



The *PRAXIS*® Study Companion

Technology Education (5051)



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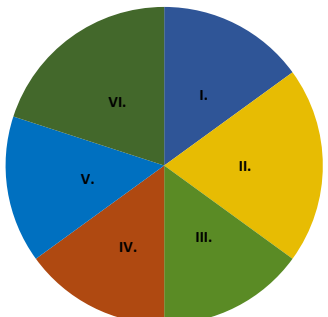
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Technology Education (5051)

Test at a Glance

The Praxis® Technology Education test is designed to measure knowledge and competencies that are important for safe and effective beginning practice as a technology education specialist

Test Name	Technology Education		
Test Code	5051		
Time	2 hours		
Number of Questions	120 selected-response		
Format	The test consists of a variety of selected-response questions, where you select one or more answer choices. You can review the possible question types in Understanding Question Types.		
Test Delivery	Computer Delivered		
	Content Categories	Approximate Number of Questions	Approximate Percentage of Examination
	I. Technology and Society	18	15%
	II. Technological Design and Problem Solving	24	20%
	III. Energy, Power, and Transportation	18	15%
	IV. Information and Communication Technologies	18	15%
	V. Manufacturing and Construction Technologies	18	15%
	VI. Pedagogical and Professional Studies	24	20%

About The Test

The Technology Education test is designed for candidates seeking certification as a middle school or high school teacher. The test focuses on the knowledge and skills a teacher must have to support the technology education curriculum. It incorporates essential concepts from the Technological Literacy Standards prepared by the International Technology and Engineering Educators Association (ITEEA). In addition, the test reflects concepts from the International Society for Technology Standards for Teachers (ISTE® Standards•T).

The 120 selected-response questions cover topics in technology education, including knowledge of information and communication; construction, manufacturing, and energy/power/transportation technologies; and the impact of these areas on individuals, the environment, and society. The test taker is required to apply pedagogical and professional knowledge to answer questions focused on the individual understanding and application of current technology education principles.

This test may contain some questions that will not count toward your score.

Content Topics

This list details the topics that may be included on the test. All test questions cover one or more of these topics.

Note: The use of “e.g.” to start a list of examples implies that only a few examples are offered and the list is not exhaustive, whereas the use of “i.e.” to start a list of examples implies that the given list of examples is complete.

Discussion Questions

In this section, discussion questions provide examples of content that may be included in the questions you receive on testing day. They are open-ended questions or statements intended to help test your knowledge of fundamental concepts and your ability to apply those concepts to classroom or real-world situations. We do **not** provide answers for the discussion questions but thinking about the answers will help improve your understanding of fundamental concepts and may help you answer a broad range of questions on the test. Most of the questions require you to combine several pieces of knowledge to formulate an integrated understanding and response. They are written to help you gain increased understanding and facility with the test’s subject matter. You may want to discuss these questions with a teacher or mentor.

I. Technology and Society

A. Understands the nature of technology, technology education, and technological literacy

- B. Understands how invention and innovation occur, how they are influenced by cultural and economic factors, and how they are built on existing technologies**
- C. Understands how technological development is influenced by knowledge from other fields of study, especially mathematics and the sciences**
- D. Understands the influence that significant technological innovations have had on human history and on today’s world**
- E. Understands critical changes in technology through the different periods of human history (e.g., the Iron Age, the Industrial Revolution, the information age)**
- F. Understands how various factors (e.g., marketing, economics, environment) affect technology development**
- G. Understands the impact of technology on society and on social institutions such as the family and the political system**
- H. Understands ways to decrease the negative environmental impact of technological systems and processes (e.g., by reducing resource inputs, reducing waste, recycling) and knows how to evaluate trade-offs with respect to different approaches**
- I. Understands the relationships between engineering, mathematics, science, and technology**

Discussion Questions: Technology and Society

- How do science, engineering, and math influence new technological developments?
- What type of impacts can a new technological innovation (e.g., a new type of water-purification system) have on a developing country?
- What are the primary differences between science, technology, and engineering?
- What ethical issues should be considered when biotechnology is developed and implemented?
- How have changes in societal norms directed the evolution of technological innovations?
- How have technological innovations influenced the evolution of societal norms?
- What technological innovations have been developed to reduce negative environmental impacts?
- How has technological evolution contributed to the interrelationship of science, technology, engineering, and mathematics?
- How do cultural and economic factors influence both technological inventions and innovations?
- Describe the interplay of science, technology, engineering, and mathematics; are they equally valued among students, technologists, and society as a whole?
- How does technology influence local, state, national, and international political systems?

- Describe when and how desirable and undesirable technological developments occur and how they are supported by economic interests and highly developed marketing.
- How have the different ages and eras (e.g., Iron Age, Renaissance, Industrial Revolution, information age) influenced technological evolution?

