



Intro to Manufacturing Technology (21,0110) (Taught)

District Junior High > 2016-2017 > Basic > Technology & Engineering > Intro to Manufacturing Technology (21,0110) (Taught)
> Despain, Phillip; Gutierrez, Steve; Rasband, Glenn; Selk, Kerry
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Unit	CTE Standards and Objectives	Essential Questions	Content	Skills	Vocabulary	Formative & Summative Assessments
Intro. to Manufacturing <i>(Week 1, 1 Week)</i>	UT: CTE: Technical and Engineering UT: Grades 9-12 Introduction to Manufacturing Technology Standard 1 Students will investigate the evolution and impacts of manufacturing technology. Objective 1 Describe differences between past and present methods of manufacturing. a. Contrast the manufacturing methods of cottage industries (sometimes called craft	<ul style="list-style-type: none"> How has manufacturing changed over time to what it is today? Why is the technology system model vital to the manufacturing industry? 	<ul style="list-style-type: none"> Past and present methods of manufacturing. Positive and negative impacts that manufacturing has had on society. The technology systems model. 	<ul style="list-style-type: none"> Apply the systems model to the manufacturing of a product. 	<ul style="list-style-type: none"> Cottage industries Industrial revolution Input Process Output Feedback Interchangeable parts Assembly line Mass Production Automation Impacts (benefits / consequences) 	Intro. to Manufacturing video worksheet - D1 Common: Written: Informative

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	<p>industries) prior to the Industrial Revolution and mass production after the Industrial Revolution.</p> <p>b. Describe the social significance of the Industrial Revolution.</p> <p>c. Identify the advantages of interchangeable parts, the assembly line, automation, robotics, and technology in the manufacturing process.</p> <p>Objective 2 Identify the positive and negative impacts that manufacturing has on society.</p> <p>a. Contrast the social benefits and the negative consequences of a manufacturing industry.</p> <p>b. Illustrate ways to reduce the negative</p>					

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	<p>impact of a manufacturing industry.</p> <p>Standard 2 Students will be able to contrast the three types of manufacturing production and apply the Technology Systems Model to manufacturing.</p> <p>Objective 3 Define and identify examples of inputs, processes, outputs, and feedback in the Technology Systems Model.</p> <p>Objective 4 For a specific manufactured product, identify the inputs, processes, outputs, and feedback in the manufacturing system.</p>					

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Measuring <i>(Week 1, 2 Weeks)</i>	UT: CTE: Technical and Engineering UT: Grades 9-12 Introduction to Manufacturing Technology Standard 3 The student will demonstrate the ability to accurately measure using both conventional and metric measuring systems. Objective 1 Demonstrate competency in the Conventional Measuring System. a. Identify measurements on a conventional ruler including 1/2, 1/4, 1/8, and 1/16 inch	<ul style="list-style-type: none"> Why do most countries use the metric system and not the conventional system of measuring? What careers require the use of measurements? Can you think of any product that does not use a form of measuring? 	<ul style="list-style-type: none"> How to read and use a ruler and tape measure to measure an object. Know the difference between Conventional (SAE) and Metric measuring systems. How to use fractions of an inch (add, subtract, reduce). Fraction to decimal equivalency for halves, quarters and eights. 	<ul style="list-style-type: none"> Use a ruler/tape measure to correctly measure objects accurately to 1/16th inch. Add, subtract, and reduce ruler-based fractions 	<ul style="list-style-type: none"> Conventional measuring system (aka - customary/US system/standard/ SAE) Metric measuring system Calipers Micrometers 	Measuring worksheets (conventional and metric) Formative: Performance: Skill Demonstration Teacher created worksheets to demonstrate conventional and metric systems of measurement. Measuring of Objects (conventional and metric) Formative: Performance: Skill Demonstration Students measure different objects of various sizes and record answers on a worksheet. Example see text: "Technology" by Brad and Terry Thoede

