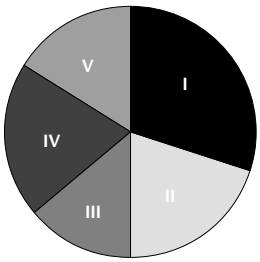
Technology Education (0050)

Test at a Glance

Test Name	**Technology Education**
Test Code	**0050**
Time	**2 hours**
Number of Questions	**120**
Format	**Multiple-choice questions**



	Content Categories	Approximate Number of Questions	Approximate Percentage of Examination
I.	Pedagogical and Professional Studies	36	30%
II.	Information and Communication Technologies	24	20%
III.	Construction Technologies	14	12%
IV.	Manufacturing Technologies	22	18%
V.	Energy/Power/Transportation Technologies	24	20%

About this test

The Technology Education test is designed for prospective teachers of technology education in the middle through senior high school level. This test is moving towards alignment with the national standards for Technology Education (Standards for Technological Literacy). The 120 multiple choice 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. In addition to these content areas the test includes questions on pedagogical and professional studies in technology education. Questions focus on the prospective teacher's understanding and application of important learned principles to the teaching of technology education.

Topics Covered

Representative descriptions of topics covered in each category are provided below.

I. Pedagogical and Professional Studies

- Philosophy: the nature of technology; technology education as a discipline
- Program development: establishing mission statements, goals, and objectives based on national standards (*Standards for Technological Literacy*); developing and using external advisory boards; selecting content and developing concept-based activities; providing for interdisciplinary approaches
- Program implementation: consideration of student population, instructional strategies, facility organization and management, resource management, safety and health, public relations
- Evaluation: evaluation of student progress, program evaluation, record-keeping and reporting, use of data for modification of instruction
- Professionalism and professional growth: professional associations, continuing education, professional and technical literature

II. Information and Communication Technologies

- Design: apply visual, aesthetic, and technological principles in the design of effective products such as those created for print, Web, video, audio, and multimedia within the context of a social and historical perspective
- Communication systems: definitions of terms, knowledge of communication systems models, resources and inputs, historical perspectives
- Communication processes: types, processes, equipment operation, adjustment, and servicing for graphic communications, such as print and photographic; electronic communications, such as telecommunications and computers; other communication processes, such as devices that use light and acoustics
- Communication outputs and impacts: products; social, cultural, and environmental impacts; forecasting in communication technology

III. Construction Technologies

- Design: apply structural, architectural, and aesthetic and technological principles in the design of physical structures, models, prototypes such as those created by civil engineers, architects, and landscape/interior designers within the context of a social and historical perspective
- Construction systems: definition of terms, construction systems models, historical perspectives
- Construction resources and inputs: materials and manufactured products, human resources and knowledge, finance and capital
- Managerial processes: management functions; managed areas of activity, such as designing, contracting, and marketing
- Construction and production processes: preparing the site, building the structure, installing utility systems, enclosing the structure, finishing the structure, completing the site
- Construction outputs and impacts: products, including residential, commercial, and civil projects; social, cultural, and environmental impacts; forecasting in construction technology

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IV. Manufacturing Technologies

- Design: apply mechanical, human factors, and aesthetic principles in the design of physical products and prototypes such as those created by industrial designers, mechanical, electrical, and structural engineers within the context of a social and historical perspective
- Manufacturing systems: definition of terms, manufacturing systems model, historical perspectives
- Manufacturing resources and inputs: materials, human resources and knowledge, finance
- Managerial processes: management functions, managed areas of activities, such as designing production systems and manufacturing the product
- Transformational processes: extracting raw materials; primary processing; secondary processing, including the conversion of industrial materials into finished products
- Manufacturing outputs and impacts: types of outputs; social, cultural, and environmental impacts; forecasting in manufacturing

V. Energy/Power/Transportation Technologies

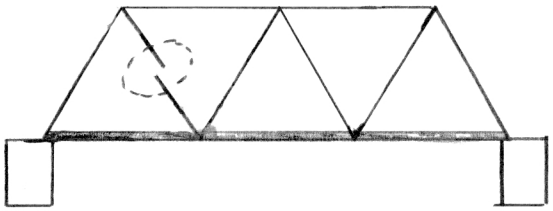
- Design: apply mechanical, structural, control, and aesthetic principles in the design of products, systems, and models associated with controlling technological systems and moving people and materials safely and effectively within a context of a social and historical perspective
- Control Systems: electrical (including computers), mechanical, hydraulics, and pneumatics
- Transportation systems: definition of terms; transportation systems models; resources and inputs; land, water, air, and space transportation modes; historical perspectives
- Energy sources, conversions, measurements, and storage: sources of energy, including electrical and solar; conversion/storage systems, including internal and external combustion; measurement and control topics, including power distribution and heat flow
- Technical systems: propulsion, suspension, control and guidance, structure, guideway, support, servicing
- Transportation outputs and impacts: outputs, such as relocated goods; social, cultural, and environmental impacts; forecasting in transportation

The sample questions that follow illustrate the kinds of questions in 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: Each of the questions or statements below is followed by five suggested answers or completions. Select the one that is best in each case.