II. Technological Design and Problem Solving

- Understands how to implement and document the steps of a design process**
- Knows how to select and use tools—especially software—in a design process, including the creation, testing, evaluation, and communication of solutions**
- Understands how to identify a problem and define design requirements (criteria and constraints)**
- Knows how to generate possible solutions to design problems and how to select, develop, and refine design proposals using analysis and creativity**
- Knows how to evaluate, test, and optimize designs using specifications, design principles, modeling, experimentation, and prototyping**
- Understands how to organize and communicate the solution to a design problem—for example, by the use of verbal, graphic, quantitative, written, and three-dimensional representations**

- G. Understands systems thinking (i.e., input, process, output, feedback) and knows how to model it for students**
- H. Understands there is no such thing as a perfect design and that making design decisions involves balancing trade-offs**
- I. Knows how to operate, maintain, and troubleshoot technological systems**
- J. Knows how to apply the design process to systems and problems in energy, power, and transportation**
- K. Knows how to apply the design process to problems in information technology and communications technology**
- L. Knows how to apply the design process to problems in manufacturing and construction**

Discussion Questions: Technological Design and Problem Solving

- What are some common techniques used for troubleshooting technological systems, and how are they documented and communicated?
- How can a design process be systematically created and applied to a given problem that is relative to each of the Technology Educations of science, technology, engineering, and mathematics (STEM)?
- What are the typical steps used in a problem-solving process?
- How is the universal systems model applied to various technology sectors (e.g., transportation, manufacturing, biotechnology)?

- How are design specifications (e.g., criteria, constraints, form, function, cost, testing) applied?
- What factors of a system's design contribute to proper maintenance and feedback to optimize the system's operation?
- A student is disappointed that the design for a vehicle using alternative fuels has failed. How should the technology education teacher use the information as an opportunity to teach the student about the advantages of design failure?

III. Energy, Power, and Transportation

- A. Understands and knows how to utilize various types of control systems (e.g., electrical, chemical, mechanical)**
- B. Knows how to apply mathematical and scientific principles to solve problems involving the harness, transfer, loss, transmission, and conversion of power and energy**
- C. Understands energy utilization systems (e.g., internal combustion, external combustion, hybrid)**
- D. Knows the inputs used in transportation systems (e.g., capital, materials, people)**
- E. Understands the components of vehicles and support systems, including infrastructures and subsystems for propulsion, suspension, control, and guidance**

- F. Understands the different processes involved in transportation operations (e.g., receiving, storing, loading, moving, unloading), along with the part each process plays in the efficiency of the overall system**
- G. Understands the different forms of energy— mechanical, thermal, chemical, nuclear, etc.— and the differences between them**
- H. Understands and can model the relationship between energy, power, and work**
- I. Knows how energy is measured and controlled**
- J. Knows how to apply concepts of energy and power to solve problems related to them**
- K. Knows the different ways power is generated and used, including the differences in efficiency and impact on the environment**
- L. Knows and applies safety practices related to working with energy and power**

Discussion Questions: Energy, Power, and Transportation

- How does a hybrid automobile differ from a traditional internal combustion automobile?
- What information is needed for a designer to build an effective wind turbine?
- What are some common methods used to transport people and goods?
- How are electronic components used in series, parallel, and series-parallel circuits?

- How are the various forms of energy (e.g., mechanical, thermal, electrical) used, measured, and transformed?
- What safety procedures must be followed when someone is working with and around mechanical, electrical, and power systems?
- Explain how a subsystem is part of a larger system and what their relationship is (e.g., gears are part of a transmission system, which is a subsystem of the drive system for a vehicle).
- How are logistics and distribution processes interrelated within local, state, national, and international transportation systems?
- Name the different modes of transportation used by logistics and distribution entities.

IV. Information and Communication Technologies

- A. Understands major concepts and terminology related to information systems**
- B. Given a communications problem or task, can identify and knows how to use appropriate tools and materials, especially software and hardware, to address it**
- C. Knows how to use operating systems, software applications, communication devices, and networking components in the classroom/ laboratory**
- D. Recognizes the various types of network structures (e.g., LAN, MAN, WAN)**

- E. Understands the concepts that make up a communications system: source, encoding, transmission, reception, decoding, storage, retrieval, and destination**
- F. Understands concepts and terminology related to audio, video, electronic, data, technical, and graphic communications**
- G. Knows how to arrange the elements of a communication message so that the message is effective and aesthetically pleasing**
- H. Knows the impact of communication technology and media on society and culture**
- I. Understands legal and ethical issues regarding the use of communications and information technologies (e.g., copyright, privacy, security)**
- J. Knows issues and trends in information and communications technologies**

Discussion areas: Information and Communication Technologies

- How does a wireless LAN differ from a wired LAN?
- What is a cable modem, and how does it work?
- How does following the rule of thirds help a person take better digital pictures?
- What are some of the causes and effects that have resulted from new communication technologies?
- Explain how copyright laws are applied to students using music in a student video.
- What are the various printing processes, and how are they applied?
- Describe the elements of communication (e.g., balance, weight, rhythm, harmony, proportion) that are used in design layout processes.
- What are the different modes of communication systems (e.g., fiberoptic, satellite, microwave), and how do they carry various signals?
- Explain how computer software is installed and maintained on a computer in a lab or classroom network.

