Michigan

TEST FOR TEACHER CERTIFICATION

STUDY GUIDE

88 Technology and Design

MI-SG-FLD088-02

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PART 1: General Information About the MTTC Program and Test Preparation

The first section of the study guide is available in a separate PDF file. Click the link below to view or print this section.

General Information About the MTTC Program and Test Preparation

PART 2: Test Objectives and Sample Test Questions

INTRODUCTION

This section includes a list of the test objectives, immediately followed by sample test questions and an answer key for the field covered by this study guide.

Test Objectives

As noted, the test objectives are broad, conceptual statements that reflect the knowledge, skills, and understanding an entry-level teacher needs in order to teach effectively in a Michigan classroom. Each field's list of test objectives represents the **only** source of information about what a specific test will cover and, therefore, should be studied carefully.

The test objectives are organized into groups known as "subareas." These subareas define the major content areas of the test. You will find a list of subareas at the beginning of the test objective list. The percentages shown in the list of subareas indicate the approximate weighting of the subareas on the test.

Sample Multiple-Choice Test Questions

The sample multiple-choice test questions included in this section are designed to give the test-taker an introduction to the nature of the test questions included on the MTTC test for each field. The sample test questions represent the various types of test questions you may expect to see on an actual test; however, they are **not** designed to provide diagnostic information to help you identify specific areas of individual strengths and weaknesses or predict your performance on the test as a whole. Use the answer key that follows the sample test questions to check your answers.

To help you identify which test objective is being assessed, the objective statement to which the question corresponds is listed in the answer key. When you are finished with the sample test questions, you may wish to go back and review the entire list of test objectives and descriptive statements once again.

TEST OBJECTIVES

Subarea	Approximate Percentage of Questions on Test
Concepts and Applications of Technology	39%
Physical Technology	23%
Information Technology	23%
Bio-Related Technology	15%

CONCEPTS AND APPLICATIONS OF TECHNOLOGY

Apply basic concepts of technology and technological systems and resources.

Includes identifying the structure and components of a technological system (i.e., input, process, output, feedback) and identifying types of technological resources (e.g., time, capital, people, information, tools and machines, energy, materials); classifying various technological systems; analyzing the operation of independent and integrated systems; evaluating processes for monitoring, adjusting, and controlling the behavior of a technological system; proposing and developing a technological system for solving a given problem; and assessing a technological solution to a given problem.

Apply principles of technological design and problem solving.

Includes identifying components of the design and problem-solving processes; applying the design process to propose solutions to technological problems; understanding the role of modeling; and employing problem-solving and critical-thinking skills to create and evaluate alternative solutions to a given technological problem.

Understand the effects of technology on individuals and societies.

Includes demonstrating a knowledge of the historical development of tools, equipment, processes, materials, systems, and products; analyzing the societal effects of a given technological development; recognizing technological developments that have led to social, civic, or economic problems; and analyzing the role of innovation and invention in technology.

Understand the relationships between technology, mathematics, science, and other fields of study.

Includes describing scientific and mathematical principles in a given technological system; and comparing and contrasting technological knowledge, principles, and methods across other fields of study.

Apply procedures and processes for servicing and maintaining technological systems.

Includes applying criteria for servicing a given technological system; selecting appropriate tools, materials, and equipment for maintaining and servicing a system; analyzing the economic advantages of maintaining a given system; demonstrating an understanding of quality control; analyzing methods for exchanging information with clients in both local and global economies; analyzing issues related to client satisfaction; and proposing mechanisms for using client feedback for product improvement.

Understand the interrelationships between technology and the environment.

Includes identifying environmental hazards associated with a given technological system; evaluating the environmental advantages and disadvantages of a technological application; analyzing the economic interrelationships between technology and the environment; analyzing how environmental factors contribute to the development of technology; and applying procedures for developing a technological solution to an environmental problem or need.

Apply health, safety, and environmental requirements to the learning environment.

Includes understanding federal, state, local, and school district regulations (e.g., OSHA, EPA, CPSC, DEQ); recognizing personal safety practices and responsibilities; understanding personal and professional liabilities; applying appropriate facilities and laboratory operation and maintenance practices; and understanding student and product safety regulations and issues.

PHYSICAL TECHNOLOGY

Apply resources, principles, and processes of manufacturing systems.

Includes identifying types of manufacturing systems (e.g., automated, custom, continuous, batch); analyzing the properties of materials; applying criteria for selecting tools, equipment, processes, materials, systems, and procedures for manufacturing a given product; understanding methods of monitoring and controlling manufacturing processes; and analyzing methods related to the operation and management of a manufacturing enterprise.

Apply resources, principles, and processes of construction systems.

