

**IOWA FFA
CAREER DEVELOPMENT EVENT
AGRICULTURAL MECHANICS**

2005

WRITTEN EXAMINATION

**IOWA STATE UNIVERSITY
AMES, IOWA
JUNE 9, 2005**



2005 Iowa FFA Agricultural Mechanics Career Development Event

State of Iowa
 DEPARTMENT OF EDUCATION
 Career Education Division
 Grimes State Office Building
 Des Moines, IA 50319

CONTESTANT NAME _____

CONTESTANT SCHOOL _____

WRITTEN EXAM

Darken the circle 0 under A, B, C, or D indicating the one best answer

	A	B	C	D		A	B	C	D		A	B	C	D
1.	0	0	0	0	21.	0	0	0	0	41.	0	0	0	0
2.	0	0	0	0	22.	0	0	0	0	42.	0	0	0	0
3.	0	0	0	0	23.	0	0	0	0	43.	0	0	0	0
4.	0	0	0	0	24.	0	0	0	0	44.	0	0	0	0
5.	0	0	0	0	25.	0	0	0	0	45.	0	0	0	0
6.	0	0	0	0	26.	0	0	0	0	46.	0	0	0	0
7.	0	0	0	0	27.	0	0	0	0	47.	0	0	0	0
8.	0	0	0	0	28.	0	0	0	0	48.	0	0	0	0
9.	0	0	0	0	29.	0	0	0	0	49.	0	0	0	0
10.	0	0	0	0	30.	0	0	0	0	50.	0	0	0	0
11.	0	0	0	0	31.	0	0	0	0	51.	0	0	0	0
12.	0	0	0	0	32.	0	0	0	0	52.	0	0	0	0
13.	0	0	0	0	33.	0	0	0	0	53.	0	0	0	0
14.	0	0	0	0	34.	0	0	0	0	54.	0	0	0	0
15.	0	0	0	0	35.	0	0	0	0	55.	0	0	0	0
16.	0	0	0	0	36.	0	0	0	0	56.	0	0	0	0
17.	0	0	0	0	37.	0	0	0	0	57.	0	0	0	0
18.	0	0	0	0	38.	0	0	0	0	58.	0	0	0	0
19.	0	0	0	0	39.	0	0	0	0	59.	0	0	0	0
20.	0	0	0	0	40.	0	0	0	0	60.	0	0	0	0

MES
ENDS

IMS
ENDS

SS
ENDS

E/NRS
ENDS

ES
ENDS

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STRUCTURAL SYSTEMS (WOOD & METAL BUILDING CONST.)

1. _____ is a semi-transparent material used in metal building construction to allow light into the building through the sidewalls and/or roof.
 - A. Silicone
 - B. Neoprene
 - C. Filon
 - D. Agri-Rib

2. _____ is a building material made of glued wood particles, pressed into 4' x 8' sheets.
 - A. High density polystyrene
 - B. Oriented Strand Board
 - C. Veneer
 - D. "Green board"

3. If you need to trim the edges of a corrugated, galvanized, steel roof, _____ would be the most practical method.
 - A. cut the edge with a Skil-saw with an old blade installed backwards in the saw
 - B. cut the edge with an oxy-acetylene cutting torch
 - C. cut the edge with a cross-cut handsaw
 - D. cut the edge with a diamond impregnated cut-off saw

4. _____ welding uses the oxy-acetylene welding and cutting torch set.
 - A. Wire
 - B. Arc
 - C. TIG
 - D. Fusion

5. _____ are roof framework units, assembled on the ground at the building site, or at a factory.
 - A. Rafters
 - B. Trusses
 - C. Joists
 - D. Stringers

6. The square poles in pole building construction are generally placed _____ feet O.C.
 - A. 2
 - B. 4
 - C. 6
 - D. 8

7. 2 x 4's used for sidewall girts in pole building construction, are usually placed _____.
- A. 2 feet apart, vertically
 - B. 2 feet apart, in a square pattern
 - C. 2 feet apart, horizontally
 - D. diagonally, 2 feet apart
8. _____ are used for fastening steel sidewall panels on a pole building.
- A. drill-point screws with neoprene washers
 - B. sheet metal screws
 - C. wood screws
 - D. aluminum screws
9. _____ should not be used in covering the roof and sidewalls of a pole building.
- A. ridged, enameled steel panels
 - B. galvanized, corrugated steel panels
 - C. completely flat steel panels
 - D. wood
10. Safety considerations for pole building construction should include _____.
- A. precipitation
 - B. wind
 - C. on-lookers
 - D. all of the above
11. Pole building sidewall and roofing sheets are generally 28 _____ thickness.
- A. gauge
 - B. thousandths
 - C. inches
 - D. mm
12. A _____ is the framing member, placed over a large door opening, in constructing a pole building.
- A. stud
 - B. plate
 - C. sill
 - D. header

MACHINERY AND EQUIPMENT SYSTEMS (CROP SPRAYERS)
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13. Current self-propelled sprayers can be operated at speeds up to _____ MPH in smooth fields when spraying crop chemicals.
- A. 2
 - B. 5
 - C. 15-18
 - D. 40
14. Broadcast spraying of non-specific pesticides should be _____.
- A. the first choice in controlling weeds
 - B. used to control giant foxtail
 - C. used on organically grown crops
 - D. used as a last resort to control weeds

15. _____ pesticides can be used to control pests in organic crops.

- A. All chemical
- B. Naturally sourced
- C. No
- D. Only Monsanto

16. _____ are used to mark the edge of the last pass with the crop sprayer.

- A. Foam markers
- B. Mechanical markers
- C. GPS guidance
- D. A or C

17. The nozzle flow rate in GPM in the following example, is _____ gallons per minute.
(30 inch rows, 2 nozzles per row)

$$\text{Formula: } \text{GPM} = \frac{\text{GPA} \times \text{S} \times \text{W}}{5940} \qquad \text{GPM} = \frac{20 \times 6 \times 15}{5940}$$

GPM= gallons per minute
GPA= gallons per acre (20)
S= field speed in miles per hour (6)
W= width of nozzle, in inches (15)
5940= constant

- A. 3.003
- B. 0.3003
- C. 30.03
- D. 20

18. Integrated Pest Management is an effective and environmentally sensitive approach to pest management that relies on _____.

- A. a single pest control method
- B. non-chemical control of pests, only
- C. all appropriate pest management options
- D. chemicals, only to control pests

19. Asian Soybean Rust is a(n) _____.

- A. weed
- B. fungus
- C. insect
- D. bug

20. Asian Soybean Rust is a potential problem which will likely invade Iowa.
_____ can be used to spray for this pest.

- A. Syngenta Quadris
- B. Roundup
- C. Northstar
- D. GreenStar

21. _____ when you are operating a sprayer for the local coop.

- A. Eat in the cab of the sprayer to save time
- B. Dispose of excess spray in the ditch, before returning to town
- C. Spray upwind of vulnerable plants, trees and gardens
- D. Be safety conscious at all times, both on-road and off-road.