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	<p>increments. b. Identify common conventional measuring tools used in manufacturing.</p> <p>Objective 2 Demonstrate competency in the Metric Measuring System.</p> <p>a. Identify measurements on a metric ruler including centimeter, and millimeter increments.</p> <p>b. Identify common metric measuring tools used in manufacturing.</p>					
<p>Safety (Week 2, 14 Weeks)</p>	<p>UT: CTE: Technical and Engineering UT: Grades 9-12 Introduction to Manufacturing Technology</p>	<ul style="list-style-type: none"> • What situations could cause injury in the shop? • How can you avoid injury in the shop? • How much is a body part worth (your thumb, eyes, hand, etc.)? • Why does your behavior 	<ul style="list-style-type: none"> • How to operate machinery safely. • Students will pass the written safety test with 100% before they can operate any piece of equipment. • Shop organization 	<ul style="list-style-type: none"> • Demonstrate the safe operation of machinery. • Demonstrate professional conduct. • Wear proper safety attire. • Follow shop rules. 	<ul style="list-style-type: none"> • UOSH • MSDS • OSHA • Safety • Safety Equipment • Safety Glasses • Safety Guards • Safety Procedures • Safety Zones • Hand Tools • Machinery 	<p>Safety Tests: General Shop; Drill Press; Scroll Saw; Band Saw; Sanders; Lathe; Radial Arm Saws, etc. Summative: Test: Written Safety tests also include Miter Saw,</p>

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	<p>Standard 6 The student will demonstrate basic skills and safe use of manufacturing equipment and tools.</p> <p>Objective 1 The student will identify and demonstrate basic rules of shop safety.</p> <p>Objective 2 The student will identify work habits required for employment.</p> <p>Objective 3 The student will demonstrate the safe use of basic tools and machines.</p>	<p>impact you and other individuals safety?</p>	<p>and cleanup procedures.</p> <ul style="list-style-type: none"> • Use proper safety apparel. • Understand Professional conduct in an industrial environment. • They must receive permission before they may use shop machines and tools. 		<ul style="list-style-type: none"> • Portable Power Tools 	<p>Planer and Jointer. Safe Shop Operations Formative: Other: Teacher Observation Teacher observes students using proper safety procedures.  Drill Press Safety Test</p>
<p>Design Process & Materials (Week 3, 3 Weeks)</p>	<p>UT: CTE: Technical and Engineering UT: Grades 9-12 Introduction to</p>	<ul style="list-style-type: none"> • Why does industry use the Problem Solving/Design Process? • How do material properties affect the 	<ul style="list-style-type: none"> • The six steps of the Problem Solving/Design Process. • The different types of materials used in 	<ul style="list-style-type: none"> • Following the six steps of the Problem Solving/Design Process and build a manufacturing project. 	<ul style="list-style-type: none"> • CAD (Computer Aided Design) • Innovation • Invention • Mock-ups • Models • Prototype • Rendering • Rough Sketch 	<p>Manufactured Project Formative: Performance: Lab Assignment Projects Rubrics Summative: Performance:</p>

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	<p>Manufacturing Technology Standard 4 The student will apply the Problem Solving/Design Process.</p> <p>Objective 1 Identify the typical steps of the Problem Solving/Design Process: a. Identify, define and state the problem. b. Research information. c. Develop possible solutions (brainstorm, develop thumbnail sketches). d. Select the best solutions or design and build a prototype. e. Test the solution or design. f. Evaluate and refine the solution.</p> <p>Objective 2 Identify, define,</p>	<p>design of a product?</p> <ul style="list-style-type: none"> • What is the purpose of a model or prototype? • What is processing and why is it important? 	<p>manufacturing.</p> <ul style="list-style-type: none"> • The different processes used in manufacturing. 	<ul style="list-style-type: none"> • Safely use forming, separating, assembling and finishing process in the manufacturing of a project. 	<ul style="list-style-type: none"> • Thumbnail Sketch • Resources (natural and synthetic) • Renewable and Non-renewable • Ferrous and Non-ferrous • Alloys • Plastics • Woods • Ceramics • Composites • Separating • Forming • Assembling • Finishing • Casting/Molding • Conditioning 	<p>Skill Demonstration Rubrics are designed to include each step of the project construction as well as students self evaluation and teacher evaluation.</p>