Includes identifying procedures used in construction projects (e.g., planning and designing, site preparation, framing, finishing); understanding characteristics and properties of construction materials (e.g., composites, wood, glass, steel, masonry) and building systems (e.g., electrical, plumbing, HVAC); analyzing the structural characteristics of a given design; selecting an appropriate tool for a given task (i.e., cutting, forming, fastening, finishing); and analyzing various construction methods and systems.

Apply resources, principles, and processes of transportation systems.

Includes classifying and analyzing types of transportation systems (e.g., land, water, aerospace); analyzing energy use in transportation systems; analyzing control and propulsion systems; analyzing a given situation to determine appropriate applications or modifications of transportation systems; and recognizing the structure and function of transportation systems.

Apply resources, principles, and processes of energy and power systems.

Includes identifying units of energy and power (e.g., joule, watt, foot-pound, calorie); identifying and classifying types of energy resources; analyzing devices and systems for converting energy; analyzing methods for the transmission and control of power and energy; and analyzing energy use in various technological systems.

INFORMATION TECHNOLOGY

Apply principles of information processing.

Includes identifying components of communication systems (e.g., encoding, transmitting, receiving, storing, retrieving, decoding); applying knowledge of a variety of information-processing methods for inputting, retrieving, and evaluating information; describing the function of sensors and controls in communication systems; applying ethical and legal standards in information processing; and understanding the different uses of communication for communicating person-to-person, person-to-machine, machine-to-person, and machine-to-machine.

Apply principles of graphic communication.

Includes identifying elements of graphic design; interpreting production specifications from drawings and models; applying principles of mathematics (e.g., measurement, scale, proportion) and graphic design (e.g., balance, texture, color) to communicate technological solutions; evaluating the characteristics of design software (e.g., desktop publishing, CAD); and describing technical processes used in graphic communications.

Apply the principles of electronic communication.

Includes applying the fundamental principles of electricity and magnetism; comparing and contrasting digital and analog signals; analyzing the operating principles of a given system (e.g., telephony, radio, television, satellite); recognizing current and emerging technologies (e.g., fiber optics); and evaluating the civic, social, and environmental impacts of electronic communication systems.

Apply the basic principles of computers and computer networks.

Includes interpreting computer terminology (e.g., CPU, RAM, ROM); identifying and describing input, output, and secondary storage devices; applying criteria for selecting computer software for a given task; understanding computer networks (e.g., LAN, WAN, Internet); applying computer technology to solve problems; and evaluating the social, environmental, and economic impacts of emerging telecommunication systems (e.g., teleconferencing, telecommuting, electronic shopping).

BIO-RELATED TECHNOLOGY

Understand issues related to health, safety, and ergonomics.

Includes recognizing potential health hazards in the home, community, and workplace; applying procedures for evaluating workplace safety; analyzing the role of state and federal health and safety regulations; applying methods for the safe operation of tools and machinery; and identifying principles of ergonomics and human dynamics in the design of systems, work methods, and work environments.

Understand applications of technology in agricultural and food production.

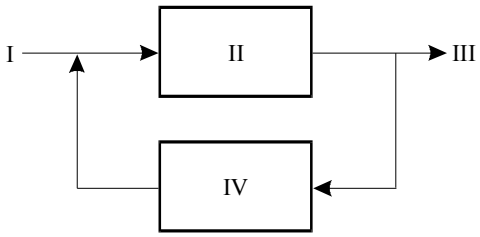
Includes recognizing agricultural resources (e.g., tools, machines, processes, materials, people, capital, energy, time, information); identifying technological applications in agriculture; analyzing technological processes used in food production and preservation; understanding the applications of technology in food-processing systems; analyzing the effects of technological development on agricultural systems; and analyzing the effects of agricultural technology on society.

Understand applications of technology in medical and health systems.

Includes recognizing medical and health resources (e.g., tools, machines, processes, materials, people, capital, energy, time, information); identifying technological applications in medical and health systems; analyzing technological processes used in the medical and health fields; understanding the applications of technology in the medical and health fields; analyzing the effects of technological development in medical and health systems; and analyzing the effects of medical and health technology on society.

SAMPLE MULTIPLE-CHOICE TEST QUESTIONS

1. Use the diagram below to answer the question that follows.



In the universal systems diagram shown above, box IV represents which of the following?

A. feedback

B. input

C. output

D. process

2. In statistical process control (SPC), the primary purpose of the control chart is to:

   A. plan the steps, tools, and processes necessary for manufacturing a given product.

   B. provide a basis for determining if product variation is due to random factors or due to a problem with the production process.

   C. predict the demand for a manufactured product under various economic conditions.

   D. provide an effective method for checking inventory of the materials needed during the manufacturing process.

3. Which of the following is typically required in all new single-family dwellings to satisfy state and local fire codes?