22. All of the following companies, except _____ manufacture field sprayers.
- A. GM
 - B. AGCO
 - C. John Deere
 - D. CNH
23. The John Deere 4920, self-propelled sprayer, owned by the Fort Atkinson Farmers Coop, can be operated by _____.
- A. any employee of the coop
 - B. any farmer-member of the coop
 - C. an employee with a commercial pesticide applicators license
 - D. only the chemical manager of the coop
24. Self-propelled sprayers, including the JD 4920 and the CaseIH Patriot, should be operated with the spray boom _____.
- A. at the recommended clearance above the crop
 - B. as high as possible
 - C. 6 inches below the top of the crop
 - D. 30 inches above the crop, minimum

ENVIRONMENT AND NATURAL RESOURCES
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25. All of the following, except _____, are brand names of integrated farm equipment GPS systems.
- A. OnStar
 - B. AFS
 - C. GreenStar
 - D. Fieldstar
26. The _____ Survey is an operational program within the Bureau of Land Management, US Department of the Interior.
- A. NAVSTAR
 - B. Navistar
 - C. TempStar
 - D. Cadastral
27. NAVSTAR (NAVigation System with Time and Ranging) is a constellation of _____ satellites orbiting the earth that are used in the GPS.
- A. 3
 - B. 12
 - C. 27
 - D. 48
28. A leveling rod is used in conjunction with another tool by a surveyor to _____.
- A. record compass headings
 - B. determine elevation
 - C. determine distance
 - D. none of the above

29. There are _____ sections in a township.
- A. 640
 - B. 6
 - C. 36
 - D. 16
30. Satellites in geosynchronous orbits, _____.
- A. orbit 19,100 miles above a fixed spot on the earth
 - B. orbit the earth on a regular orbit
 - C. orbit the earth in a random pattern
 - D. orbit the earth at 500 miles above the surface
31. Determining position, using 4 satellites to determine DISTANCE, is called _____.
- A. GDOP
 - B. selective availability
 - C. trilateration
 - D. triangulation
32. GPS satellites orbit the earth at _____ elevation above the earth's surface.
- A. 12,600 miles
 - B. 12,600 kilometers
 - C. 126,000 miles
 - D. 1260 miles
33. _____ is used to determine location by using angles.
- A. GDOP
 - B. Selective Availability
 - C. trilateration
 - D. triangulation
34. There are _____ acres in a section.
- A. 640
 - B. 40
 - C. 80
 - D. 120
35. The John Deere GreenStar, AutoTrac, assisted steering, used on the 4920 self-propelled sprayer, can provide an accuracy in steering the sprayer, as close as _____.
- A. plus or minus 7 feet
 - B. plus or minus 4 inches
 - C. plus or minus 27 feet
 - D. plus or minus .001 inch
36. There are _____ acres in an area measuring 40 rods by 120 rods.
- A. 80
 - B. 20
 - C. 120
 - D. 30

INDUSTRY AND MARKETING

37. One of these 3 signal words; _____, must be used on the pesticide label to describe the relative toxicity to humans of the active ingredient in the pesticide.
- A. danger, lethal, irritant
 - B. caution, warning, danger
 - C. notice, caution, danger
 - D. dangerous, extreme, lethal
38. "Routes of Entry" statements on pesticide labels describe _____.
- A. how pesticides can enter the human body
 - B. how pesticides can enter waterways
 - C. how pesticides can enter the environment
 - D. how pesticides enter the targeted pest
39. Restricted use pesticides can be applied by _____.
- A. any applicator
 - B. trained and certified applicators
 - C. Terminex employees only
 - D. only employees of the pesticide manufacturer
40. BT hybrids produce insect specific toxins that make the corn plant resistant to _____.
- A. cutworms
 - B. wireworms
 - C. European corn borers
 - D. SCN
41. Glyphosate is the active ingredient in _____ herbicide.
- A. Liberty Link
 - B. Fortress 5G
 - C. Northstar
 - D. Roundup
42. Rinsates are _____ wastes.
- A. water used to rinse spraying equipment, which contains some remaining pesticide.
 - B. clear water added to mix the ingredients in the spray tank
 - C. pesticides at strength of use
 - D. pure pesticide
43. Cutworms can be controlled with _____.
- A. Roundup
 - B. Northstar
 - C. SPF 250
 - D. Fortress 5G
44. If allowed by the pesticide label, pesticide containers should be disposed of _____ in the landfill.
- A. immediately after emptying
 - B. after proper rinsing
 - C. after incineration
 - D. after being stored empty for 1 year

45. Pesticides can be applied at _____ rate.
- A. only the rate specified on the label
 - B. up to twice the recommended amount
 - C. only ½ of the rate specified on black soil
 - D. none of the above
46. Roundup is a contact herbicide. This means that it must be applied _____.
- A. before the weeds emerge
 - B. before working the soil
 - C. after the weeds have emerged and are 2-6 inches tall
 - D. while planting the crop
47. If the corn field was sprayed with Roundup last year, the farmer can _____ this year.
- A. plant only Roundup Ready crops
 - B. plant Roundup Ready corn and get residual effects from last year's Roundup
 - C. plant any crop he desires, because Roundup is not a residual herbicide
 - D. Plant Pioneer corn only
48. _____ is a pre-emerge herbicide for corn.
- A. Lumax
 - B. Roundup
 - C. DuPont Resolve
 - D. Northstar

ENERGY SYSTEMS (SMALL ENGINES)

49. The electronic ignition module on a Briggs and Stratton engine is a(n) _____.
- A. electron
 - B. Delcotron
 - C. Magnetron
 - D. Spark-O-Matic
50. Valve overlap on a small 4-stroke cycle engine occurs on the _____ stroke.
- A. intake
 - B. compression
 - C. power
 - D. exhaust
51. On a diesel small engine, _____ is compressed on the compression stroke.
- A. air and diesel fuel
 - B. air and gasoline
 - C. air only
 - D. fuel only
52. When stopping a small engine with magneto ignition, the following happens:
- A. the ignition is grounded
 - B. the wire from the switch to the ignition is open
 - C. the wire from the switch to the ignition is powered
 - D. none of the above

53. Briggs and Stratton is now owned by _____.
- A. Honda
 - B. MTD
 - C. Cub Cadet
 - D. Kubota
54. Small engines _____ 10% ethanol blended gasoline.
- A. are approved to use
 - B. can not use
 - C. can use for light loads only
 - D. can only be used at high altitudes
55. Small engines should be operated in a well-ventilated area because of _____ in the exhaust.
- A. carbon dioxide
 - B. H O
 - C. carbon monoxide
 - D. heat
56. When using the small engine for the last time in the fall, do all of the following, except _____.
- A. run the engine out of fuel
 - B. clean off all debris
 - C. put Sta-Bil in the fuel tank
 - D. fill the tank with clean fuel
57. The choke on a small engine _____.
- A. enriches the fuel mixture
 - B. leans out the fuel mixture
 - C. allows less air and fuel into the combustion chamber
 - D. advances the timing
58. In a 4-stroke cycle small engine, the crankshaft rotates _____ degrees and the camshaft rotates _____ degrees in one complete sequence.
- A. 360, 360
 - B. 720, 360
 - C. 360, 720
 - D. 720, 720
59. _____ is the air-fuel ratio, by weight, in a small engine.
- A. 100-1
 - B. 14-1
 - C. 1-1
 - D. 1-14
60. Late timing in a small engine, used on a lawnmower, could be caused by _____.
- A. the flywheel key is completely sheared and the flywheel can rotate on the crankshaft
 - B. the engine is flooded
 - C. the spark plug is grounded out
 - D. the flywheel key is partially sheared by having struck a big rock with the lawnmower blade

2005

**IOWA FFA AGRICULTURAL MECHANICS CDE
WRITTEN TEST ANSWER KEY**

- | | |
|-------|-------|
| 1. C | 31. C |
| 2. B | 32. A |
| 3. A | 33. D |
| 4. D | 34. A |
| 5. B | 35. B |
| 6. D | 36. D |
| 7. C | 37. B |
| 8. A | 38. A |
| 9. C | 39. B |
| 10. D | 40. C |
| 11. A | 41. D |
| 12. D | 42. A |
| 13. C | 43. D |
| 14. D | 44. B |
| 15. B | 45. A |
| 16. D | 46. C |
| 17. B | 47. C |
| 18. C | 48. A |
| 19. B | 49. C |
| 20. A | 50. D |
| 21. D | 51. C |
| 22. A | 52. A |
| 23. C | 53. B |
| 24. A | 54. A |
| 25. A | 55. C |
| 26. D | 56. D |
| 27. C | 57. A |
| 28. B | 58. B |
| 29. C | 59. A |
| 30. A | 60. D |

Select the one best answer for each question and write it in the blank to the left of the question:

Ag Machinery - Sprayers

- _____ 1. As ground speed of the sprayer increases with all other settings remaining unchanged, application rates:
A. increase
B. decrease
C. stay the same
- _____ 2. When sprayer pressure is increased to a sprayer nozzle, the droplet size will:
A. increase
B. decrease
C. remain the same
D. fluctuate back and forth
- _____ 3. In order to double the flow rate or individual output from a nozzle, the pressure must be:
A. doubled.
B. increased three times.
C. increased four times.
D. reduced to one-fourth of the original pressure
- _____ 4. Which of the following materials is not recommended for cleaning sprayer nozzle tips?
A. soft bristle brush
B. toothpick
C. water and solvent
D. wire brush
- _____ 5. The application rate in gallons per acre is determined by:
A. the tractor speed
B. the pump pressure
C. the nozzle spacing
D. all of these
- _____ 6. Nozzle manufacturers often code spray nozzles to indicate specific spray characteristics. The tip number may indicate
A. nozzle type
B. spray fan angle
C. flow rate
D. all of the above
- _____ 7. Wearing of the nozzle tips would tend to _____ application rates.
A. increase
B. decrease
C. have no effect on
- _____ 8. The purpose of the boom selector is to:
A. regulate pressure to maintain constant pressure at each nozzle
B. allow for by-pass to agitate material in the tank
C. allow for sections of the boom to be turned off while the rest continue to spray
D. regulate tank pressure

- _____ 9. You are considering banding all your pesticides and liquid fertilizers in the next cropping season. The broadcast rate of the pesticide you use on your corn acreage is 12 gal./acre. If you want to spray a 9-inch band on a 36-inch row spacing, what is the band rate?

$$\frac{\text{Width of band (inches)}}{\text{Row spacing (inches)}} \times \text{broadcast rate in gal./acre} = \text{Gal./acre of spray for band}$$

- A. 1.5
B. 3
C. 4
D. 6
- _____ 10. The spray nozzle least resistant to wear from abrasive materials is made of:
A. Stainless steel. C. Brass.
B. Tungsten. D. Ceramic.
- _____ 11. Calibration includes:
A. checking tractor speed
B. calculating nozzle flow rate
C. adjusting pressure
D. all of the above
- _____ 12. Agitation in the sprayer tank is typically required when using a _____ type of crop protection chemical.
A. wettable powder
B. dry flowable powder
C. solution
D. all of the above

Chemical Safety & Reading Labels

- _____ 13. Pesticides are toxic substances. The potential toxicity to humans is stated on the label by use of "signal words." Which of the following "signal words" indicate the greatest toxicity to people?
A. warning
B. danger
C. caution
D. none of the above
- _____ 14. Chemicals should be stored _____
A. in the basement
B. in a free-standing, locked building
C. in the barn
D. on the tractor
- _____ 15. Skin, eyes and lungs should be protected when _____
A. loading or mixing chemicals
B. cleaning or changing spray tips
C. applying chemicals
D. all of the above

- _____ 16. When working with crop protection chemicals, the minimum amount of protective clothing that should be worn is _____.
- A. long-sleeved shirt
 - B. long-legged trousers
 - C. socks and sturdy shoes
 - D. all of the above
- _____ 17. The hazard of a crop protection chemical, or threat that injury will result from its use, is a combination of _____.
- A. formulation and toxicity
 - B. toxicity and exposure
 - C. Environmental Protection Agency use classification and distribution
 - D. none of the above
- _____ 18. Low level exposure to a crop protection chemical over a long period of time is known as _____.
- A. acute exposure
 - B. oral exposure
 - C. chronic exposure
 - D. inhalation exposure
- _____ 19. Crop protection chemical absorption is fastest in the _____.
- A. ear canal
 - B. groin area
 - C. palm of hand
 - D. scalp
- _____ 20. If your sprayer is traveling at 5 mph and your application width is 20 ft. and you are discharging 1 gallon of solution per minute, the total gallons per acre that is being applied is:
- A. 4.95
 - B. 4.00
 - C. 6.50
 - D. None of the above
- _____ 21. Pesticide drift is affected by:
- A. Droplet size.
 - B. Temperature.
 - C. Height at which the pesticide is released.
 - D. All of the above.
- _____ 22. A restricted use crop protection chemical is _____.
- A. one that can be purchased and applied by anyone
 - B. one that requires no special care in mixing, applying, storing and disposing
 - C. the class of chemicals requiring the highest level of caution
 - D. an arbitrary classification
- _____ 23. Toxicity of pesticides is expressed as an LD50. LD50 means:
- A. Lowest dose necessary to kill a test animal.
 - B. The dose of a pesticide that will kill half of the population of test animals.
 - C. Lethal dose to 50 test animal species.
 - D. None of the above.
- _____ 24. A simple definition of a "weed" is:
- A. All broadleaf plants.
 - B. All flowering perennial plants.
 - C. A plant out of place.
 - D. Uncultivated plants.

- _____ 25. Which Federal law regulates the labeling of pesticides?
- A. SARA/EPCRA
 - B. FIFRA (Federal Insecticide, Fungicide & Rodenticide Act)
 - C. Farm bill.
 - D. None of the above.

GPS applications

- _____ 26. Global Positioning Systems (GPS) are used
- A. only for agricultural systems.
 - B. only for operations that have satellite receivers.
 - C. for a wide range of systems including agriculture.
 - D. only for the Federal Communications Commission (FCC).
- _____ 27. Precision Farming involves
- A. Global Positioning Systems.
 - B. Grid soil sampling, spatial mapping, variable rate application, and real-time yield monitoring.
 - C. Farming by the foot rather than the field.
 - D. Crop practices that improve the yields based on the needs of the land
 - E. All the above.
- _____ 28. The initials VRT stand for
- A. Vertical Ridge Technology.
 - B. Vertically Round Tiling
 - C. Variable Rate Technology
 - D. Variety Round-up Ready Technology
- _____ 29. Grid mapping of farm fields is generally done in ____ sized units.
- A. 1/10 acre
 - B. 80 acre
 - C. 2.2 acre
 - D. 1 square rod
- _____ 30. The External antenna required when using GPS in a combine should be placed:
- A. at the highest point on the combine.
 - B. below the highest point on the combine so that it doesn't get broken off.
 - C. in the cab of the combine.
 - D. near the rear end of the combine.
- _____ 31. GPS satellites:
- A. have random orbits.
 - B. circle the sun every 24 hours.
 - C. circle the earth every 24 hours.
 - D. have geosynchronous orbits.
- _____ 32. The GPS system was started by the:
- A. Department of Transportation.
 - B. Department of Defense.
 - C. IBM Corporation.
 - D. Biosystems Engineering At ISU.
- _____ 33. GLONASS refers to the satellite system operated by:
- A. Russia.
 - B. Canada.
 - C. Germany.
 - D. France.

- ____ 34. GPS will work in any of the following locations except:
 A. corn fields.
 B. cow pastures.
 C. city streets.
 D. inside a steel shop building.
- ____ 35. The initials GPS stand for:
 A. Geographical Positioning System.
 B. Geosynchronous position System.
 C. Global Positioning System.
 D. Ground Plane Status.
- ____ 36. The External antenna required when using GPS in a combine should be placed:
 A. at the highest point on the combine.
 B. below the highest point on the combine so that it doesn't get broken off.
 C. in the cab of the combine.
 D. near the rear end of the combine.
- ____ 37. GPS systems installed
 A. measure corn yields
 B. check harvest loss
 C. determine field position of the combine
 D. check the moisture content of the crop being harvested
- ____ 38. "Ghosting" on TV, similar to "multipath error" in GPS readouts, could be caused by any of the following except:
 A. signals from satellites bouncing off buildings.
 B. signals bouncing off hills
 C. signals bouncing off large tree groves
 D. other GPS units in the immediate area.