V. Manufacturing and Construction Technologies

- A. Knows the management functions used in construction and manufacturing (e.g., planning, organizing, directing)**
- B. Knows how to apply a systems model to manufacturing and construction processes (inputs, processes, outputs, feedback)**
- C. Knows the key concepts associated with the efficiency of production (e.g., automation, interchangeable parts, just-in-time inventory)**
- D. Understands the differences between manufacturing systems that involve flexible, continuous, batch, and custom production**
- E. Knows the variety and properties of materials used in the manufacture of products and can evaluate the suitability of material to different manufacturing purposes**

- F. Knows the primary processing methods of converting raw materials into industrial materials or standard stock (e.g., electrochemical, mechanical, thermal) and the secondary processing methods of converting industrial materials into finished products (e.g., casting and molding, forming, assembling)**
- G. Understands the key concepts and terminology related to construction**
- H. Knows the variety and properties of materials used in the construction of structures and can evaluate the suitability of material to different construction purposes**
- I. Understands the numerous constraints on structural designs, such as building codes, cost, and function**
- J. Knows the systems and subsystems of buildings and structures and the functions they perform**
- K. Understands static and dynamic loads and how they produce forces (e.g., compression, tension, torsion) that affect stability and failure in a structure**
- L. Understands the variety of processes used in construction, including on-site and prefabricated techniques**

Discussion areas: Manufacturing and Construction Technologies

- What types of information does a designer need to consider when building a home in the mountains near a ski resort?
- What are some differences between manufactured homes and site-built homes?
- Explain the components of the universal systems model as it is applied to the manufacturing and construction sectors.
- What are some quality processes (e.g., just-in-time, TQM, Six Sigma) that are employed by the manufacturing sector?
- How are secondary processes (e.g., conditioning, separating, assembling) applied to various materials (e.g., ceramics, metals, plastics, wood)?
- Explain how different forces (e.g., tension, compression, torsion) are calculated and accounted for in the design of a structure (e.g., bridge, home, highway, skyscraper).
- What concerns do construction managers face regarding building permits, building codes, and hiring practices?
- Identify current local, state, and national safety regulations associated with the manufacturing and construction industries.
- What are some common building materials that can be used to construct a deck on the back of a home?

VI. Pedagogical and Professional Studies

- A. For a technology education program, knows how to create and implement a curriculum based on state and national standards (e.g., Standards for Technological Literacy)
- B. Knows how to select appropriate instructional content and develop learning activities
- C. Knows how to choose, adapt, and implement instructional strategies appropriate to both the content and the level at which the content is being taught
- D. Understands the importance of designing and implementing instructional activities that emphasize problem solving
- E. Knows how to apply appropriate instructional technology equipment, materials, processes, and tools to enhance teaching and to actively engage students in learning
- F. Knows how to select and use a variety of assessment methods—formal and informal, formative and summative—to monitor and evaluate both student learning and instructional effectiveness
- G. Knows how to create and maintain a safe and healthy learning environment (e.g., in a laboratory), where appropriate practices and procedures are followed in the use of equipment, materials, and tools
- H. Is aware of the relationship between classroom learning and student organizations
- I. Understands the relationship between technology education programs and advisory committees
- J. Knows how to modify instructional activities and methods to address students' diverse needs
- K. Understands the importance of promoting technology education internally and externally (e.g., to the community, school staff, and students)
- L. Understands the importance of becoming involved in professional associations and organizations related to technology education
- M. Understands the importance of the professional growth of the technology education teacher via formal instruction, in-service activities, and professional association meetings
- N. Is familiar with current educational policy, legislation, and funding opportunities
- O. Is familiar with opportunities for further education and careers
- P. Is aware of the history, issues, and trends related to technology education
- Q. Is familiar with the management of resources, records, and budgets
- R. Recognizes the importance of collaborating with other school faculty to design instruction that integrates knowledge and skills from other core academic subject areas into instruction in technology

Discussion areas: Pedagogical and Professional Studies

- How can the Standards for Technological Literacy be used to develop an effective technology education curriculum?
- What are some typical instructional strategies or teaching methods used by today's technology education teachers?
- How can technology education teachers stay informed and current in their field by affiliating themselves with professional associations and organizations (e.g., SkillsUSA, FFA, HOSA, ITEEA, ACTE)?
- What are the benefits and challenges of collaborating with core academic colleagues on cross-curricular activities and lessons?
- How should a technology education teacher address the local chamber of commerce to promote and educate local business leaders about his or her program?
- How should a technology teacher design a poster to attract students to his or her program?
- Why should proper safety procedures be followed in an advanced manufacturing training lab?
- What problem-solving methods can a technology education teacher use with students to help solve the challenge of budget cuts in career and technical education?
- What differentiated instructional strategies can technology education teachers use to ensure that students with physical and emotional disabilities have access to career and technical education?

