

2016 Agricultural Technology and Mechanical Systems CDE

The Agricultural Technology and Mechanical Systems Career Development Event is intended for teams of 3-4 students, with the top 3 individual scores counted toward the overall team score.

For this event, students must come prepared with proper safety equipment, including welding jackets, closed-toe leather shoes, safety glasses and welding gloves. Official FFA Dress is not required for this event.

The National FFA Organization theme for this event in 2016 is “Animal Production Systems.” This is reflected in components (C) and (D) of this format.

NOTE: IF STUDENTS WISH TO INCORPORATE A JIG INTO THIS YEAR’S WELDING ASSIGNMENT (RECOMMENDED, NOT REQUIRED), THEY MUST MAKE THE JIG IN ADVANCE AND BRING IT WITH THEM TO CONVENTION. UPON ADVANCE REQUEST BY THEIR CHAPTER ADVISOR, THEY WILL BE SENT 6 METAL PIECES FOR PRACTICE PURPOSES WHICH WILL BE OF THE SAME DIMENSIONS AS THOSE THEY WILL RECEIVE AT CONVENTION TO COMPLETE THE WELDING ASSIGNMENT.

The following components will be included in this event:

- (A) Welding with stick and MIG welder. Six metal pieces will be provided to students at Convention to weld. Three of these pieces will be welded together along each their edges (total of two edge welds) using a stick welder and the other three the same (again a total of two edge welds) using a MIG welder.

It is suggested that FFA members make ahead of time and bring to Convention a jig to hold their pieces in place. If students follow this suggestion, this jig must already be built prior to the event. There will be no time to build a jig at the CDE. A series of photos will be posted at the Maine FFA website explaining the step by step assembly of the pieces.

Regardless of whether students build a jig, a hole will be pre-drilled on each end of the part they make. This will need to be matched with the corresponding holes in the other device they weld. How close they fit to a standard will be scored. Refer to the photos! Student can practice welding, before they get to Convention, these pieces to achieve this result and can construct on their own, the jig that they will bring to Convention with them. FFA members will get six new un-welded pieces of metal at the contest site which they will weld.

- (B) General Knowledge Test – questions will be taken from among those posted at the end of this format.
- (C) Animal Water Pump Trouble Shooting – Each team will trouble shoot a water pump intended to pump water for animals. By the end of their trouble shooting, the pump should function adequately for them to pump water from one location to another.
- (D) Model Animal Shelter – Students will build out of index cards and 2 inch pieces of tape a scale model for a large animal shelter (suitable for horses, cows or buffalo), including a second floor for storing hay. Judges will test strength of student creations in front of all students at event. See attached sheet for more information.
- (E) Electrical Circuit – Teams will complete a simple electrical circuit using materials and instructions provided. An example of the circuit to be assigned will be posted on the Maine FFA website. <https://www.youtube.com/watch?v=-R8EhNDd738>

Participants will be scored as follows:

Top 3 scores count for overall team score

	<u>Individual</u>	<u>Team Points</u>
Team Activity (Water Pump)	1 / 3 of team	90 points
Welding (MIG and stick)	30 points	90 points
Team Activity (Electricity)	1 / 3 of team	90 points
Animal Shelter Model	1 / 3 of team	90 points
General Knowledge Exam	<u>30 points</u>	<u>90 points</u>
Total points possible	150 points	450 points

Tiebreaker

The team score for the event will be determined by adding all the points earned by adding individual points as listed above. The following activities will be used to break ties between individuals and/or teams:

The highest written exam scores; if still tied top welding scores

Agricultural Technology and Mechanical Systems CDE Score Sheets

2016

Name and FFA Chapter	General Knowledge	Team Electrical Activity	Welding Section	Team Water Pump	Animal Shelter	Place
1.						
2.						
3.						
4.						
1.						
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2016 Ag Mechanics CDE

Welding Segment

MIG Section Scoring

Point Value	What judges will look for
1 2 3	No visible imperfections or spatter damage
1 2 3 4	High quality appearance
1 2	Proper welding apparel
1 2	Safety glasses worn at all times
1	Check for hazards
1 2	Proper handling of hot materials
1	Clean up and tool return
	Total points earned (15 possible)

Stick Welding Segment

Point value	What the judge is looking for
1 2 3	All pieces fit properly and are correctly located.
1 2 3	High quality appearance
1 2	Proper welding apparel
1 2	Safety glasses worn at all times
1	Check for hazards
1 2	Proper chipping
1	Safe handling of hot metal
1	Clean up and tool return
	Total points earned (15 possible)

Ag Mechanics Team Activity

You are working on a farm which requires pumping of water from a reservoir to a storage tank for utilization by livestock. The engine will not run and you must get this running soon.