Carpentry

- ____ 39. Pitch of a roof is the ratio of ____ to ____.
 A. rise, run
 B. run, rise
 C. rise, span
 D. run, span
- ____ 40. A 1 x 8 x 8'- 0" piece of lumber actually measures:
 A. 1" x 8" x 96"
 B. 5/8" x 7 5/8" x 80"
 C. 3/4" x 7 1/4" x 96"
 D. 1 1/2" x 7 1/4" x 96"
- ____ 41. A bolt used in wood that has a round head over a square shoulder is a:
 A. stove bolt.
 B. machine bolt.
 C. carriage bolt.
 D. none of these.
- ____ 42. The horizontal members that siding is attached to in pole construction are called:
 A. purlins.
 B. headers.
 C. girts.
 D. poles.
- ____ 43. The lowercase letter "d" is used to designate sizes of:
 A. lumber.
 B. screws.
 C. nails.
 D. bolts.

- _____ 44. The term "dead load" of a building refers to:
- A. the weight of snow and ice which may accumulate on the roof.
 - B. the weight of livestock and equipment that are supported by a building.
 - C. the weight of all materials used to construct a building.
 - D. the wind force which creates an uplifting effect on a building.
- _____ 45. A "bird's mouth" is a:
- A. part of a bird.
 - B. part of the top plate.
 - C. the part of a rafter that fits on the top plate.
 - D. none of these.
- _____ 46. There is (are) _____ 2 x 4 (s) used in framing the top plate of a wall.
- A. one
 - B. two
 - C. three
 - D. four
- _____ 47. A 2" x 8" piece of lumber actually measures:
- A. 2 x 8 inches
 - B. 1 1/2 x 7 1/4 inches
 - C. 1/2 x 7 1/2 inch
 - D. 1/2 x 7 1/4 inch
- _____ 48. A "square" of roofing material:
- A. is cut in square shapes for easier installation.
 - B. will cover 100 square feet of roof area.
 - C. will cover 144 square feet of roof area.
 - D. refers only to roofing and siding shingle materials.
- _____ 49. An advantage of pole building construction is:
- A. extra roof support from interior structural members.
 - B. that it can be easily remodeled to more than one story height.
 - C. the capacity to withstand lateral pressure on the walls.
 - D. that it is less expensive due to minimal foundation requirement.
- _____ 50. The most common hammer used in building construction is the:
- A. curved claw
 - B. mallet
 - C. ball peen.
 - D. straight claw.

Sub-District FFA Ag Mechanics Contest --- Rockford, Iowa --- February 17, 2005
WRITTEN EXAM KEY

Answers

- | | | | |
|-----|---|-----|---|
| 1. | B | 31. | C |
| 2. | B | 32. | B |
| 3. | C | 33. | A |
| 4. | D | 34. | D |
| 5. | D | 35. | C |
| 6. | D | 36. | A |
| 7. | A | 37. | C |
| 8. | C | 38. | D |
| 9. | B | 39. | C |
| 10. | C | 40. | C |
| 11. | D | 41. | C |
| 12. | D | 42. | C |
| 13. | B | 43. | C |
| 14. | B | 44. | C |
| 15. | D | 45. | C |
| 16. | D | 46. | B |
| 17. | A | 47. | B |
| 18. | C | 48. | B |
| 19. | B | 49. | D |
| 20. | A | 50. | A |
| 21. | D | | |
| 22. | C | | |
| 23. | B | | |
| 24. | C | | |
| 25. | B | | |
| 26. | C | | |
| 27. | E | | |
| 28. | C | | |
| 29. | C | | |
| 30. | A | | |

**NORTHEAST IOWA
FFA AGRICULTURAL MECHANICS
CAREER DEVELOPMENT EVENT
NORTHEAST IOWA COMMUNITY COLLEGE
AGRICULTURAL EQUIPMENT TECHNOLOGY
CALMAR, IOWA
MAY 4, 2005**

WRITTEN EXAM

I. STRUCTURAL SYSTEMS (WOOD CONSTRUCTION)

- _____ 1. OSB is the abbreviation for _____.
- A. outside boards
 - B. oriented strand board
 - C. oriented sheathing board
 - D. Oregon standard board
- _____ 2. Steel building sidewall covering panels are generally _____ widths.
- A. 1 foot
 - B. 2 feet
 - C. 3 feet
 - D. 4 feet
- _____ 3. Steel building screws will have a(n) _____ under the head of the screw.
- A. rubber or neoprene washer
 - B. paper washer
 - C. nothing
 - D. a galvanized washer
- _____ 4. Panels for covering the sidewalls of a steel building are generally _____ gauge, enameled steel.
- A. 12
 - B. 18
 - C. 28
 - D. 72

- _____ 5. When you are cutting galvanized, corrugated siding panels with the oxy-acetylene torch, _____ of the following should be observed.
- A. toxic fumes can be formed when cutting galvanized material
 - B. do your cutting in a well-ventilated area
 - C. be aware of hot material and sparks
 - D. all of the above
- _____ 6. Use _____ when constructing a header for use over a 14' sliding door in a chemical storage building.
- A. 2, 2x6's placed beside each other and nailed together
 - B. 2, 2x12's placed on edge on top of supports
 - C. 1, 2x12, built up of several pieces of plywood
 - D. 2, 2x12's, with a piece of 1/2" plywood placed between them, and glued and nailed together.
- _____ 7. Pole building trusses are generally placed _____ feet OC..
- A. 2
 - B. 4
 - C. 6
 - D. 8
- _____ 8. Approved oxy-acetylene goggles should be worn _____ when using the oxy-acetylene torch.
- A. only when you are cutting for more than 3 minutes
 - B. only if it bothers your eyes
 - C. anytime you are using it
 - D. none of the above
- _____ 9. You should be aware of _____ when working with steel building panels.
- A. steel building panels can be very slippery
 - B. steel building panels have sharp edges
 - C. panels can become "kites" in any kind of wind
 - D. all of the above
- _____ 10. Roofs on pole buildings should be _____.
- A. built for the maximum snow load for that area
 - B. built for the minimum snow load
 - C. built without considering snow load in Iowa
 - D. built with a 6-12 pitch

- _____ 11. Pole barn spikes _____
- A. should be long enough to clinch them
 - B. are equivalent to 7d nails
 - C. can be identified by the "ribs" or ridges on the sides of the nails
 - D. should be used for fastening metal siding
- _____ 12. "Filon" is a material used in metal building construction _____
- A. for providing extra strength for the roof
 - B. is semi-transparent and is used as skylights
 - C. requires special fasteners when used in roof construction
 - D. should not be used in metal building construction

II. MACHINE AND EQUIPMENT SYSTEMS (CROP SPRAYERS)

- _____ 13. IPM stands for _____
- A. Iowa Pest Management
 - B. Isolated Pest Management
 - C. Integrated Pest Management
 - D. International Pest Management
- _____ 14. IPM is an effective and environmentally sensitive approach to pest management that relies on _____
- A. chemicals, only, to control pests
 - B. all appropriate pest management options
 - C. non-chemical control of pests
 - D. a single pest control method
- _____ 15. IPM uses _____ as a last resort for controlling pests.
- A. broadcast spraying of non-specific pesticides
 - B. pheromones
 - C. mechanical control, such as trapping or cultivating
 - D. prevention, such as rotating crops
- _____ 16. Organic crops _____ to control pests.
- A. can not use any chemicals
 - B. can use pesticides that are produced from natural sources, as opposed to
 - C. synthetic chemicals
 - D. do not use crop rotation practices
 - E. can not produce good yields, because of pests which cannot be controlled