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	<p>and clearly state a manufacturing design problem.</p> <ol style="list-style-type: none"> a. Identify that a problem exists. b. Define the requirements, criteria and constraints of the design problem. c. State or write the problem clearly. <p>Objective 3 Conduct research to solve a design problem.</p> <ol style="list-style-type: none"> a. Research information that is currently available. b. Identify conditions or factors which may affect the solution or design. c. Select the best solution or design and build a prototype for testing. d. Test the solution or prototype and analyze data. <p>Objective 4 Evaluate and</p>					

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	<p>refine a solution or prototype.</p> <p>Objective 5 Participate in solving a design-based manufacturing problem.</p> <p>Standard 5 The student will use manufacturing processes to change raw materials into finished products.</p> <p>Objective 1 Identify and compare renewable and non-renewable natural resources.</p> <p>Objective 2 Compare various manufacturing materials, their sources, properties and uses:</p> <p>a. Ferrous (iron and steel) and non-ferrous metals (copper, aluminum, brass, lead, etc.)</p>					

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	<p>b. Alloys (mixing of metals: brass, steel, aluminum alloys, gold alloys)</p> <p>c. Plastics (thermal plastic and thermal set)</p> <p>d. Woods (hardwood and softwoods)</p> <p>e. Ceramics (bricks, table ware, insulators and heat shield, Space Shuttle tiles, dental work, internal coatings on jet engines, ceramic bearings, crucible used in metal casting, cutting tools)</p> <p>f. Composites (fiberglass, carbon fiber, concrete, plywood, Masonite, Trex)</p> <p>Objective 3 Define and use a separating process. (Separating processes include: sawing, milling, routing, die cutting,</p>					

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	<p>sanding, drilling, shearing, flame cutting, laser cutting, water-jet cutting, etc.)</p> <p>Objective 4 Define and use a forming process. (Forming processes include: casting, injection molding, bending, stamping, forging, rolling, extruding, etc.)</p> <p>Objective 5 Define and use an assembling process including the use of a jig or fixture. (Assembly processes include: combining, joining, bonding, gluing, nailing, riveting, bolting, screwing, welding, etc.)</p> <p>Objective 6 Describe the purpose of, and use a finishing process. (Finishing processes</p>					

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	include: painting, staining, waxing, anodizing, electroplating, plating, coating, glazing, etc.)					
Types of Manufacturing Production <i>(Week 5, 6 Weeks)</i>	UT: CTE: Technical and Engineering UT: Grades 9-12 Introduction to Manufacturing Technology Standard 2 Students will be able to contrast the three types of manufacturing production and apply the Technology Systems Model to manufacturing. Objective 1 Define continuous,	What are the pros and cons of the different types of manufacturing production? What manufacturing production was used to construct certain items?	<ul style="list-style-type: none"> Define Custom, Intermittent and Continuous Manufacturing Production Systems. The differences between the Manufacturing Production Systems. When to use each Manufacturing Production System. Know the positive and negative impacts of each type of manufacturing production. 	<ul style="list-style-type: none"> Participate in a custom project. Participate in a mass production project. (These could also be done in the Changing Raw Materials into Finished Products Unit.)	<ul style="list-style-type: none"> Continuous Manufacturing Intermittent Manufacturing Custom Manufacturing Mass Production Interchangeable Parts Just-In-Time Assembly Line 	Class Discussion Formative: Oral: Discussion Class discussion covering the three production systems after textbook/video lessons. Manufacturing Systems D2 worksheet Formative: Test: Written Worksheet that goes with D2 video