The engine does not require disassembly of engine. The complaint is simply that it will not start.

Use proper troubleshooting to determine the problem. Fix the problem and pump water from point "A" to point "B".

Scoring:

1. Utilize proper troubleshooting technique.
 - (1) Check oil.....4 points _____
 - (2) Check fuel.....4 points _____
 - (3) Check ignition4points _____
 - (4) Check compression.....4 points _____

2. Engine runs properly10 points _____

3. Water pumped in the allotted time frame4 points _____

Total points _____

Total X 3 _____

Ag Mechanics Special Projects Section

Team Activity

This winter the snow totals have been lower than normal. Last year the opposite conditions occurred. Record totals meant that roofs and buildings were stressed resisting the heavy snow loads.

For this section of the CDE you will produce a prototype (model) for an animal shelter that will be free standing in a pasture. The structure could contain horses, cows, or sheep. The model will be at least 15.5 centimeters in height and support as much weight as possible.

A supplied cylinder will replicate the turning space and headroom needed by one animal. The bottom floor must allow two of those cylinders to fit vertically. The cylinders are slightly less than 80 mm in height and 70 mm in diameter.

The building must have 3 surface levels. Level one will be where the animals reside. Level two will contain hay, grain, and small equipment for the remote shelter. Level three will be the roof.

Design criteria:

- Materials will be 40 index cards 77 mm(3 inches) X 128 mm(5 inches)
- One roll of transparent office tape
- Index cards may be folded but not torn
- A scale (rule) will be provided
- No pieces of tape longer than 50 mm (2 inches)
- Model may not be taped to testing surface
- Height will be measured to lowest part of roof.
- Roof must be designed to hold test weights
- Weights will be added until roof sags or sidewalls shift
- The model must hold this weight at least 10 seconds
- Each index card not used will add 10 units to total weight (10 cards = 100 grams)
- Team with greatest total weight will get maximum points
- Formula { Your total weight ÷ top weight = _____ X 30 }

TOTAL points _____

Teams are urged to build a trial model **before** they come to the FFA State Convention and enter this CDE. They may make sketches of what they will build since they will only have **25 minutes** to build a complete model. They may not bring a pre-manufactured model into the CDE area. Must work as a TEAM to get this done.

Typical Agricultural Technology and Mechanical Systems Questions

These questions are the type you might see during the general examination portion of the State Ag Mechanics CDE. The questions for the exam are being developed and will be disseminated as soon as possible.

Mark all answers on the answer sheet using a pencil. Read each question carefully and identify the correct single answer. Use the blank sheet of paper to do all the scratch work. Students will need a calculator to complete this examination, but they are not allowed to share a calculator with another student.

1. What is the name of the device to measure tractor PTO (power take-off) horsepower?
2. A diesel engine produces white- colored exhaust. What is the most likely cause?
3. A diesel engine produces blue-colored exhaust. What is the most likely cause?
4. Which hydraulic system component converts mechanical energy into hydraulic energy?
5. Which of the following would be considered a fuel conservation technique?
6. A skid-steer loader is used to move soil from a stockpile. The loader used two 3- inch by 36-inch hydraulic cylinders to raise and lower the loader lift arms. If the loader's hydraulic system can generate a maximum pressure of 2,500 pounds per square inch, approximately what is the maximum lifting force (pounds) that each cylinder can produce?

7. A twenty-foot-long dump truck bed is 54 inches deep and seven feet wide. What is the approximate capacity of the truck bed in cubic yards if a load is struck level across the top?

8. Which of the following is the safest way to drive a loader uphill with a full bucket?

9. A John Deere utility tractor has been re-equipped with low profile tires (smaller diameter than the factory equipped tires) for orchard use. How will the smaller diameter tires change the relative ground speeds listed in the operator's manual for specific RPMs and gear settings? Assume both tire sizes are properly inflated.

10. When the piston of the four stroke small engine reaches the bottom of the cylinder on the intake stroke it starts upward on what stroke?