- _____ 17. If a farmer plans to grow Roundup Ready soybeans next year, he should plant _____ in that field this year.
- A. Roundup Ready corn
 - B. conventional soybeans only
 - C. corn, other than Roundup Ready, so that volunteer corn next year will be killed by Roundup
 - D. plant wheat or oats only
- _____ 18. When you are operating a sprayer for the local co-op, you should _____.
- A. wash your hands and face before eating
 - B. avoid spraying on windy days
 - C. be safety conscious at all times, both on-road and in the field
 - D. all of the above
- _____ 19. A John Deere 4920, self-propelled sprayer can cover up to _____ feet widths in one pass.
- A. 12
 - B. 40
 - C. 120
 - D. 500
- _____ 20. Asian Soybean Rust (ASR) is a potential problem which will likely invade Iowa. Any of the following, except _____ should be used to spray for this pest.
- A. Roundup
 - B. Syngenta Quadris
 - C. Laredo
 - D. Bumper
- _____ 21. The chemical used to control Asian Soybean Rust is classed as a(n) _____.
- A. weed killer
 - B. suicide
 - C. herbicide
 - D. fungicide
- _____ 22. GMO is the abbreviation for _____.
- A. General Motors Oldsmobile
 - B. genetically modified organism
 - C. genetically manufactured organism
 - D. generally modified organism

_____ 23. All of the following, except _____ are companies which manufacture field sprayers.

- A. Massey-Ferguson
- B. Spra-Coupe
- C. Terragator
- D. RoGator

_____ 24. The Patriot self-propelled sprayer is manufactured by _____.

- A. AGCO
- B. John Deere
- C. New Holland
- D. Case-IH

III. ENVIRONMENT AND NATURAL RESOURCE SYSTEMS

_____ 25. GPS and GIS systems are integrated into several tractor and combine systems. The following are brand names of those systems except _____.

- A. GreenStar
- B. OnStar
- C. AFS
- D. Fieldstar

_____ 26. The initials GPS stand for _____.

- A. General Power Supply
- B. Global Positioning System
- C. Global Power Supply
- D. Governor Power Stabilization

_____ 27. The initials GIS stand for _____.

- A. Generated Information System
- B. Global International System
- C. Geographic Information System
- D. Global Information System

_____ 28. The _____ program basically makes a computer think that it is a map with powers to process spatial information to tell its users about any part of the world.

- A. GIS
- B. GPS
- C. Windows XP Pro
- D. AppleSoft

- _____ 29. The GPS of the United States is called _____. (Read the answers carefully)
- A.. Navistar International
 - B.. Northstar
 - C.. NAVSTAR
 - D.. none of the above
- _____ 30. GPS capability, as used by surveyors, is accurate down to _____.
- A. 7 meters
 - B. 20 meters
 - C. .01 mm
 - D. less than a foot
- _____ 31. GPS satellites _____.
- A. orbit the earth on a regular orbit
 - B. are geosynchronous
 - C. orbit the earth in a random orbit
 - D. orbit the earth at 70,000 feet
- _____ 32. Cadastral Survey (Latin term for registry of lands) is an operational program within the _____.
- A. Department of Agriculture
 - B. Bureau of Land Management, Department of the Interior
 - C. American Farm Bureau Federation
 - D. National Land Survey Organization
- _____ 33. The instrument used by a surveyor to record elevation and compass heading is called a _____.
- A. theodolyte
 - B. transit level
 - C. sextant
 - D. A or B
- _____ 34. The "stick" held by the surveyor's assistant, that has inch and foot marks on it, is called a _____.
- A. tripod
 - B. prism
 - C. leveling rod
 - D. measuring ruler
- _____ 35. There are _____ acres in an area 80 rods long and 80 rods wide.
- A. 20
 - B. 40
 - C. 80
 - D. 60

- _____ 36. There are _____ sections in a township.
- A. 6
 - B. 16
 - C. 36
 - D. 640

IV. **INDUSTRY AND MARKETING**

- _____ 37. Pesticide labels must include one of 3 signal words to describe the relative toxicity to humans of the active ingredient. The signal words are _____.
- A. danger, extreme, lethal
 - B. yellow, red, maroon
 - C. notice, caution, danger
 - D. caution, warning, danger
- _____ 38. Pesticides may enter the body in one of three ways. The "Route of Entry" statement suggests the route(s) more likely for a specific product. All of the following are routes of entry, except _____.
- A. through the skin (dermal)
 - B. in the lungs (inhalation)
 - C. electrostatic
 - D. by mouth (oral)
- _____ 39. Training and certification are required for an applicator to purchase, apply, or supervise the application of a _____ pesticide.
- A. general use
 - B. dangerous use
 - C. restricted use
 - D. cautionary use
- _____ 40. Every pesticide label must include _____ of the following statements.
- A. Keep out of reach of children
 - B. Keep away from extreme cold
 - C. To be applied by licensed applicators only
 - D. Is legal for use in Iowa
- _____ 41. Pesticides include _____.
- A. herbicides
 - B. insecticides
 - C. fungicides
 - D. all of the above

- _____ 42. _____ is the active chemical in Roundup herbicide.
- A. ammonium sulphate
 - B. glyphosate
 - C. dicamba, sodium salt
 - D. acetamide chemical family
- _____ 43. Roundup, in a tank mix, should be applied at a rate of about _____ per acre in 30 inch row Roundup Ready soybeans.
- A. 1 pint
 - B. 1 gallon
 - C. 1 quart
 - D. 1 tsp
- _____ 44. Fortress 5G would be used to control _____.
- A. cutworms
 - B. giant foxtail
 - C. corn borers
 - D. quack grass
- _____ 45. _____ produces insect specific toxins that make the corn plant resistant to European corn borers.
- A. Liberty Link hybrids
 - B. Roundup Ready hybrids
 - C. seed treated with Counter
 - D. BT hybrids
- _____ 46. If allowed by the pesticide label, containers can be disposed of safely, after doing all of the following, except _____.
- A. empty pesticide container into spray tank
 - B. allow the container to drain for 30 seconds
 - C. throw can in ditch right after use, if no one is looking
 - D. rinse and drain the container 3 times
- _____ 47. If allowed by the pesticide label, after proper rinsing and draining, dispose of the pesticide container _____.
- A. in the landfill with other trash
 - B. by returning it to the seller
 - C. by returning it to the manufacturer
 - D. by storing it in an airtight building

- _____ 48. Many pesticide labels allow disposal of waste generated by the product and rinsates _____.
- A. in the sanitary sewer
 - B. in the storm drain
 - C. right in the field being sprayed
 - D. in the road ditch

v. ENERGY SYSTEMS (SMALL ENGINES)

- _____ 49. On a Briggs and Stratton 12 HP engine, a Magnetron is a(n) _____.
- A. alternator
 - B. generator
 - C. electronic ignition module
 - D. conventional magnetic ignition
- _____ 50. A small engine, used on a sprayer, pulled behind a L& G tractor, would have a _____ valve arrangement.
- A. valve in block
 - B. dual overhead cam, 4V
 - C. overhead valve
 - D. A or C
- _____ 51. 10% Ethanol blend fuel, _____ in a Honda 14 HP small engine, manufactured in 2005.
- A. should never be used
 - B. is approved for use
 - C. can be used for no more than 10% of operation time
 - D. must be used with a lead additive
- _____ 52. All of the following companies, except _____ manufacture small engines.
- A. Daimler-Chrysler
 - B. Briggs and Stratton
 - C. Honda
 - D. Onan
- _____ 53. Armature air gap on a B&S small engine should be _____ inch.
- A. .160
 - B. .0016
 - C. .016
 - D. 1.060

- _____ 54. Compression pressure, at cranking speed, on a small engine, should be about _____ PSI.
- A. 100
 - B. 450
 - C. 600
 - D. 14.7
- _____ 55. All of the following, except _____, are good safety practices when operating a small engine.
- A. operate the engine in a well-ventilated area
 - B. wear close fitting, serviceable clothing
 - C. wear baggy, frayed jeans, to be in style
 - D. be aware of hot areas on the engine
- _____ 56. _____ is(are) the deadly product formed in the exhaust of a small engine.
- A. carbon dioxide
 - B. oxides of nitrogen
 - C. particulates
 - D. carbon monoxide
- _____ 57. _____ is the correct sequence of events in a 4-stroke cycle engine.
- A. exhaust, intake, power, compression
 - B. intake, compression, power, exhaust
 - C. power, intake, compression, exhaust
 - D. intake, compression, exhaust, power
- _____ 58. If the fly-wheel key is partially sheered in a small engine, _____ could result.
- A. late timing of spark
 - B. advanced timing of spark
 - C. increase in power
 - D. increase in engine speed
- _____ 59. The cooling fins on an air-cooled small engine should be cleaned or inspected in all of the following situations, except _____.
- A. as needed
 - B. on a regular basis
 - C. never
 - D. by removing the sheet metal shroud

