

Agricultural Mechanics and Technology 2

Exam Information	Description
Exam number 113 Items 43 National Career Cluster Agriculture, Food, and Natural Resources Certification available Yes	The Agricultural Mechanics and Technology 2 industry certification exam assesses learners' knowledge on the principles and techniques of power, structural, and technical systems used in the agricultural industry. Learners will be tested on selecting, operating, maintaining, servicing, and using agricultural power units and equipment. The exam also assesses the agricultural uses of concrete and electricity, safety, and the proper use of safe practices.

Exam Blueprint and Performance Skills

Standard	Percentage of exam score
1. Personal & Leadership Development	6%
2. Supervised Agricultural Experience	4%
3. Safety Practices	6%
4. Internal Combustion Engines	18%
5. Power Units: Maintenance and Repair	8%
6. Power Units: Safe Operation	8%
7. Concrete	8%
8. Electrical Wiring Systems	20%

9. Metals	20%
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*Includes performance skill evaluation

Standard 1 - Personal & Leadership Development

Candidates will participate in personal and leadership development activities

Objective 1 Candidates will use communication skills to effectively communicate with others.

1. Understand when it is appropriate to listen and to speak.
2. Understand and follow verbal and written instructions for classroom and laboratory activities.

Objective 2 Candidates will effectively use teamwork to respectfully work with others.

1. Identify and understand different roles in working with a team

Objective 3 Candidates will use critical thinking and problem-solving skills.

1. Analyze the cause of the problem.
2. Develop a solution to address the problem.
3. Implement the plan.
4. Evaluate the effectiveness of the plan.
5. Use generally accepted industry standards to analyze, evaluate, troubleshoot and diagnose the challenges associated with a specific repair, maintenance, or fabrication project.

Objective 4 Candidates will be dependable, reliable, steady, trustworthy and consistent in performance and behavior.

1. Set and meet goals on attendance and punctuality.
2. Prioritize, plan and manage work to complete assignments and projects on time.

Objective 5 Candidates will be accountable for results.

1. Use an achievement chart for activities and behaviors in class that encourages a personal evaluation of classroom performance.
2. File a weekly/bi-weekly written report on progress toward completion of assignments and projects.

Objective 6 Be familiar with the legal requirements and expectations of the course.

1. Be familiar with the course disclosure statement and all requirements for successful completion of the course.
2. Demonstrate workplace ethics, e.g. fair, honest, disciplined

Optional: Standard performance evaluations on the final page of this document.

Standard 2 - Supervised Agricultural Development

Candidates will participate in work-based learning activities through the Supervised Agricultural Experience (SAE) Program.

Objective 1 Candidates will demonstrate employability skills

1. Use a career search network to find career choices.
2. Identify appropriate CTE Pathway for selected career choice.
3. Write a resume including a list of demonstrated skills.
4. Write a letter of application.
5. Complete a job application.
6. Participate in an actual or simulated job interview.

Objective 2 Candidates will participate in a work-based learning experience outside the classroom.

1. Candidates will plan and implement a Supervised Agricultural Experience Program from at least one of the following areas; ownership/entrepreneurship, placement/internship, research, school-based enterprise, and/or service-learning experiences.

Optional: Standard performance evaluations on the final page of this document.

Standard 3 - Safety Practices

Candidates will demonstrate appropriate safety practices in agricultural power, structural, and technical systems in laboratory and work settings.

Objective 1 Implement safety practices related to agricultural power, structural, and technical systems in learning and work situations.

1. Identify, select, and properly use appropriate personal protective equipment (PPE).
2. Verify that all equipment is in good operating condition and that appropriate safety devices are in place and working (e.g., guards in place, tool rests adjusted, etc.).
3. Maintain neat, well-organized, well-ventilated, and safe work areas.

Objective 2 Understand and demonstrate safety in agricultural power, structural, and technical systems.