   A. All homes must be built from fire-resistant materials.

   B. Sprinkler systems must be installed in all living quarters.

   C. Fiberglass insulation must be used in walls and ceilings.

   D. Smoke detectors must be installed in appropriate locations.

4. Which of the following best describes the concept of flexible manufacturing?

   A. Machines can be reprogrammed or set up to produce different parts.

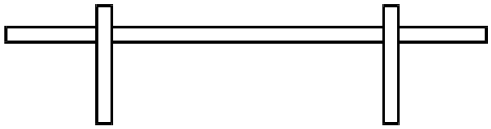
   B. Equipment can be easily relocated to maintain a constant production flow.

   C. Production lines can be redesigned to fit existing facilities.

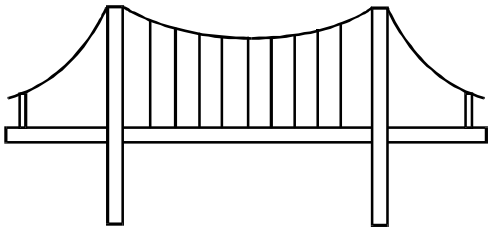
   D. Supplies can be recycled to reduce overhead costs.

5. Which of the following bridges uses a truss design?

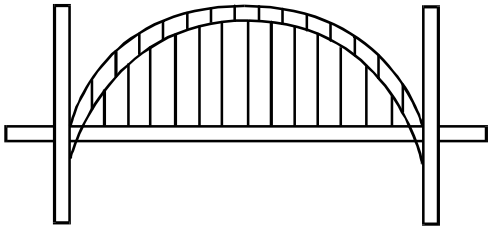
A.



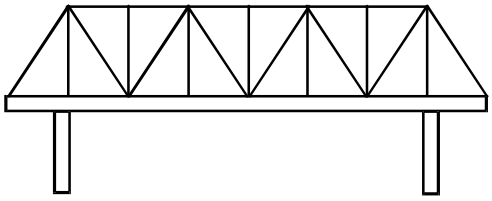
B.



C.



D.



6. Which of the following is an example of an intermodal transportation system?

   A. A person takes an elevator from the basement to the top floor of a skyscraper.

   B. Oil is piped from a field to a tanker for shipment across the ocean.

   C. An aircraft goes from subsonic to supersonic speeds while flying from New York to Paris.

   D. A train is switched to a secondary track while another train passes in the opposite direction.

7. A database management file has the following structure.

Field	Name	Description	Type	Width
1	Cust	Customer number	Char	5
2	Famnam	Last name	Char	12
3	Givnam	First name	Char	12
4	Address	St. Address	Char	22
5	City	City	Char	22
6	State	State	Char	2
7	Zip	ZIP code	Char	10

Which of the following commands will most likely return all of the customers whose last name is Henry and who live in Michigan or California?

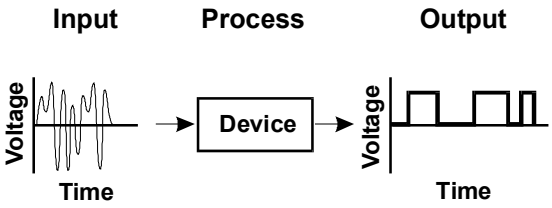
A. Famnam = "Henry" AND (state = "MI" .OR. state = "CA")

B. Famnam = "Henry" OR (state = "MI" .AND. state = "CA")

C. Lastname = "Henry" AND (state = "MI" .OR. state = "CA")

D. Lastname = "Henry" OR (state = "MI" .AND. state = "CA")

8. Use the diagram below to answer the question that follows.



The diagram above represents a function carried out by which of the following devices?

A. microphone

B. modem

C. CPU

D. audio speaker

9. The principles of ergonomics would be most important to consider in designing which of the following products?

A. a software program for an educational computer game

B. an epoxy glue for fastening plastic parts to metal

C. a desk and chair for a person working at a computer

D. an image cylinder on an offset lithography press

10. Which of the following bio-related technological devices has a pump as one of its primary subsystems?

    A. hip prosthesis

    B. hearing aid

    C. dialysis machine

    D. pacemaker

ANSWER KEY FOR THE SAMPLE MULTIPLE-CHOICE TEST QUESTIONS

Item Number	Correct Response	Objective
1.	**A**	Apply basic concepts of technology and technological systems and resources.
2.	**B**	Apply procedures and processes for servicing and maintaining technological systems.
3.	**D**	Understand the interrelationships between technology and the environment.
4.	**A**	Apply resources, principles, and processes of manufacturing systems.
5.	**D**	Apply resources, principles, and processes of construction systems.
6.	**B**	Apply resources, principles, and processes of transportation systems.
7.	**A**	Apply principles of information processing.
8.	**B**	Apply principles of electronic communication.
9.	**C**	Understand issues related to health, safety, and ergonomics.
10.	**C**	Understand applications of technology in medical and health systems.