- _____ 60. All of the following except _____ are good safety practices, when checking the spark on a small engine.
- A. take hold of the spark plug wire and turn the engine over
 - B. use a test spark plug
 - C. ground the plug, away from the spark plug hole
 - D. leave the spark plug in place and hook the spark plug wire to another spark plug

2005 FFA Northeast Iowa District Ag. Mech CDE Written Test Answer Key

- | | |
|-------|-------|
| 1. B | 40. A |
| 2. C | 41. D |
| 3. A | 42. B |
| 4. C | 43. C |
| 5. D | 44. A |
| 6. D | 45. D |
| 7. B | 46. C |
| 8. C | 47. A |
| 9. D | 48. C |
| 10. A | 49. C |
| 11. C | 50. D |
| 12. B | 51. B |
| 13. C | 52. A |
| 14. B | 53. C |
| 15. A | 54. A |
| 16. B | 55. C |
| 17. C | 56. D |
| 18. D | 57. B |
| 19. C | 58. A |
| 20. A | 59. C |
| 21. D | 60. A |
| 22. B | |
| 23. A | |
| 24. D | |
| 25. B | |
| 26. B | |
| 27. C | |
| 28. A | |
| 29. C | |
| 30. D | |
| 31. A | |
| 32. B | |
| 33. D | |
| 34. C | |
| 35. B | |
| 36. C | |
| 37. D | |
| 38. C | |
| 39. C | |

Iowa FFA Agricultural Mechanics Career Development Event
2005

State of Iowa DEPARTMENT OF EDUCATION
Career Education Division
Grimes State Office Building
Des Moines, IA 50319

CONESTENT NAME _____

CONTESTANT SCHOOL _____

Computer Application
(15 minutes)

Note: No calculators are allowed for this activity.

Your farm sprayer is used for broadcast application of herbicides. There are 17 nozzles with a nozzle spacing of 20 inches. You will travel through the field at a speed of 6.5 miles per hour.

During a calibration check, you measured the output of each nozzle for 11 seconds and got the following results:

Nozzle #	Output (oz)	Nozzle #	Output (oz)
1	9.00	10	9.25
2	8.70	11	9.35
3	9.75	12	9.00
4	10.00	13	9.25
5	8.60	14	9.50
6	7.95	15	10.70
7	9.50	16	9.35
8	9.95	17	10.60
9	9.80		

USEFUL FORMULAS & CONVERSIONS

$$GPA = \frac{(5,940) \times (GPM \text{ per nozzle})}{(MPH) \times (W)}$$

where GPA = gallons/acre
GPM = gallons/minute
MPH = speed in miles/hr
W = nozzle spacing in inches

$$Acres/hr = \frac{(MPH) \times (TW)}{(8.25)}$$

where MPH = speed in miles/hr
TW = total width of implement in feet

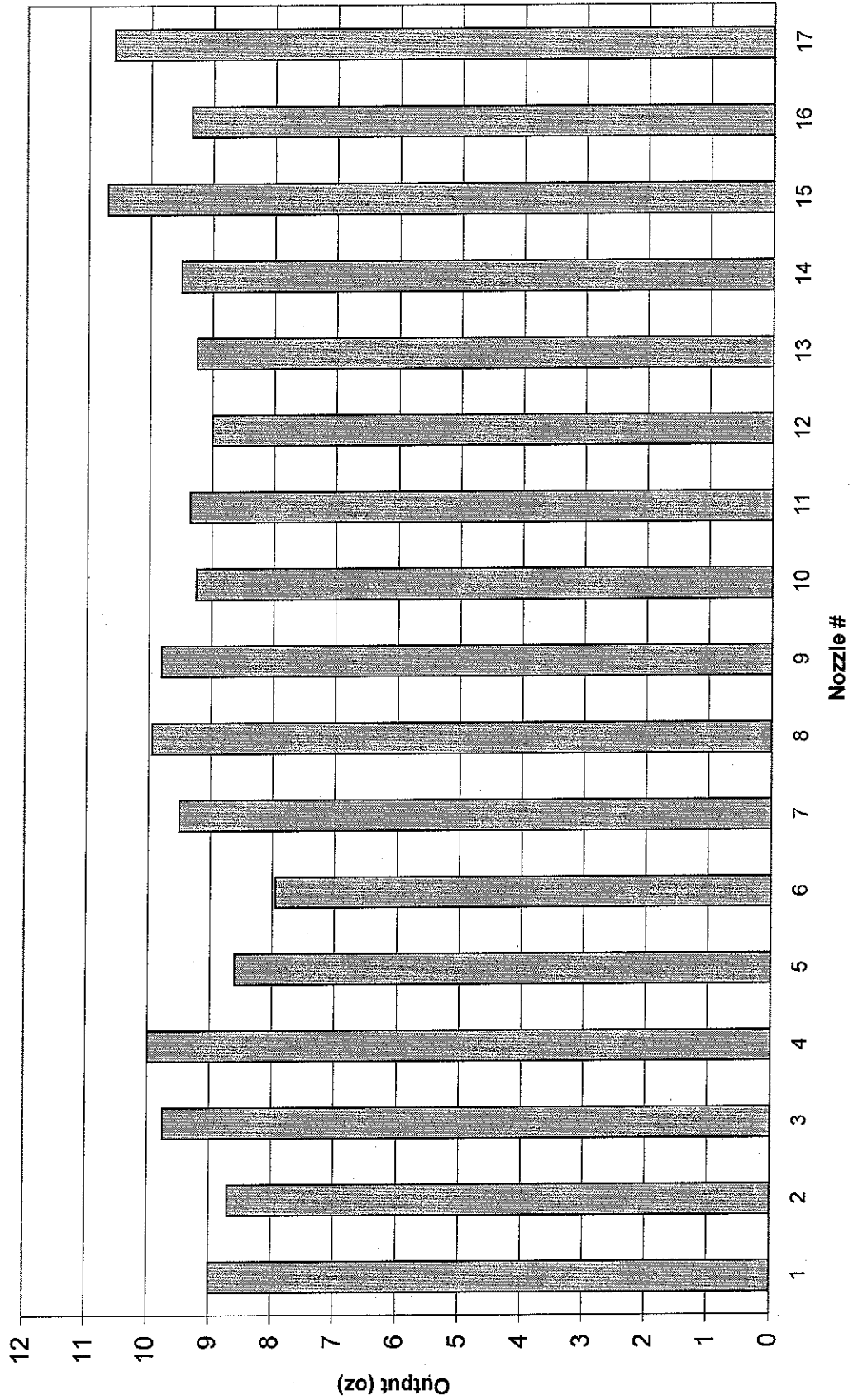
1 gallon = 128 oz
1 minute = 60 seconds

1. Enter your name, your school and the data into the Excel spreadsheet.
2. Enter appropriate formulas into the spreadsheet to calculate:
 - a. the average nozzle output,
 - b. the gallons per acre,
 - c. the acres per hour,
 - d. the number of acres in 8 hours.
3. Print out the data spreadsheet and graph.
4. Circle the nozzle #'s on the graph that have output greater than or less than 10% of the average output.
5. How many nozzles should be replaced, based on your calibration check? Answer: _____

EVALUATION SCORE SHEET

ITEM	POINTS	
	POSSIBLE	EARNED
Data entered/Print outs	6	_____
Circled correct nozzles	3	_____
Number GPM	3	_____
Number GPA	3	_____
Estimated Acres per hours	3	_____
Acres - 8 hr. day	3	_____
Number of nozzles to be replaced	3	_____
TOTAL	25	<div style="border: 1px solid black; width: 40px; height: 30px; margin: 0 auto;"></div>