1. Identify safety hazards and the actions needed to minimize risk with agricultural power units, machinery, and equipment
2. Identify appropriate safety responses in accidents or emergencies, including the use of first aid and contact of emergency services.
3. Properly dispose of waste materials to assure minimum environmental impact.
4. Identify the three parts of the fire triangle: fuel, oxygen and heat

Optional: Standard performance evaluations on the final page of this document.

Standard 4 - Internal Combustion Engines

Candidates will provide preventive maintenance in the care and operation of internal combustion engines.

Objective 1 Assess the importance of proper preventive maintenance of internal combustion engines.

1. Demonstrate proper preventive maintenance to engine life and efficiency of operation.
2. Utilize operators' manuals to determine preventive maintenance schedules and practices for specific engines.
3. Identify, select, properly use, and maintain tools needed in preventive maintenance of internal combustion engines.

Objective 2 Identify and distinguish the components and systems of internal combustion engines.

1. Classify engines by fuel used, kind of ignition, and cycle of operation.
2. Explain the functions of engine systems, including air, fuel, exhaust, ignition, lubrication, and cooling.
3. Identify the major components or structure of an engine, including engine block, cylinders, pistons, connecting rods, and crankshaft.
4. Describe the strokes of a four-stroke-cycle engine, including the role of combustion and heat.

Objective 3 Perform preventive maintenance on engine systems.

1. Perform air intake system maintenance on engines, including those with dry element filters, oil foam filters, and oil bath cleaners.
2. Perform fuel system maintenance on an engine, including filter replacement.
3. Perform lubrication system maintenance on an engine, including selecting and changing oil and replacing the filter.

4. Perform ignition system maintenance on an engine, including battery cleaning and hydrometer testing.
5. Perform exhaust system maintenance on an engine, including checking for leaks and replacing worn or damaged components.
6. Perform cooling system maintenance on liquid- and air-cooled engines.
7. Perform electrical system maintenance on engines.

Optional: Standard performance evaluations on the final page of this document.

Standard 5 - Power Units: Maintenance and Repair

Candidates will provide preventive maintenance and repair in the care and operation of power units and implements.

Objective 1 Perform preventive maintenance on power units and implements.

1. Clean all components, removing trash, mud, dust, and other dirt by using pressure washing, hand wiping, or other appropriate methods.
2. Assess the drive train for maintenance or repair.
3. Properly inflate tires.
4. Use pneumatic and hand tools to perform maintenance on power units.
5. Lubricate the steering system, as appropriate.
6. Adjust belts and chains for proper operation.
7. Inspect, analyze, and provide appropriate service for the clutch and brakes.
8. Perform appropriate service on a hydraulic system, including checking fluid levels and replenishing fluids as needed, checking for leaks, and replacing or tightening faulty fluid conveyance components.
9. Adjust covers, shields, and other safety devices.
10. Evaluate and service vehicle traction and ballasting as needed.

Objective 2 Perform basic repair on power units and implements.

1. Explain the meaning and importance of troubleshooting malfunctions.
2. Using the gauges and warning lights on the dashboard diagnose problems, take corrective actions, and test power units and implements following repair.
3. Use metal fabrication skills in making selected repairs to power units and implements.

Optional: Standard performance evaluations on the final page of this document.

Standard 6 - Power Units: Safe Operation

Candidates will safely operate basic power units and equipment.

Objective 1 Identify power unit controls and instruments and their functions.

1. Locate controls on a power unit, including starter button or key, throttle, clutch, brakes, lights, and others (depending on the unit), and explain and demonstrate their functions.
2. Locate instruments on a power unit, including oil pressure gauge, temperature gauge, tachometer, fuel gauge, and others (depending on the unit), and discuss their functions.
3. Perform a pre-operation inspection according to the manufacturer's recommendations in the owner's manual

Objective 2 Identify equipment controls for various agricultural power units and describe their functions.