Technology Education (5051) Sample Test Questions

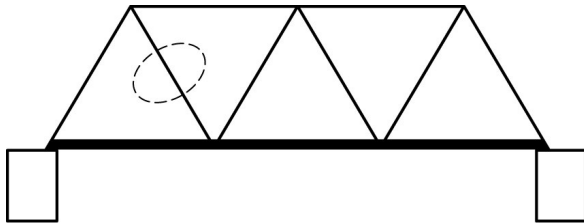
Sample Questions

The sample questions that follow represent a number of the types of questions and topics that appear on the test. They are not, however, representative of the entire scope of the test in either content or difficulty. Answers with explanations follow the questions.

Directions: The test consists of a variety of selected-response questions, where you select one or more answer choices, and questions where you enter a numeric answer in a box.

Questions 1–3 are based on the following situation.

A class of technology students has just completed an activity in designing and building bridges. Each student's bridge has undergone destructive testing by applying force to the bridge deck, and the point of failure has been identified. One student's bridge failed in the area that is circled in the picture below.



1. Which of the following forces most likely caused the student's bridge to fail?
 - (A) Compression
 - (B) Shear
 - (C) Tension
 - (D) Torsion

2. If the student were asked to determine what caused the bridge to fail, which of the following would be the most appropriate next step for the student to take?
 - (A) Evaluate the materials and techniques used in the student's design and construction of the bridge
 - (B) Brainstorm new ideas for a bridge design
 - (C) Change the design constraints
 - (D) Identify the bridge in the class that held the most weight and construct a bridge just like it

3. Which of the following states an appropriate affective learning objective for the students engaged in the exercise described?
 - (E) Develop skills in bridge building
 - (F) Apply mathematical analysis to determine why the bridge failed
 - (G) Document the design process
 - (H) Recognize that risk-taking and failure are a normal part of learning

4. Which of the following components is present in both pneumatic and hydraulic systems?
 - (A) Exhaust
 - (B) Reservoir
 - (C) Compressor
 - (D) Control valve

5. A student in the process of solving a fabrication problem in the manufacturing laboratory asks the teacher what assembly procedures should be used. The teacher's best response would be to
 - (A) give an opinion as to the best assembly procedure for the particular problem
 - (B) suggest two or three possible assembly procedures and have the student select one
 - (C) place the responsibility completely on the student for making the judgment
 - (D) use leading questions to help the student review and analyze the relative merits of several assembly procedures

6. Which of the following guidance systems is principally a materials-handling device?
 - (A) Escalator
 - (B) Conveyor
 - (C) Highway
 - (D) Railroad



7. The most important consideration in designing successful messages to be transmitted through graphic communications is knowledge and understanding of

- (A) current technologies
- (B) the capabilities of the designer
- (C) the limitations of the printer
- (D) the nature of the audience

8. Which of the following is a renewable energy source?

- (A) Wood
- (B) Oil
- (C) Natural gas
- (D) Coal

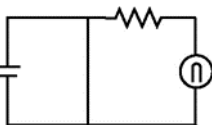
9. In which of the following is the battery short-circuited?

= – battery  – resistance  – bulb

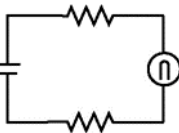
(A)



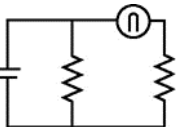
(B)



(C)



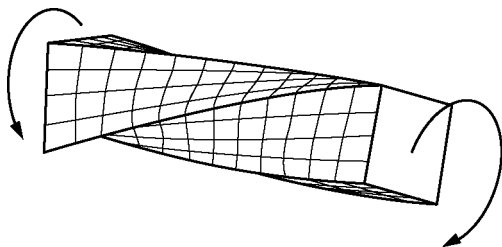
(D)