Farm Sprayer Calibration Check - Nozzle Output



Contestant Name: Enter your name here
Contestant School: Enter your school here

Nozzle #	Output (oz)
1	<input type="text"/> ← Enter data
2	<input type="text"/> ← Enter data
3	<input type="text"/> ← Enter data
4	<input type="text"/> ← Enter data
5	<input type="text"/> ← Enter data
6	<input type="text"/> ← Enter data
7	<input type="text"/> ← Enter data
8	<input type="text"/> ← Enter data
9	<input type="text"/> ← Enter data
10	<input type="text"/> ← Enter data
11	<input type="text"/> ← Enter data
12	<input type="text"/> ← Enter data
13	<input type="text"/> ← Enter data
14	<input type="text"/> ← Enter data
15	<input type="text"/> ← Enter data
16	<input type="text"/> ← Enter data
17	<input type="text"/> ← Enter data

Avg. Nozzle Output (oz) ← Enter formula to calculate
Avg. Nozzle Output +10% (oz) 0.00 ← Calculated for you based on your avg nozzle output
Avg. Nozzle Output -10% (oz) 0.00 ← Calculated for you based on your avg nozzle output

Time of collection (sec) ← Enter data
Speed (mph) ← Enter data
Nozzle spacing (inches) ← Enter data

Avg. GPM per nozzle (gallons/min) ← Enter formula to calculate
GPA (gallons/acre) ← Enter formula to calculate
Acres per hour ← Enter formula to calculate
Acres in 8 hrs. ← Enter formula to calculate

Iowa FFA Agricultural Mechanics Career Development Event
2005

State of Iowa DEPARTMENT OF EDUCATION
Career Education Division
Grimes State Office Building
Des Moines, IA 50319

CONESTENT NAME _____
CONTESTANT SCHOOL _____

ENVIRONMENTAL & NATURAL RESOURCE SYSTEMS
Problem Solving/Skills
(15 minutes)

INSTRUCTIONS: Determine the elevations at each of the stations specified below. An automatic level was used to read a back-sight (B.S.) and a foresight (F.S.) from the adjacent turning points (T.P.). Start at the top of the survey table and calculate the Height of the Instrument (H.I.) for each automatic level setup and the elevation at each of the three turning points (T.P.) and the bench mark (B.M.).

Differential Leveling: Davidson Hall ISU				
Station	B.S. (+ sight)	H.I.	F.S. (- sight)	Elevation
B.M.	5.68			100.00
T.P.1	4.32		4.39	
T.P.2	3.98		4.02	
T.P.3	6.01		5.89	
B.M.			5.82	
Sum Columns	B.S. Sum Total =		F.S. Sum Total =	

CALCULATE:

[Ending B.M. Elevation] - [Beginning B.M. Elevation] = _____

[B.S. Sum Total] - [F.S. Sum Total] = _____

Note: The difference between [Beginning B.M.1 elevation] and [Final B.M.1 elevation] should equal the difference between the [B.S. Sum Total] and the [F.S. Sum Total].

Give one possible source of error that might have occurred during the differential leveling exercise that may have caused the difference between the beginning and final B.M. elevation.

Answer: _____

EVALUATION SCORE SHEET

ITEM	POINTS		ITEM	POINTS	
	POSSIBLE	EARNED		POSSIBLE	EARNED
B.M. - B.S.	2		T.P.1 - F.S.	2	
T.P.1 - B.S.	2		T.P.2 - F.S.	2	
T.P.2 - B.S.	2		T.P.3 - F.S.	2	
T.P.3 - B.S.	2		B.M. - F.S.	2	
B.S. Total	2		F.S. Total	2	
Change in Elevation	2		B.S. Sum- F.S. Sum	2	
Possible Error	1		TOTAL POSSIBLE	25	

Iowa FFA Agricultural Mechanics Career Development Event
2005

State of Iowa DEPARTMENT OF EDUCATION
Career Education Division
Grimes State Office Building
Des Moines, IA 50319

CONESTENT NAME _____

CONTESTANT SCHOOL _____

ENVIRONMENTAL & NATURAL RESOURCE SYSTEMS
Problem Solving/Skills
(15 minutes)

INSTRUCTIONS: Determine the elevations at each of the stations specified below. An automatic level was used to read a back-sight (B.S.) and a foresight (F.S.) from the adjacent turning points (T.P.). Start at the top of the survey table and calculate the Height of the Instrument (H.I.) for each automatic level setup and the elevation at each of the three turning points (T.P.) and the bench mark (B.M.).

Differential Leveling: Davidson Hall ISU				
Station	B.S. (+ sight)	H.I.	F.S. (- sight)	Elevation
B.M.	5.68			100.00
		105.68		
T.P.1	4.32		4.39	101.29
		105.61		
T.P.2	3.98		4.02	101.59
		105.57		
T.P.3	6.01		5.89	99.68
		105.69		
B.M.			5.82	99.87
Sum Columns	B.S. Sum = 19.99		F.S. Sum = 20.12	

CALCULATE:

[Ending B.M. Elevation] - [Beginning B.M. Elevation] = **-0.13**

[B.S. Sum Total] - [F.S. Sum Total] = **-0.13**

Note: The difference between [Beginning B.M. 1 elevation] and [Final B.M. 1 elevation] should equal the difference between the [B.S. Sum Total] and the [F.S. Sum Total].

Give one possible source of error that might have occurred during the differential leveling exercise that may have caused the difference between the beginning and final B.M. elevation.

Answer: **(1) Faulty reading of rod; (2) Rod not fully extended; (3) touching tripod during reading; (4) confusion in recording BS and FS entries into the field book; (5) any other reasonable response.**

EVALUATION SCORE SHEET

ITEM	POINTS		ITEM	POINTS	
	POSSIBLE	EARNED		POSSIBLE	EARNED
B.M. - B.S.	2		T.P.1 - F.S.	2	
T.P.1 - B.S.	2		T.P.2 - F.S.	2	
T.P.2 - B.S.	2		T.P.3 - F.S.	2	
T.P.3 - B.S.	2		B.M. - F.S.	2	
B.S. Total	2		F.S. Total	2	
Change in Elevation	2		B.S. Sum - F.S. Sum	2	
Possible Error	1		TOTAL POSSIBLE	25	

Iowa FFA Agricultural Mechanics Career Development Event
2005

State of Iowa
DEPARTMENT OF EDUCATION
Career Education Division
Grimes State Office Building
Des Moines, IA 50319

CONESTENT NAME _____

CONTESTANT SCHOOL _____

INDUSTRY AND MARKETING SYSTEMS

Problem Solving/Skills

Material Safety Data sheets and Personal Protective Equipment

Instructions:

Refer to the accompanying chemical label to obtain answers for the questions below.

I. Chemical information (4 pts)

1. (1 pt) What is the trade or brand name? _____
2. (1 pt) This product is a pre- and post-emergence herbicide. (True or False) _____
3. (2 pt) What is the percentage of active ingredient in the product? _____

II. Environmental and Personal Safety (12 pts)

4. (1 pt) What is the signal word for this chemical? _____
5. (4 pts) List the recommended protective clothing to wear during loading.

6. (1 pt) Heavily chemical contaminated clothing must be? _____
7. (2 pts) This chemical is extremely toxic to what kind of wildlife? _____
8. (2 pts) This chemical can not be applied to what areas? _____
9. (2 pts) In case of accidental swallowing, who should be called? _____

III. Directions for Use (9 pts)

10. (1 pt) Partially filled containers must be stored in a secured locked area? (True or False) _____
11. (1 pt) Does this chemical require agitation in the tank? _____
12. (1 pt) When is it possible for re-entry without protective clothing? _____
13. (2 pts) What should be done with empty container? _____
14. (2 pts) What is the degree of control for morning glory? _____
15. (2 pts) How many applications can be made per year? _____

Total Possible 25

--

Iowa FFA Agricultural Mechanics Career Development Event
2005

State of Iowa
DEPARTMENT OF EDUCATION
Career Education Division
Grimes State Office Building
Des Moines, IA 50319

CONESTENT NAME _____

CONTESTANT SCHOOL _____

INDUSTRY AND MARKETING SYSTEMS

Problem Solving/Skills

Material Safety Data sheets and Personal Protective Equipment

Instructions:

Refer to the accompanying chemical label to obtain answers for the questions below.