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	<p>intermittent, and custom types of manufacturing production.</p> <p>Objective 2 Identify the advantages and disadvantages of the three types of manufacturing production.</p>					
<p>Changing Raw Materials into Finished Products (Week 6, 12 Weeks)</p>	<p>UT: CTE: Technical and Engineering UT: Grades 9-12 Introduction to Manufacturing Technology Standard 3 The student will demonstrate the ability to accurately measure using both conventional and metric measuring systems.</p>	<ul style="list-style-type: none"> • How have computers changed the manufacturing industry? • What are the best processes and materials to use to build each project? • What are the manufacturing processes used to make each project? • What do you need to know to feel comfortable using each machine safely? 	<ul style="list-style-type: none"> • The various manufacturing materials: ferrous; non-ferrous; alloys; plastics; woods; ceramics and composites. • The difference between renewable and non-renewable resources. • How are the different raw materials harvested. • The different ways each manufacturing process may be accomplished. 	<ul style="list-style-type: none"> • Demonstrate safely the separating, forming, assembling, conditioning and finishing processes. • Safely use shop tools and machines. • Demonstrate quality craftsmanship. 	<ul style="list-style-type: none"> • Separating Processes (sawing, milling, routing, die cutting, sanding, drilling, shearing, flame cutting, laser cutting, water-jet cutting) • Forming Processes (casting, molding, bending, die stamping, forging, rolling, extruding) • Injection molding • Assembly Processes (combining, joining, bonding, 	<p>Manufacturing Processes - D4 video Common: Written: Narrative While watching the D4 Manufacturing Processes fill our the worksheet.</p>

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	<p>Objective 1 Demonstrate competency in the Conventional Measuring System. a. Identify measurements on a conventional ruler including 1/2, 1/4, 1/8, and 1/16 inch increments. b. Identify common conventional measuring tools used in manufacturing.</p> <p>Objective 2 Demonstrate competency in the Metric Measuring System. a. Identify measurements on a metric ruler including centimeter, and millimeter increments. b. Identify common metric measuring tools used in manufacturing.</p> <p>Standard 4 The student</p>		<ul style="list-style-type: none"> • The role that automation plays in manufacturing. • The role that robotics play in manufacturing. • The role that computers play in manufacturing. • The use of jigs and fixtures. 		<p>gluing, nailing, riveting, bolting, screwing, welding)</p> <ul style="list-style-type: none"> • Fasteners • Conditioning Processes (heat treating, cooling, drying, tempering, annealing, firing, chemical etching) • Finishing Processes (painting, staining, waxing, anodizing, electroplating, plating, coating, glazing) • Production Sequence • Automation • CAM (Computer Aided Manufacturing) • CNC (Computer Numeric Control) • Robotics • Jigs • Fixtures 	

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	<p>will apply the Problem Solving/ Design Process.</p> <p>Objective 1 Identify the typical steps of the Problem Solving/Design Process:</p> <ol style="list-style-type: none"> a. Identify, define and state the problem. b. Research information. c. Develop possible solutions (brainstorm, develop thumbnail sketches). d. Select the best solutions or design and build a prototype. e. Test the solution or design. f. Evaluate and refine the solution. <p>Objective 2 Identify, define, and clearly state a manufacturing design problem.</p> <ol style="list-style-type: none"> a. Identify that a problem exists. 					

