Michigan

TEST FOR TEACHER CERTIFICATION

STUDY GUIDE

87 Industrial Technology

MI-SG-FLD087-02

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National Evaluation Systems, P.O. Box 226, Amherst, MA 01004

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
Industrial Technology Fundamentals	33%
Power, Energy, and Transportation	18%
Manufacturing	13%
Construction	13%
Communication	23%

INDUSTRIAL TECHNOLOGY FUNDAMENTALS

Understand the design process.

Includes identifying components of the design process; recognizing the design process as a problem-solving strategy; applying design principles to solve problems; employing critical-thinking skills to evaluate alternative solutions to technological problems; and demonstrating knowledge of tools and materials used in the design process.

Understand systems and the interrelationships between industry, society, and other fields of study.

Includes analyzing a system in terms of its components; recognizing the interrelationships among integrated systems (e.g., communication, manufacturing, power and energy); evaluating procedures for monitoring and controlling systems; analyzing the connections between science and technology; and demonstrating an understanding of the effects of technology on society.

Apply principles of technical reading and writing.

Includes reading and interpreting charts, graphs, and flowcharts; understanding symbols and dimensioning; interpreting technical drawings (e.g., blueprints, electrical schematics); interpreting information from manuals and other references; and applying principles of technical writing.

Understand applications of science and mathematics in industry.

Includes performing basic calculations and unit conversions; calculating areas, volumes, and surface area; applying units of linear measure; using fundamental formulas (e.g., calculating board feet); understanding basic statistics; and applying fundamental principles of physics and other sciences.

Understand principles of measuring, marking, and layout.

Includes understanding procedures for measuring, marking, and layout using various materials; and using measuring devices, scales, awls, center punches, surface gauges, squares, dividers, and other measuring, marking, and layout tools.

Understand applications and operating procedures for hand and power tools.

Includes selecting the appropriate tool for a given application; recognizing proper maintenance and safety practices for various tools; and describing uses and operating procedures for commonly used hand and power tools (e.g., saws, sanders, chisels, routers, lathes, drills).

Understand properties of various materials and how these properties relate to a material's workability.

Includes recognizing the properties (e.g., hardness, density, strength) of various materials (e.g., woods, metals, plastics, composites); understanding the relationship between a material's properties and its workability (e.g., feed and speed); and applying principles for cutting, forming, fastening, and finishing various materials.

Understand health and safety requirements in industry.

Includes identifying principles of ergonomics and human dynamics in the design of systems, work methods, and work environments; recognizing principles of hazard avoidance; applying safety principles for the handling and storage of materials; and recognizing potential hazards related to manufacturing and construction procedures and equipment operation.

Understand the nature of careers in industry and principles of employability skills.

Includes identifying different types of careers in industry; describing the requirements for various jobs; understanding career planning; identifying important employability skills and traits (e.g., personal responsibility, honesty, ability to work in teams); and describing job-seeking skills (e.g., job research, résumé writing, interviewing skills).

POWER, ENERGY, AND TRANSPORTATION

Understand basic principles of electricity and electronics.

Includes applying terms (e.g., volt, ampere, ohm) and concepts (e.g., capacitance, resistance, impedance) used in electricity and electronics; analyzing components and properties of DC and AC circuits; and comparing and contrasting digital and analog circuits.

Understand the production, transmission, and control of power and energy.

Includes understanding devices for converting energy; describing the operation of an electric generator or electric motor; analyzing electrical power generation systems (e.g., coal, hydroelectric, nuclear); analyzing methods for transmitting mechanical energy and electrical energy; identifying devices for storing energy; and analyzing the use of energy in devices.

Understand basic principles, processes, procedures, and resources used in transportation.

Includes classifying and analyzing types of transportation systems (e.g., land, atmospheric, marine, space); demonstrating knowledge of power sources in transportation media; applying technical and scientific principles related to control, guidance, propulsion, and energy storage; analyzing a given transportation situation to determine appropriate applications or modifications of transportation technologies; identifying properties and uses of materials used in transportation systems; describing characteristics and applications of tools and test equipment used in transportation technology; selecting an appropriate tool for a given task; and understanding the safe and proper use of tools and equipment used in transportation systems.

Understand principles of motors and engines.

Includes analyzing the fundamental principles and operation of motors and engines; analyzing motor and engine systems; trouble-shooting and maintaining motors and engines; applying trouble-shooting techniques and procedures for automotive systems (e.g., fuel, electrical); applying procedures for service and maintenance; and understanding the safe and proper use of tools and equipment.