10. Which of the following is generally the first step taken in a large-scale commercial construction venture?
- (A) Filing applications for building permits and variances
 - (B) Ordering the materials needed for the building foundation
 - (C) Drafting a contract that spells out the details of the building plan
 - (D) Holding a discussion between the developer and the designer/contractor about the scope of the construction
11. A clothes dryer that is set to run for 30 minutes is an example of which of the following control systems?
- (A) Open loop
 - (B) Closed loop
 - (C) Negative feedback
 - (D) Positive feedback
12. Of the following objectives, which is most appropriate for a technology education program that has a goal of enabling students to develop creative technical solutions to present and future societal problems?
- (A) Design and construct a three- dimensional model of a low-income, multifamily dwelling unit
 - (B) Describe several construction careers that are related to home building
 - (C) Categorize the components of a technical system
 - (D) Identify the major tools and equipment used in highway construction

13. Which of the following materials has a resistance that decreases as temperature increases?
- (A) Silicon
 - (B) Aluminum
 - (C) Gold
 - (D) Copper
14. An external circuit has a resistance of 7.0 ohms and a current of 2.0 amperes. The potential difference across the circuit is which of the following?
- (A) 14.0 volts
 - (B) 9.0 volts
 - (C) 3.5 volts
 - (D) 0.28 volts
15. A person uses a remote control to change the volume level on a television. The signal that travels from the remote to the television is most likely encoded in a
- (A) visible light pulse
 - (B) radio wave signal
 - (C) series of infrared pulses
 - (D) series of intense infrared beams
16. When scanning a drive for viruses, it is typically important to check files having which of the following extensions?
- (A) .jpg
 - (B) .pdf
 - (C) .wav
 - (D) .exe

17. A committee of middle school teachers is meeting to begin the process of finding a software program to improve students' drafting skills. Which of the following steps should the committee take first in the process?
- (A) Downloading a trial version of the most popular software for evaluation
 - (B) Conducting a survey to determine the importance of drafting skills in the classroom
 - (C) Defining the learning objectives they would like the software to meet
 - (D) Deciding what type of user interface would be most appropriate
18. Which of the following systems within a vehicle produces the power needed to move it?
- (A) Guidance
 - (B) Control
 - (C) Propulsion
 - (D) Structural
19. Which of the following is a type of wall that helps support the weight of the ceiling and roof?
- (A) Rafter-plate
 - (B) Ceiling-joist
 - (C) Stud-support
 - (D) Load-bearing



20. The vector arrow above symbolizes which of the following types of mechanical stress?
- (A) Compression
 - (B) Shear
 - (C) Tension
 - (D) Torsion

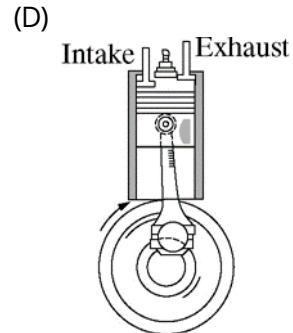
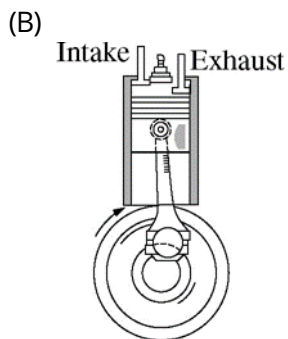
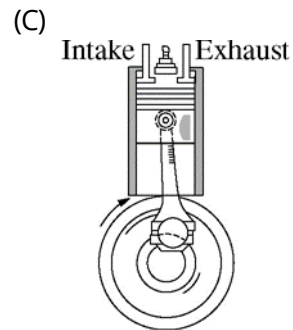
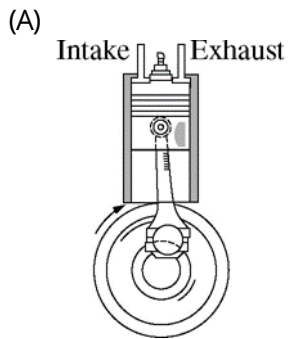


21. The USDOT safety placard above indicates which of the following?
- (A) Biohazard
 - (B) Corrosive substance
 - (C) Electrical hazard
 - (D) Recycling
22. A car-manufacturing factory is considering a new site for its next plant. Which of the following would community planners be most concerned with before allowing the plant to be built?
- (A) The amount of materials stored in the plant
 - (B) The hours of operations of the new plant
 - (C) The effect the plant will have on the environment
 - (D) The work environment for the employees at the plant
23. Which of the following steps in the design of a dog house would be earliest?
- (A) Acquiring all the tools necessary for the building
 - (B) Purchasing all the materials for building the structure
 - (C) Identifying the color, shape, and style of the exterior surface
 - (D) Accessing the measurements of the dog and all the interior materials

24. Which of the following is the most effective way to evaluate the development of a student's drafting skills throughout the school year?

- (A) Baseline assessment
- (B) Portfolio assessment
- (C) Short-answer unit assessment
- (D) Teacher-created assessment

25. Which of the following diagrams shows the correct positions of the intake and exhaust valves of a four-stroke internal combustion engine during the intake stroke?