1. Compare and contrast various agricultural power units and equipment.
2. Mount or attach equipment to a power unit or tractor following manufacturer's recommendations.
3. Operate equipment following safe and approved practices.

Optional: Standard performance evaluations on the final page of this document.

Standard 7 - Concrete

Candidates will plan and construct with concrete.

Objective 1 Explain the composition and characteristics of concrete.

1. Define concrete, and list advantages and disadvantages of its use.
2. Identify important agricultural uses of concrete.
3. Explain proportions and qualities of ingredients.
4. Describe the qualities of properly placed and cured concrete.

Objective 2 Place concrete.

1. Identify tools and equipment used in placing concrete.
2. Explain the construction and use of forms.
3. Calculate the amount of concrete needed for a job.
4. Explain the use of reinforcing steel.

5. Demonstrate the placing of concrete, including striking off, finishing the surface, and curing.

Optional: Standard performance evaluations on the final page of this document.

Standard 8 - Electrical Wiring Systems

Candidates will plan and install basic electrical wiring systems.

Objective 1 Explain the characteristics and measurement of electricity.

1. Describe safety practices with electricity.
2. Define electricity and identify the kinds of current (DC and AC) used in agriculture.
Describe how electricity is measured, including amperage, ohms watt, and volt.
3. Discuss voltage drop and its impact on electrical devices.
4. Describe the meaning and use of circuits.

Objective 2 Install basic electrical circuits

1. Distinguish between the functions and materials of insulators and conductors.
2. Identify and use materials and tools in circuit installation.
3. Energize a simple circuit to test its workability.
4. Use instruments to test and validate circuits.
5. Explain and demonstrate the installation of electrical boxes, splices, and connections.

Optional: Standard performance evaluations on the final page of this document

Standard 9 - Metals

Candidates will fabricate with metal.

Objective 1 Use shielded metal arc welding (SMAW) processes.

1. Make 3F (vertical position-butt weld) welds on carbon steel.
2. Make 3G (vertical position-groove weld) welds on carbon steel.

Objective 2 Use plasma cutting processes.

1. Perform safety inspections of equipment and accessories.
2. Set up for and make manual plasma cutting operations on carbon steel.

Objective 3 Use gas metal arc welding (GMAW) processes.

1. Use Short Circuit Transfer welding process to make 3F (vertical position-fillet weld) welds on carbon steel.
2. Use Short Circuit Transfer welding process to make 3G (vertical position-groove weld) welds on carbon steel.

Objective 4 Candidates will fabricate a project using metal.

1. Develop sketches or plans for the project.
2. Select materials for the project.
3. Prepare a bill of materials for the project including a cost estimate.
4. Measure, mark, and cut materials according to the plans.
5. Complete project. 6. Evaluate a completed structure in terms of plans and quality of work.

Optional: Standard performance evaluations on the final page of this document

Performance Skills Evaluation

Exam name: *Exam title*

Candidate Name: _____

Performance assessments may be completed and evaluated any time before the certification is issued. The following performance skills can be used in connection with the associated standards and exam. The evaluator will function as the subject matter expert to determine if the candidate meets the skills requirements with a Yes/No for passing.

Standard 1 – Personal and Leadership Activities File a weekly/bi-weekly written report on progress toward completion of assignments and projects.	Pass:
Standard 2 – Supervised Agricultural Experiences Candidates will keep a personal record/journal/log of their work-based learning experience; including pictures, financial records, skills learned, hours associated with project, goals, reflection, etc.	Pass:
Standard 3 – Safety Practices - Maintain neat, well-organized, well-ventilated, and safe work areas.	Pass:
Standard 4 – Internal Combustion Engines - Perform preventive maintenance on engine systems	Pass:
Standard 5 – Internal Combustion Engines Use technical manuals in diagnosing problems, taking corrective actions, and testing power units and implements following repair.	Pass:

Evaluator Name: _____

Date: _____