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	<p>b. Define the requirements, criteria and constraints of the design problem.</p> <p>c. State or write the problem clearly.</p> <p>Objective 3 Conduct research to solve a design problem.</p> <p>a. Research information that is currently available.</p> <p>b. Identify conditions or factors which may affect the solution or design.</p> <p>c. Select the best solution or design and build a prototype for testing.</p> <p>d. Test the solution or prototype and analyze data.</p> <p>Objective 4 Evaluate and refine a solution or prototype.</p> <p>Objective 5 Participate in solving a design-based</p>					

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	<p>manufacturing problem.</p> <p>Standard 5 The student will use manufacturing processes to change raw materials into finished products.</p> <p>Objective 1 Identify and compare renewable and non-renewable natural resources.</p> <p>Objective 2 Compare various manufacturing materials, their sources, properties and uses:</p> <p>a. Ferrous (iron and steel) and non-ferrous metals (copper, aluminum, brass, lead, etc.)</p> <p>b. Alloys (mixing of metals: brass, steel, aluminum alloys, gold alloys)</p>					

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	<p>c. Plastics (thermal plastic and thermal set)</p> <p>d. Woods (hardwood and softwoods)</p> <p>e. Ceramics (bricks, table ware, insulators and heat shield, Space Shuttle tiles, dental work, internal coatings on jet engines, ceramic bearings, crucible used in metal casting, cutting tools)</p> <p>f. Composites (fiberglass, carbon fiber, concrete, plywood, Masonite, Trex)</p> <p>Objective 3 Define and use a separating process. (Separating processes include: sawing, milling, routing, die cutting, sanding, drilling, shearing, flame cutting, laser cutting, water-jet cutting, etc.)</p>					

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	<p>Objective 4 Define and use a forming process. (Forming processes include: casting, injection molding, bending, stamping, forging, rolling, extruding, etc.)</p> <p>Objective 5 Define and use an assembling process including the use of a jig or fixture. (Assembly processes include: combining, joining, bonding, gluing, nailing, riveting, bolting, screwing, welding, etc.)</p> <p>Objective 6 Describe the purpose of, and use a finishing process. (Finishing processes include: painting, staining, waxing, anodizing,</p>					

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	<p>electroplating, plating, coating, glazing, etc.)</p> <p>Objective 7 Apply the necessary steps to complete a production sequence.</p> <p>Objective 8 Identify the advantages and disadvantages of an automated manufacturing system.</p> <p>a. Define and identify manufacturing applications of automation.</p> <p>b. Define CAM (Computer Aided Manufacturing)</p> <p>c. Define CNC (Computer Numeric Control)</p> <p>d. Define and identify manufacturing applications of robotics.</p> <p>Standard 6 The student will demonstrate basic skills and safe use</p>					

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	<p>of manufacturing equipment and tools.</p> <p>Objective 1 The student will identify and demonstrate basic rules of shop safety.</p> <p>Objective 2 The student will identify work habits required for employment.</p> <p>Objective 3 The student will demonstrate the safe use of basic tools and machines.</p> <p>Objective 4 Use a jig to guide a tool to an exact spot in a manufacturing process. (Example: drilling jig) Use a fixture to hold material in place during a manufacturing process.</p>					
<p>Free Enterprise / <i>(Week 13, 5 Weeks)</i></p>	<p>UT: CTE: Technical</p>	<ul style="list-style-type: none"> • What does it take to start a business? 	<ul style="list-style-type: none"> • Students should learn and know how a 	<ul style="list-style-type: none"> • Calculate profit margins. 	<p>Entrepreneur Free Enterprise Continuous Production Labor Efficiency</p>	<p>Break even math Summative: Other: Quiz</p>

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	<p>and Engineering UT: Grades 9-12 Introduction to Manufacturing Technology Standard 7 The student will define free enterprise and marketing as it relates to manufacturing. Objective 1 Define free enterprise and entrepreneurship. Objective 2 Participate in a continuous production system. (Mass production activity) Objective 3 Explain the importance of labor efficiency and identify ways to improve</p>	<ul style="list-style-type: none"> • What is free enterprise? • What does it mean to be an entrepreneur? 	<p>business works.</p> <ul style="list-style-type: none"> • Understand profit margins. • Materials / Processes flow chart. • The purpose of jigs and fixtures. 	<ul style="list-style-type: none"> • Create and follow a material / processes flow chart. • Use jigs or fixtures in a manufacturing process. • Safely use tools and machines. 	<p>Mass Production Budget Capitol Labor Costs Material Costs Production Costs Profit Stock Advertising Distribution Marketing Market Research Market Survey Packaging Sales Supply and Demand</p>	<p>Calculate the break even point of creating a business to make and sell the project that was made. Include a standard material, equipment and labor costs. How many of the project to you need to sell and at what cost. Mass Production Project Summative: Project: Technology After the projects are done they are turned in to the instructor to be graded.</p>

