as white space does.</p> <p>Back to Question</p>
10	018	A	<p>Option A is correct because the strongest alloy is steel mixed with a few other elements. Steel alloys rank first in the top ten for yield and tensile strength. Options B, C and D are incorrect because tungsten, chromium, and titanium alloys are not stronger than steel.</p> <p>Back to Question</p>
11	017	C, E	<p>Option C is correct because a circular saw is designed for rough, fast cutting of wood. Option E is correct because a handsaw is a manual version of the circular saw. Option A is incorrect because a band saw is best used for metals and intricate work. Option B is incorrect because a table saw is best used for rip cuts, or lengthwise cutting of boards. Option D is incorrect because a jigsaw has a delicate blade designed for fine detail work.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
12	003	C	<p>Option C is correct because when adopted into law by states and local jurisdictions, the NEC has a more real significance. Option A is incorrect because installation-code timing is different among locals. Option B is incorrect because different electrical codes are enforced across the United States. Option D is incorrect because the NEC can be adopted with both state and local amendments.</p> <p>Back to Question</p>
13	025	B	<p>Option B is correct because research shows that competition for limited agricultural resources is by far the primary concern of biofuel technologies. Option A is incorrect because bioremediation is one of the primary concerns of environmental biotechnology and waste treatment. Option C is incorrect because cross-pollination is a major concern associated with genetically modified food. Option D is incorrect because carbon-monoxide-infused slurry is associated with bioleaching technologies.</p> <p>Back to Question</p>
14	020	D	<p>Option D is correct because the transportation of electromagnetic waves creates radiant energy. Option A is incorrect because chemical energy is created from the making and breaking of bonds in molecules. Option B is incorrect because sound energy is produced when compression and rarefaction waves travel through the air. Option C is incorrect because nuclear energy is produced when nuclear mass is converted into energy.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
15	013	C	<p>Option C is correct because composite decking, which contains about 50 percent wood dust, can easily degrade without proper drainage and airflow. Option A is incorrect because applying chemical strippers and sanding is done before staining a wooden deck. Option B is incorrect because susceptibility to load failure from incorrectly formed joints is a drawback of an aluminum deck. Option D is incorrect because vulnerability to sagging in high temperatures is a drawback of a plastic deck.</p> <p>Back to Question</p>
16	002	D	<p>Option D is correct because the driver is removed from the feedback loop when the speed is automatically monitored. Option A is incorrect because speed is one of the elements of the feedback system. Option B is incorrect because the engine is the part of the system that propels the car. Option C is incorrect because the speedometer monitors the speed to make sure the car is at the desired speed.</p> <p>Back to Question</p>
17	011	B	<p>Option B is correct because test marketing enables the company to test the product out before fully manufacturing it on a large scale. Option A is incorrect because commercialization is the process of introducing a new product or production method into commerce—making it available on the market. Option C is incorrect because product development describes the process of developing the product. Option D is incorrect because product screening is the process by which a company makes a selection from a set of potential products.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
18	026	C	<p>Option C is correct because the main advantage of ultrasound is that certain internal structures can be observed without using radiation. Option A is incorrect because Computerized Tomography (CT) or Computerized Axial Tomography (CAT) scanning adds x-ray images with the aid of a computer to generate cross-sectional views of a patient’s anatomy, which exposes patients to radiation. Option B is incorrect because mammography exposes patients to radiation; it is a specific type of imaging that uses a low-dose x-ray system to examine breasts. Option D is incorrect because imaging with x-rays involves exposing a part of the body to a small dose of ionizing radiation to produce pictures of the inside of the body. X-rays are the oldest and most frequently used form of medical imaging.</p> <p>Back to Question</p>
19	023	B	<p>Option B is correct because according to Ohm’s law, increasing the resistance of the circuit will lower the current. Raising the temperature of copper increases its resistance by 0.393 percent per degree Celsius. Options A and C are incorrect because increasing temperature increases resistance, which lowers the current flow. Option D is incorrect because copper is able to conduct electricity at varying temperatures.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
20	009	D	<p>Option D is correct because electronic signals change from analog to digital and vice versa. Option A is incorrect because one-way transmissions are known as simplex. Option B is incorrect because digital signals are discrete on/off codes. Option C is incorrect because messages are converted to electrical signals instead of analog signals.</p> <p>Back to Question</p>
21	015	D	<p>Option D is correct because the transit is a surveyor’s tool that measures both horizontal and vertical angles. Option A is incorrect because a compass determines the direction of a line. Option B is incorrect because a level determines elevation. Option C is incorrect because a chain measures distance.</p> <p>Back to Question</p>
22	024	C	<p>Option C is correct because lift is the aerodynamic force that holds an airplane in the air. Option A is incorrect because thrust is generated by airplane engines. Options B and D are incorrect because force and gravity are too broad and could apply to many activities, not just activities related to airplanes.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
23	006	A, C, D	<p>Option A is correct because the solid tab only appears in the 3-D work space. Option C is correct because the surface tab only appears in the 3-D work space. Option D is correct because the mesh tab only appears in the 3-D work space. Option B is incorrect because the layout tab only appears in the 2-D work space. Option E is incorrect because the parametric tab appears in both the 2-D and 3-D work spaces.</p> <p>Back to Question</p>
24	028	D	<p>Option D is correct because productivity software includes word processing, spreadsheet, presentation, database, personal information management, and personal finance applications. Spreadsheet software enables users to do calculations and manipulate numerical analyses easily using built-in formulas. Option A is incorrect because system software is software that enables a computer to run, such as operating system software, drivers for hardware devices, and computer resource management programs. Option B is incorrect because educational software includes products that teach users new skills such as typing, speaking a language, cooking, or playing an instrument. Option C is incorrect because multimedia software includes image editing, video editing, and auditing software; animation software; and other specialty software required to produce computer games, animations and movies.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
25	008	C	<p>Option C is correct because physically moving the camera up or down along a constant vertical axis is called a pedestal shot. Option A is incorrect because in a tilt shot, only the camera lens moves; the camera itself remains in the same spot. Option B is incorrect because to pan means to move the camera lens from side to side. The camera itself remains in the same spot. Option D is incorrect because to zoom means to use the lens to make the subject appear farther away or closer to the camera.</p> <p>Back to Question</p>
26	011	C	<p>Option C is correct because a unique selling proposition sets businesses apart from the competition. Option A is incorrect because most business is generated from repeat customers, not new customers. Option B is incorrect because having only a general idea is not enough; businesses should determine specifically what their customers want. Option D is incorrect because developing an effective advertising plan requires extensive research.</p> <p>Back to Question</p>
27	025	A	<p>Option A is correct because the United States government has not to date established any regulations specific to bioengineered food. Option B is incorrect because labeling laws have been proposed, but none have been passed. Option C is incorrect because foods produced from genetically modified crops are not tested more than other foods. Option D is incorrect because not only are genetically modified crops not banned, but some sources estimate that up to 85 percent of United States corn is genetically engineered.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
28	014	B	<p>Option B is correct because a deburring and polishing machine uses abrasive material like sandpaper to smooth and polish the ragged edges that result from cutting or welding. Option A is incorrect because a lathe rotates a part against a tool whose position it controls. It is useful for fabricating parts or features that have a circular cross section. Option C is incorrect because a drill press is a rotating power tool that uses drill-bit tools of various sizes for boring cylindrical holes in wood, metal, plastic, etc. Option D is incorrect because a sheet metal shear machine can be a manual or power metal-cutting tool.</p> <p>Back to Question</p>
29	021	A	<p>Option A is correct because the most common type of active solar collector is the flat-plate collector because of its simplicity and reliability. Options B, C and D are incorrect because they are less commonly used solar collectors.</p> <p>Back to Question</p>
30	011	B	<p>Option B is correct because most experts recommend identifying the customer for the product as the first step. Option A is incorrect because the product is being provided to the students, so it has already been identified. Option C is incorrect because educational materials must be geared toward the ideal customer. Option D is incorrect because an overarching plan can only be developed after identifying the market, or ideal customer.</p> <p>Back to Question</p>