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, 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
   (E) Weight

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
   (E) Rebuild the bridge using the original design

3. Which of the following states an appropriate affective learning objective for the students engaged in the exercise described?

   (A) Develop skills in bridge building
   (B) Understand how physical forces act upon structures
   (C) Apply mathematical analysis to determine why the bridge failed
   (D) Document the design process
   (E) Recognize that risk-taking and failure are a normal part of learning

4. The National Standards for Technology Education published in 2000 by the International Technology Education Association are titled

   (A) A Conceptual Framework for Technology
   (B) Standards for Technological Literacy
   (C) Technology Education: The New Basic
   (D) Technology for All Americans
   (E) The Technology Teacher

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
   (E) refer the student to a reference on assembly procedures

6. Which of the following guidance systems is principally a materials-handling device?

   (A) Escalator
   (B) Conveyor
   (C) Highway
   (D) Railroad
   (E) Moving sidewalk

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 estimated cost of the product
   (D) the limitations of the printer
   (E) the nature of the audience

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

   (A) Wood
   (B) Oil
   (C) Natural gas
   (D) Coal
   (E) Liquid propane

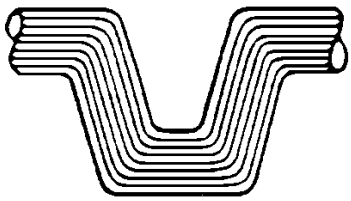
9. Which two of the following composite materials used in manufacturing would generally be classified as laminar composites in the United States?

   I. Particle board
   II. Plywood
   III. Fiberglass
   IV. Bimetal coins
   V. Concrete

   (A) I and II
   (B) I and III
   (C) II and IV
   (D) III and V
   (E) IV and V

10. Which of the following is generally the first step taken in a large-scale commercial construction venture?

    (A) Making a topological survey of the actual building site
    (B) Filing applications for building permits and variances
    (C) Ordering the materials needed for the building foundation
    (D) Drafting a contract that spells out the details of the building plan
    (E) Holding a discussion between the developer and the designer/contractor about the scope of the construction



11. Which of the following processes should be used to manufacture the metal part with the grain direction shown above?

    (A) Green sand casting
    (B) Traditional machining
    (C) Press forging
    (D) Die casting
    (E) Powder metallurgy

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 types of construction that exist in the local community.
    (E) Identify the major tools and equipment used in highway construction.

Answers

1. 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. The correct answer is C.

2. 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. Therefore, the correct response is A.

3. 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. Therefore, the correct answer is E.

4. Developed by the National Science Foundation in conjunction with NASA, and published in 2000 by the International Technology Education Association, the national standards for Technology Education are titled *Standards for Technological Literacy*. The correct answer, therefore, is B.

5. One instructional goal of technology education is to offer opportunities for students to develop their problem-solving abilities. Choice D, the correct answer, is a teaching method that requires the student to apply critical-thinking skills in selecting the best solution to a problem. Choices A and B are teacher centered, and choices C and E do not provide the guidance a student would need.

6. Choices A and E are people-moving devices, and choices C and D are used for moving both people and materials. Choice B is the only one that is not used to move both people and materials, thus making it the best answer among the choices offered.

7. 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. Thus, the best answer is choice E.

8. Renewable energy sources are those that can be replaced by natural processes within the limits of the control of human beings. Only wood can be regrown, making A the correct answer choice. Choices B through E are fossil fuels and cannot be readily replaced.

9. Fiberglass is a fibrous composite; particle board and cement are particulate composites. Only plywood and bimetal coins, of the choices offered, are laminar composites. Therefore, choice C, which includes II and IV, is the correct response.

10. 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. Therefore, the best response among those given is choice E.

11. Only press forging, choice C, would produce a metal part with a continuous grain line. With all of the other procedures, either the metal would have a broken grain flow (as in machining) or there would be no grain flow (as in casting or in powder metallurgy).

12. A secondary instructional goal of technology education is that of forecasting future technological trends or possible problem solutions. Choices B, C, D, and E address only present construction solutions. Only choice A, the correct answer, would allow the student to be creative and explore new or future construction alternatives.