26. An early-nineteenth-century railroad steam engine is an excellent example of which of the following power systems?
- (A) Internal combustion engine
 - (B) External combustion engine
 - (C) Rotary engine
 - (D) Reaction engine
27. In construction, the plates are horizontal structures at the top and bottom of a wall. Which of the following are the vertical structures?
- (A) Rafters
 - (B) Studs
 - (C) Headers
 - (D) Joists
28. Which of the following geometric shapes is most commonly used to give strength to the structure of truss bridges?
- (A) Circle
 - (B) Triangle
 - (C) Hexagon
 - (D) Rectangle
29. Which of the following is a force that is most responsible for causing a fixed-wing aircraft to move forward?
- (A) Lift
 - (B) Drag
 - (C) Thrust
 - (D) Weight

30. Which of the following charts is used in advanced manufacturing to record results data for a preproduction process?
- (A) R chart
 - (B) Run chart
 - (C) X-bar chart
 - (D) Pareto chart

Answers

1. Option (C) is correct. The area of the bridge that is circled in the picture is being pulled on with sufficient tension force to cause the bridge to fail.
2. Option (A) is correct. The technological design process calls for students to design, evaluate, and redesign solutions to problems. Since the student's original design has failed, it is appropriate now for the student to evaluate the materials and techniques used in that design before going on to build additional solutions.
3. Option (D) is correct. Affective objectives concern students' value judgments and their emotional responses in learning situations. Students in a technology education class need to recognize that risk-taking and even failing is a normal part of the learning process. They also need to understand that every solution to a technological problem has the potential to fail.
4. Option (D) is correct. Both hydraulic and pneumatic systems share some of the same basic components. The components may look different, but they perform the same basic functions. Exhaust (A) is only present in a pneumatic system. Hydraulic systems return fluid to a reservoir (B) to be recycled. Pneumatic systems use a compressor (C) to build and store air pressure to be used. Hydraulic systems use an electric pump to circulate the liquid. Both systems use a control valve.
5. Option (D) is correct. One instructional goal of technology education is to offer opportunities for students to develop their problem-solving abilities. (A) and (B) are teacher centered, and (C) does not provide the guidance a student would need. (D) is a teaching method that requires the student to apply critical-thinking skills in selecting the best solution to a problem.
6. Option (B) is correct. (A) is a people-moving device, and (C) and (D) are used for moving both people and materials. (B) is the only one that is not used to move both people and materials.
7. Option (D) is correct. All answer choices must be considered in producing a graphic communication, and failing to meet established criteria on any one could result in a given product being rejected. However, regardless of how well the product meets all other criteria, if it does not consider the nature of the audience, it will not communicate successfully.
8. Option (A) is correct. Renewable energy sources are those that can be replaced by natural processes within the limits of the control of human beings. (B), (C), and (D) are fossil fuels and cannot be readily replaced. Only wood can be regrown.

9. Option (B) is correct. In this diagram, the path of the circuit is such that current will be diverted from passing through the resistor and the bulb. When the part of a circuit with the most resistance is bypassed, and all of the current flows through the part with zero (negligible) resistance, a short circuit is said to exist.
10. Option (D) is correct. A property owner or developer would need to meet with the designer or contractor to discuss the scope of the project before any other action is taken.
11. Option (A) is correct. An open-loop system, sometimes referred to as a nonfeedback system, is a control system that follows its input command, or setting, regardless of the final result. In this case, a user sets the drying time for a load of clothes for 30 minutes, and the dryer will work continuously for 30 minutes, regardless of whether the clothes are fully dry at the end of that time.
12. Option (A) is correct. A secondary instructional goal of technology education is that of forecasting future technological trends or possible problem solutions. (B), (C), and (D) address only present construction solutions. Only (A) would allow the student to be creative and explore new or future construction alternatives.
13. Option (A) is correct. This question tests your knowledge of the properties of conductors and insulators. Since silicon's resistance falls with an increase in temperature, it is said to have a negative temperature coefficient and, therefore, is the only option that is an insulator. Aluminum, gold, and copper's resistance increases as temperature rises, giving them a positive temperature coefficient and designating them as conductors.
14. Option (A) is correct. The mathematical equation that describes this relationship is

$$I = \frac{V}{R}$$

where I represents the current through the conductor in units of amperes, V is the potential difference measured across the conductor in units of volts, and R is the resistance of the conductor in units of ohms. Using the mathematical equation, $I=2$; $R=7$; and V is unknown, this would be illustrated as $2 = \frac{V}{7}$ or $V = 2 \times 7$.

15. Option (C) is correct. When changing the channel on a television with a remote control, a precise communication is taking place through the use of infrared pulses. These pulses allow the one device to react, as opposed to interacting with multiple items.