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	<p>a mass production system.</p> <p>Objective 4 Identify the process of obtaining capital and managing finances.</p> <p>a. Contrast a business loan from a bank and sale of stock.</p> <p>b. Calculate manufacturing costs and profit.</p> <p>Objective 5 Apply the four “ P’ s” of Marketing to manufacturing:</p> <p>a. Product (determined by market research and market surveys)</p> <p>b. Price (determined by cost analysis, price point, and supply and demand)</p> <p>c. Promotion (advertising, and Packaging)</p> <p>d. Place (target customer, sales and distribution)</p>					

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Career Pathways <i>(Week 17, 2 Weeks)</i>	UT: CTE: Technical and Engineering UT: Grades 9-12 Introduction to Manufacturing Technology Standard 8 Students will identify the educational pathways and career opportunities in the manufacturing industry. Objective 1 Identify careers relating to the manufacturing industry. a. Identify skilled occupations in manufacturing. b. Identify unskilled occupations in manufacturing. c. Contrast the increasing demand for skilled workers	<ul style="list-style-type: none"> • How do the courses I take now effect my future employment possibilities? • After discussing different manufacturing career options and opportunities, is there a career that interests me? Why or why not? 	<ul style="list-style-type: none"> • What career oportunities are available in the Manufacturing field. 	<ul style="list-style-type: none"> • List different careers in Manufacturing. 	Career Pathway Skilled/Unskilled Occupations On-the-job-training Apprentice Skill Certification Associate Degree Bachelor Dergree	Career Identification Web Search Formative: Performance: Lab Assignment Students research possible careers in the field of manufacturing and make a list.

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	<p>and the decreasing need for unskilled workers.</p> <p>Objective 2 Identify Career Pathways, types of career training and resulting certifications in manufacturing careers.</p> <p>a. Investigate Career Pathways.</p> <p>b. Define on-the-job-training and apprenticeships.</p> <p>c. Define Skill Certificate, Associate Degree, and Bachelor' s Degree</p>					
<p>State Skills Test <i>(Week 17, 3 Weeks)</i></p>				<ul style="list-style-type: none"> • Pass the State Intoduction to Manufacturin g test at an 80% rate. Receive their certificate. 		<p>Pre-Test Pre-Assessment: Test: Written Practice Test for State Test.</p>

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<p>Shop Maintenance (Week 18, 2 Weeks)</p>	<p>UT: CTE: Technical and Engineering UT: Grades 9-12 Introduction to Manufacturing Technology Standard 6 The student will demonstrate basic skills and safe use of manufacturing equipment and tools. Objective 1 The student will identify and demonstrate basic rules of shop safety. Objective 2 The student will identify work habits required for employment.</p>	<ul style="list-style-type: none"> • Why does having a clean and organized shop matter? • Why are students responsible for clean up? • Why is it important to have well maintained equipment? 	<ul style="list-style-type: none"> • How to be safe by having a well maintained shop. • How to be shop safe by having a clean working environment. • What needs to be done to keep equipment safe and running. 	<ul style="list-style-type: none"> • Execute safe practices and procedures while working in the manufacturing laboratory. • Perform assigned clean-up responsibilities. 	<p>Hand broom Dust mop Dust pan Saw Dust collection System Tool Organization Clean up duties</p>	<p>General Safety Test Summative Test: Common General safety test covering classroom and lab behavior and procedures.</p>