11. The intake valve of a 4-stroke single-cylinder small engine is opened and closed by the action of what component?

12. A partially sheared flywheel key can result in which of the following?

13. In four-stroke small gasoline engines, how fast does the camshaft turn with respect to the speed of the crankshaft?

14. What is the name given to the printed safety information that must be kept on file for each hazardous material kept or used in a small engine shop?

15. How much torque in ft-lbs is applied to a head bolt by applying 120 pounds of force on the end of a wrench 12 inches in length? Note: Torque in ft-lbs = (Force in pounds) x (length of lever arm in feet)

16. In electrical terminology, what is the meaning of the abbreviation AC?
17. Which of the following statement is correct with respect to wearing safety glasses while welding?
18. Approximately how much time is required to remove 750 round hay bales from a field if bale transport can be completed at average hauling rate 11.5 bales per hour? Note: 1 hour= 60 minutes.
19. A tractor fueled by No. 2 diesel burns 7.75 gallons per hour. When the same tractor is fueled with B20 biodiesel it burns 8.25 gallons per hour. Approximately how many more gallons of fuel will the tractor use during eight hours of operation if it is fueled by B20 biodiesel rather than No. 2 diesel?
20. What tractor power train component directs power equally to both rear wheels to prevent the loss of traction that occurs when one wheel is slipping?
21. If the measured tractor wheel slippage is zero, what adjustment can increase wheel slippage?
22. Why do engine manufactures recommend that fuel stabilizer be added to fuel left in gasoline engines, such as lawnmowers and snow blowers, when the equipment will not be used from one season to the next?
23. When pulling or towing a trailer with a tractor, what is the correct place to connect the load?

24. When a hydraulic leak is suspected to originate from an implement hose, which of the following is the correct procedure to locate the leak?

25. Which of the following statement about the American Wire Gauge (AWG) conductor rating system is true?

26. A non-metallic sheathed cable that contains two #12 insulated conductors (white and black) and one bare grounding conductor would be identified by which of the following markings?

27. According to Article 547 of the National Electric Code, all electrical wiring cable in agricultural application shall be secured with how many inches of exiting a box?

28. At least how many inches of free conductors shall be left at each outlet, junction, and switch point for splices or the connection of fixtures or devices?

29. When operation a tractor on a road or highway, which of the following is correct regarding brakes?

30. When using 12-2 WG nonmetallic-sheathed cable in a 120-volt electrical lighting circuit, which conductor should a single pole, single throw light switch controls (make or break the connection)?

31. The best spray tip to select for superior wear life is:

32. A(n) _____ uses spinning disks (or cups) to break liquid into uniformly sized droplets by centrifugal force.

33. Chemical application rates can be increased by:

34. Nozzles with wider spray angles permit_____, thereby reducing the potential for drift.

35. The first step in sprayer calibration is to check two important factors related to nozzles:

36. When calibrating a sprayer, if the measured gallon per minute value is slightly lower or higher than the required level, the easiest method of fine tuning the flow rate is:

37. When calibrating a sprayer, if the gallons per acre value determined is much lower or higher than the required level, the preferred method of correction is:

38. Changing sprayer operating pressure can change:

39. The pump of a tractor mounted sprayer is usually driven by a(n):

40. A(n) _____ produces positively charged insecticides as the solution leaves the nozzles.

41. A 48-foot-wide spray boom with spray tips that have a flow rate of 0.4 gallons per minute and are spaced on 20- inch centers will produce an application rate of _____ gallons per acre when the sprayer travels at 6 miles per hour.

42. If nozzle pressure was increased from a level of 10 psi to 40 psi, output flow rate would be:

43. Most 80 flat fan spray tips have _____% spray overlap to ensure even distribution for broadcast application.
44. The _____ controls the pressure developed by a sprayer and, indirectly, the quantity of spray material delivered by the nozzles.
45. Which of the following is the signal word used to identify high toxicity (category) pesticides?
46. The first step in effective pest management is
47. A reaction to a pesticide that occurs from a single incident, such as when a person ingests a pesticide and loses consciousness immediately, is known as a
48. A measure of the relative oral or dermal toxicity of a pesticide is measured in
49. MSDS stand for
50. What is the most common type of pesticide exposure?
51. The proper footwear to use for handling a pesticide carrying the signal word “Danger” would be
52. The major danger posed to bystander by a walk behind rotary mower is
53. Which of the following is appropriate footwear for mowing with a walk behind rotary mower?

54. Oral ingestions of pesticides can occur from

55. Clothing worn applying pesticides

56. Empty pesticide containers should be