16. Option (D) is correct. Viruses have the capability of infecting any file; however, they will generally infect executable (.exe) files or data files.
17. Option (C) is correct. There are many issues to consider when selecting educational software. The main consideration is given to the evidence of its effectiveness; its ability to align to a school, state, or district's standards; how it suits the students' needs and learning styles; and the overall cost of purchasing, maintaining, licensing, and upgrading, as well as the hardware and software needed. Of the answer choices provided, defining the learning objectives the software would meet is the primary concern.
18. Option (C) is correct. The main function of the propulsion system is to convert energy into mechanical power that can be used to drive, fly, sail, or move a vehicle in some other way. Guidance systems provide the information required to make a vehicle follow a particular path or perform a certain task. Control systems are the parts of vehicles used to change a vehicle's direction and speed. Structural systems are the parts of vehicles that hold other vehicular systems and the loads they will carry.
19. Option (D) is correct. A load-bearing wall is a wall specifically designed and built to support an imposed load in addition to its own weight.
20. Option (D) is correct. Compression is a force that is pushing against something. Shear is when a compression force is applied on a material in opposite directions across a perpendicular plane. Tension forces try to pull elements apart. This image reflects a mechanical stress that is twisted.
21. Option (B) is correct. Biohazard is hazardous biological materials and organisms. The basic outline of the biohazard symbol is a plain trefoil, which is three circles overlapping each other equally like in a triple Venn diagram. Electrical hazard is any device that has the potential to injure or cause death to an individual by the direct or indirect exposure to an energized circuit. There are myriad warning and safety placards that can be used to warn of the potential dangers of electricity. Most of them use the universal symbol of a lightning bolt. The recycling symbol represents a Möbius loop consisting of three-chasing-arrows in the shape of a triangle with rounded vertices. Each arrow twists and turns itself, and all three arrows chase each other. It is a consummate representation of recycling. Corrosive substance is a graphic label showing drips of liquid from a lab tube eroding the symbol of an object or hand, and indicates that the contents are corrosive.
22. Option (C) is correct. Reviewing the amount of materials stored in a plant, the hours of operation, and the employee work environment are business concerns. The effect of the new site on the environment would be a serious concern to the community as the environment affects the community as a whole.
23. Option (D) is correct. All engineering and construction design processes use a "planning, gathering data, or research" step. Depending on the version used, the planning, gathering data, or research step would come before any steps that include (A), (B), and (C).

24. Option (B) is correct. A portfolio assessment is typically used by the teacher to gauge a student's understanding of material as the student's skills develop. This type of assessment is designed so that the content of the assessment matches the content of the instruction.
25. Option (D) is correct. During the intake stroke, the intake valve (as labeled in the diagram) must be open so that fuel can enter the piston cylinder, and the piston must be moving down to pull the fuel into the cylinder. The exhaust valve must be closed during intake to prevent air from entering the cylinder instead of fuel.
26. Option (B) is correct. All steam engines are external combustion engines. External means that the power source is outside the engine. Combustion refers to burning. Steam engines use the heat from burning coal or wood to change water into steam. Since the fire is under a boiler, which is outside the engine, the power source is external.
27. Option (B) is correct. In most houses, walls are made of wood framing. Wall frames are designed to be light and strong. They include plates, studs, and headers. Plates are the horizontal parts at the top and bottom of the wall. They hold the studs, which are the vertical parts.
28. Option (B) is correct. Truss bridges use a framework made of struts that are connected together in a triangular grid. Using triangular struts helps ensure that the resulting structure is rigid. A truss bridge resists bending when subjected to static and dynamic loads.
29. Option (C) is correct. A fixed-wing airplane has four major forces that affect its ability to fly. Thrust, Lift, Weight, and Drag. Thrust is the force that causes the aircraft to move forward.
30. Option (B) is correct. The first step in establishing Statistical Process Control (SPC) is to determine if a process is capable of meeting the parameters established by the design engineers. To do this, an operator will do a preproduction run that will provide data to determine the capability of the process. The operator records the data and then constructs a "run chart" to determine if there are instances of special (sporadic) variation.

Understanding Question Types

The *Praxis*® assessments include a variety of question types: constructed response (for which you write a response of your own); selected response, for which you select one or more answers from a list of choices or make another kind of selection (e.g., by selecting a sentence in a text or by selecting part of a graphic); and numeric entry, for which you enter a numeric value in an answer field. You may be familiar with these question formats from taking other standardized tests. If not, familiarize yourself with them so you don't spend time during the test figuring out how to answer them.

Understanding Selected-Response and Numeric-Entry Questions

For most questions, you respond by selecting an oval to select a single answer from a list of answer choices.