Question Number	Competency Number	Correct Answer	Rationales
31	019	A	<p>Option A is correct because the major advantage of trusses is that the roof can be built much more quickly. Option B is incorrect because metal drip edges keep rainwater from damaging the ends of the wooden decking. Option C is incorrect because trusses do not cover the house; gable roofs have two sloping sides that meet at the ridge, which makes a strong and secure cover for the house. Option D is incorrect because insulation has waterproof paper attached to one side that faces the inside of the house and keeps moisture away from the wooden framing materials.</p> <p>Back to Question</p>
32	027	C	<p>Option C is correct because an IP address is a unique numeric identifier for a computer or other device on a TCP/IP network. Option A is incorrect because a media access control address (MAC address) is a unique identifier assigned to most network adapters or network interface cards (NICs) by the manufacturer for identification. Option B is incorrect because an International Standard Serial Number (ISSN) is an identifier assigned to a device that is permanent, in the same way ISBNs uniquely identify books. Option D is incorrect because a system set identifier (SSID) is the name of a wireless local area network (WLAN).</p> <p>Back to Question</p>

Preparation Resources

The resources listed below may help you prepare for the TExES test in this field. These preparation resources have been identified by content experts in the field to provide up-to-date information that relates to the field in general. You may wish to use current issues or editions to obtain information on specific topics for study and review.

JOURNALS

Career and Technical Education Research, Association for Career and Technical Education Research. <http://cter.cteunt.org/journal>

Journal of Technology Education, Council on Technology Teacher Education and the International Technology Education Association.
<http://scholar.lib.vt.edu/ejournals/JTE/>

OTHER RESOURCES

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Wright, R. T. (2011). *Manufacturing and Automation Technology*. Tinley Park, Ill.: Goodheart-Willcox.

Wright, R. T. (2008). *Technology*. Tinley Park, Ill.: Goodheart-Willcox.

Wright, R. T., Brown, R. A., and Gradwell, J. B. (2008). *Technology: Design and Applications*. Tinley Park, Ill.: Goodheart-Willcox.

ONLINE RESOURCES

International Technology and Engineering Educators Association —
<http://www.iteea.org/>

Texas Education Agency Career Technology Education —
http://tea.texas.gov/Curriculum_and_Instructional_Programs/Learning_Support_and_Programs/Career_and_Technical_Education/Career_and_Technical_Education/