Understand the structure and function of transportation industries.

Includes identifying types of transportation industries; recognizing the effects of transportation industries on the economy; demonstrating a knowledge of federal and state regulations on the transportation industry; analyzing the environmental impacts of transportation technology; and analyzing the movement of goods, people, services, and information.

MANUFACTURING

Understand basic principles of manufacturing.

Includes understanding procedures for developing a product (e.g., research and development, prototypes); and applying principles for marketing and servicing products in both local and global markets.

Understand the materials, tools, and resources used in manufacturing.

Includes identifying, analyzing, and utilizing properties of materials (e.g., woods, metals, plastics, composites); applying criteria for selecting an appropriate material for a given purpose; and applying criteria for the selection and safe operation of tools and equipment used in manufacturing.

Understand processes and procedures used in manufacturing.

Includes utilizing equipment, processes, and procedures for casting and molding, forming, separating, conditioning, assembling, and finishing materials and products; evaluating the role of automation in manufacturing (e.g., robotics, computer-aided manufacturing); and applying and analyzing quality control procedures (e.g., statistical product control).

CONSTRUCTION

Understand basic principles of construction.

Includes applying criteria for site selection; reading blueprints; recognizing and accessing building codes; applying procedures for constructing foundations, floors, walls, roofs, and other systems; understanding the environmental impacts of construction projects; and applying scheduling procedures for various construction activities.

Understand materials, tools, and resources used in construction.

Includes understanding properties and dimensions of various construction materials (e.g., wood, glass, steel, concrete, masonry); understanding devices and methods for fastening and bonding construction materials; selecting appropriate tools or equipment for various construction activities; and understanding the safe and proper use of hand and power tools.

Understand processes and procedures used in construction.

Includes demonstrating knowledge of terms related to structural components (e.g., studs, sheets, joists, trusses); and applying basic knowledge of rough and finish assembly (e.g., framing, drywalling, installing flooring).

COMMUNICATION

Understand principles of sketching.

Includes selecting and using sketching materials; understanding types and uses of lines; describing methods for sketching different shapes; applying principles of estimation and proportion; and understanding views, projections, and functions of sketches.

Understand principles of technical drawing.

Includes selecting and using technical drawing tools and materials; applying technical drawing conventions (e.g., dimensioning, lettering, lines, symbols); using various scales; understanding views (e.g., sections, auxiliaries); and applying technical drawing principles in industry.

Understand basic principles, processes, and procedures used in electronic communication.

Includes demonstrating a knowledge of computers and computer software; and analyzing principles and uses of electronic and telecommunication systems (e.g., television, telephone, satellite systems, computer networks).

Understand principles of computer-aided drawing and design.

Includes understanding the use of coordinate systems; applying basic CAD functions (e.g., snapping lines); describing the functions and applications of input and output devices; understanding storage and retrieval systems; utilizing menu tools; and applying CAD technology to solve problems.

Understand basic principles of graphic arts.

Includes identifying elements of graphic design (e.g., line, color, layout); identifying tools and materials used in graphic arts; analyzing equipment and processes used in photography; understanding basic processes used in desktop publishing; and analyzing the characteristics of various printing and imaging processes.

Understand the basic characteristics, components, and functions of computers and computer systems.

Includes identifying the characteristics and functions of computer components (e.g., input and output devices, storage and memory devices); understanding the types and applications of computer software; recognizing the types and characteristics of networks (e.g., LANs, WANs); understanding the characteristics and uses of the Internet and World Wide Web; and using computer technology to solve problems.

SAMPLE MULTIPLE-CHOICE TEST QUESTIONS

1. Before gluing together several narrow pieces of oak to make a tabletop, a woodworker should use which of the following tools to ensure a smooth and straight edge on each board?

   A. circular saw

   B. jointer

   C. belt sander

   D. miter saw

2. Ceramic tiles are used to cover the outside of a space shuttle primarily because of their:

   A. hardness.

   B. light weight.

   C. heat resistance.

   D. strength.

3. Rags are used in a machine shop to clean excess oil from the tools. The safest way to store these oily rags for collection is to:

   A. put them in a cloth bag hung well off the floor.

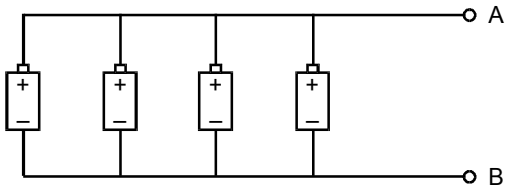
   B. spread them loosely in an open wooden bin.