However, interactive question types may also ask you to respond by:

- Selecting more than one choice from a list of choices.
- Typing in a numeric-entry box. When the answer is a number, you may be asked to enter a numerical answer. Some questions may have more than one entry box to enter a response. Numeric-entry questions typically appear on mathematics-related tests.
- Selecting parts of a graphic. In some questions, you will select your answers by selecting a location (or locations) on a graphic such as a map or chart, as opposed to choosing your answer from a list.
- Selecting sentences. In questions with reading passages, you may be asked to choose your answers by selecting a sentence (or sentences) within the reading passage.
- Dragging and dropping answer choices into targets on the screen. You may be asked to select answers from a list of choices and to drag your answers to the appropriate location in a table, paragraph of text or graphic.
- Selecting answer choices from a drop-down menu. You may be asked to choose answers by selecting choices from a drop-down menu (e.g., to complete a sentence).

Remember that with every question you will get clear instructions.

Understanding Constructed-Response Questions

Some tests include constructed-response questions, which require you to demonstrate your knowledge in a subject area by writing your own response to topics. Essays and short-answer questions are types of constructed-response questions.

For example, an essay question might present you with a topic and ask you to discuss the extent to which you agree or disagree with the opinion stated. You must support your position with specific reasons and examples from your own experience, observations, or reading.

Review a few sample essay topics:

- *Brown v. Board of Education of Topeka*
 “We come then to the question presented: Does segregation of children in public schools solely on the basis of race, even though the physical facilities and other ‘tangible’ factors may be equal, deprive the children of the minority group of equal educational opportunities? We believe that it does.”
 - A. What legal doctrine or principle, established in *Plessy v. Ferguson* (1896), did the Supreme Court reverse when it issued the 1954 ruling quoted above?
 - B. What was the rationale given by the justices for their 1954 ruling?
- *In his self-analysis, Mr. Payton says that the better-performing students say small-group work is boring and that they learn more working alone or only with students like themselves. Assume that Mr. Payton wants to continue using cooperative learning groups because he believes they have value for all students.*
 - Describe **TWO** strategies he could use to address the concerns of the students who have complained.
 - Explain how each strategy suggested could provide an opportunity to improve the functioning of cooperative learning groups. Base your response on principles of effective instructional strategies.
- *“Minimum-wage jobs are a ticket to nowhere. They are boring and repetitive and teach employees little or nothing of value. Minimum-wage employers take advantage of people because they need a job.”*
 - Discuss the extent to which you agree or disagree with this opinion. Support your views with specific reasons and examples from your own experience, observations, or reading.

Keep these things in mind when you respond to a constructed-response question:

1. **Answer the question accurately.** Analyze what each part of the question is asking you to do. If the question asks you to describe or discuss, you should provide more than just a list.
2. **Answer the question completely.** If a question asks you to do three distinct things in your response, you should cover all three things for the best score. Otherwise, no matter how well you write, you will not be awarded full credit.
3. **Answer the question that is asked.** Do not change the question or challenge the basis of the question. You will receive no credit or a low score if you answer another question or if you state, for example, that there is no possible answer.
4. **Give a thorough and detailed response.** You must demonstrate that you have a thorough understanding of the subject matter. However, your response should be straightforward and not filled with unnecessary information.
5. **Take notes on scratch paper** so that you don't miss any details. Then you'll be sure to have all the information you need to answer the question.
6. **Reread your response.** Check that you have written what you thought you wrote. Be sure not to leave sentences unfinished or omit clarifying information.

General Assistance For The Test

***Praxis*® Interactive Practice Test**

This full-length *Praxis*® practice test lets you practice answering one set of authentic test questions in an environment that simulates the computer-delivered test.

- Timed just like the real test
- Correct answers with detailed explanations
- Practice test results for each content category

ETS provides a free interactive practice test with each test registration. You can learn more [here](#).

Doing Your Best

Strategy and Success Tips

Effective *Praxis* test preparation doesn't just happen. You'll want to set clear goals and deadlines for yourself along the way. Learn from the experts. Get practical tips to help you navigate your *Praxis* test and make the best use of your time. Learn more at [Strategy and Tips for Taking a *Praxis* Test](#).

Develop Your Study Plan

Planning your study time is important to help ensure that you review all content areas covered on the test. View a sample plan and learn how to create your own. Learn more at [Develop a Study Plan](#).

Helpful Links

[Ready to Register](#) – How to register and the information you need to know to do so.

[Disability Accommodations](#) – Testing accommodations are available for test takers who meet ETS requirements.

[PLNE Accommodations \(ESL\)](#) – If English is not your primary language, you may be eligible for extended testing time.

[What To Expect on Test Day](#) – Knowing what to expect on test day can make you feel more at ease.

[Getting Your Scores](#) – Find out where and when you will receive your test scores.

[State Requirements](#) – Learn which tests your state requires you to take.

[Other Praxis Tests](#) – Learn about other *Praxis* tests and how to prepare for them.

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