   C. pack them in a tightly sealed heavy-duty plastic bag.

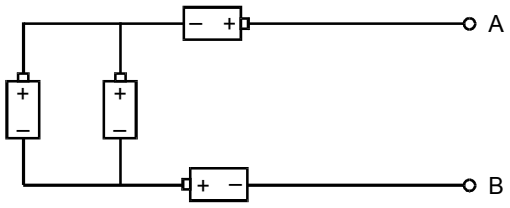
   D. place them in a metal container with a tight-fitting cover.

4. In the diagrams below, each battery is rated at 1.5 V. Which arrangement will result in the greatest voltage across points A and B?

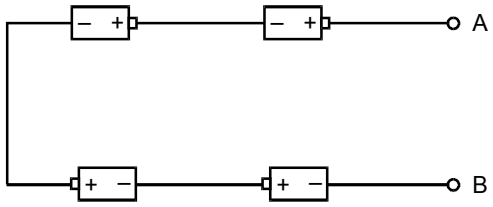
A.



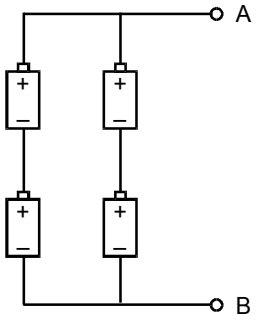
B.



C.



D.



5. Which of the following statements best describes an advantage of using a hydraulic system for power transmission?

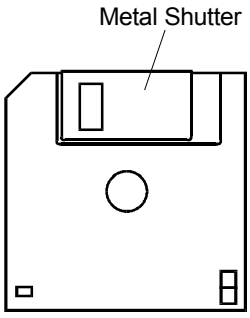
   A. Hydraulic fluids are highly compressible and take up less space when under pressure.

   B. Hydraulic systems do not have any frictional drag forces.

   C. Hydraulic hose can go around corners and flex with machine motion.

   D. Hydraulic systems are able to output more energy than they require as input.

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



The metal shutter on the 3.5-inch floppy computer disk is most likely formed by which of the following machines?

   A. injection molding machine

   B. stamping press

   C. gravity-drop forge

   D. cold chamber casting machine

7. Steel mesh or reinforcing rods are embedded in concrete walls or beams in order to:

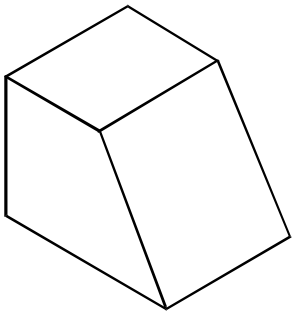
   A. strengthen the concrete against tensile stresses.

   B. hold the concrete in place while it dries.

   C. support bolts used to attach wooden structural members to the concrete.

   D. link together the sections of the wall or beam.

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



What kind of drawing is shown in the diagram above?

   A. isometric

   B. auxiliary

   C. orthographic

   D. oblique

9. Which of the following is a major advantage of using a CAD program to design a product?

   A. Specialized technical design knowledge is unnecessary.

   B. Production costs can be immediately calculated.

   C. The program can automatically select the best design.

   D. The design can be modified quickly and easily.

10. A company has 40 workstations on a local area network (LAN). Which of the following is an advantage of having the computers attached to a central file server?

    A. The workstations can share files, programs, and printers.

    B. The workstations can continue to access network files if the file server crashes.

    C. The speed at which the workstations send and receive data depends only on the speed of the file server.

    D. A computer virus introduced on a single workstation is not likely to spread throughout the network.

ANSWER KEY FOR THE SAMPLE MULTIPLE-CHOICE TEST QUESTIONS

Item Number	Correct Response	Objective
1.	**B**	Understand applications and operating procedures for hand and power tools.
2.	**C**	Understand properties of various materials and how these properties relate to a material's workability.
3.	**D**	Understand health and safety requirements in industry.
4.	**C**	Understand basic principles of electricity and electronics.
5.	**C**	Understand the production, transmission, and control of power and energy.
6.	**B**	Understand the materials, tools, and resources used in manufacturing.
7.	**A**	Understand materials, tools, and resources used in construction.
8.	**A**	Understand principles of sketching.
9.	**D**	Understand principles of computer-aided drawing and design.
10.	**A**	Understand the basic characteristics, components, and functions of computers and computer systems.