I. Chemical information (4 pts)

1. (1 pt) What is the trade or brand name? LUMAX
2. (1 pt) This product is a pre- and post-emergence herbicide. (True or False) False
3. (2 pt) What is the percentage of active ingredient in the product? 43.34%

II. Environmental and Personal Safety (12 pts)

4. (1 pt) What is the signal word for this chemical? Caution
5. (4 pts) List the recommended protective clothing to wear during loading.
Coveralls over short sleeved shirt / shorts
Chemical resistant gloves
chemical resistant footwear plus socks
chemical resistant apron
6. (1 pt) Heavily chemical contaminated clothing must be? Discarded
7. (2 pts) This chemical is extremely toxic to what kind of wildlife? Aquatic invertebrates
8. (2 pts) This chemical can not be applied to what areas? Water, surface water
9. (2 pts) In case of accidental swallowing, who should be called? Poison Control

III. Directions for Use (9 pts)

10. (1 pt) Partially filled containers must be stored in a secured locked area? (True or False) FALSE
11. (1 pt) Does this chemical require agitation in the tank? YES
12. (1 pt) When is it possible for re-entry without protective clothing? 24 hrs after application
13. (2 pts) What should be done with empty container? Discard
14. (2 pts) What is the degree of control for morning glory? Partial control
15. (2 pts) How many applications can be made per year? Once (pre-emergence)

Total Possible 25



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CONTESTANT NAME _____
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MACHINERY AND EQUIPMENT SYSTEMS

Liquid Chemical Application
Problem Solving/Skill

Instructions:

You will have 15 minutes to do this exercise. Using material from the Teejet formulas and conversion factors bulletin or the Iowa State sprayer calibration reference guide, the sprayer, and your knowledge of sprayers, please answer the following questions.

1. What is the nozzle tip number identifying the nozzles used on this sprayer?

2. A sprayer travels 200 feet in 23 seconds. What is its travel speed?
_____ mi/hr
3. Nozzle tips on a broadcast sprayer have a 20-inch spacing and deliver 0.61 gal/min each. If the sprayer travel speed is 7 mi/hr, what is the application rate?
_____ gal/acre
4. Liquid was collected for 30 seconds from one nozzle of the spray boom into a measuring container by the sprayer. What is the nozzle application rate for each nozzle?
_____ gal/min
5. Several parts of the sprayer are tagged. Identify the number that matches the following sprayer parts:

_____	Boom
_____	Pump
_____	By-pass line
_____	Agitation line
_____	Strainer
6. What's the nozzle spacing along the boom of the sprayer?
_____ inches

Evaluation Score Sheet

<u>Items</u>	<u>Points</u>	
	<u>Possible</u>	<u>Earned</u>
1. Nozzle tip number	3	_____
2. Sprayer speed	5	_____
3. Application rate	5	_____
4. Nozzle application rate	4	_____
5. Parts ID	5	_____
6. Nozzle spacing	3	_____
Total	25	<div style="border: 1px solid black; width: 60px; height: 25px; display: inline-block;"></div>

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MACHINERY AND EQUIPMENT SYSTEMS

Liquid Chemical Application
Problem Solving/Skill

Instructions:

You will have 15 minutes to do this exercise. Using material from the Teejet formulas and conversion factors bulletin or the Iowa State sprayer calibration reference guide, the sprayer, and your knowledge of sprayers, please answer the following questions.

1. What is the nozzle tip number identifying the nozzles used on this sprayer? 8003 EVS
2. A sprayer travels 200 feet in 23 seconds. What is its travel speed?
5.9 or 6 mi/hr
3. Nozzle tips on a broadcast sprayer have a 20-inch spacing and deliver 0.61 gal/min each. If the sprayer travel speed is 7 mi/hr, what is the application rate?
25.9 or 26 gal/acre
4. Liquid was collected for 30 seconds from one nozzle of the spray boom into a measuring container by the sprayer. What is the nozzle application rate for each nozzle?
0.25 gal/min
5. Several parts of the sprayer are tagged. Identify the number that matches the following sprayer parts:
 - D Boom
 - A Pump
 - C By-pass line
 - E Agitation line
 - B Strainer
6. What's the nozzle spacing along the boom of the sprayer?
 15 inches

Evaluation Score Sheet

<u>Items</u>	<u>Points</u>	
	<u>Possible</u>	<u>Earned</u>
1. Nozzle tip number	3	_____
2. Sprayer speed	5	_____
3. Application rate	5	_____
4. Nozzle application rate	4	_____
5. Parts ID	5	_____
6. Nozzle spacing	3	_____
Total	25	<div style="border: 1px solid black; width: 60px; height: 25px; margin: 0 auto;"></div>

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CONESTENT NAME _____

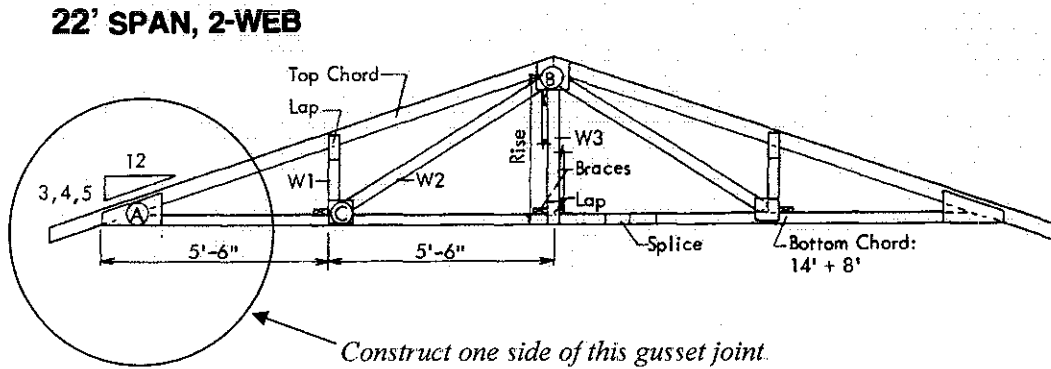
CONTESTANT SCHOOL _____

STRUCTURAL SYSTEMS

Wood Construction – Truss Rafter for a Chemical Storage Building
(15 minutes)

Your job is to layout, cut and nail together a heel gusset (A) for a truss in a chemical storage building. It is a 2-web, 22-ft span truss using a 5/12 slope, 2-ft truss spacing, 0 psf ceiling dead load and 44 psf maximum snow + roof dead load, with 2x4 1100f lumber. Use the fact sheet printed on the back to determine sizes and construction procedures for the heel gusset.

1. Determine the required length (in feet) of the top chords. Record it here: _____ (feet)
2. Use the shortened top chord provided (do not make any cuts on it). Measure and cut the angle on the bottom chord from the 2x4 provided.
3. Layout and cut one of the two gussets from the plywood furnished.
4. Nail the one gusset to the upper chord and bottom chord, as shown, with 5 nails, just to hold it together.



Use the tools, materials, and sawhorse at your work station to complete this job. When completed turn in your skill sheet and completed job for evaluation and leave your work station in order.

EVALUATION SCORE SHEET

ITEM	POINTS	
	POSSIBLE	EARNED
1. Length of top chord.....	3	_____
2. Layout (angle) of bottom chord	6	_____
3. Size and angles of gussets	6	_____
4. Face grain of gusset to bottom chord.....	2	_____
5. Location of gusset on chords	3	_____
6. Correct number of nails and proper nailing of gusset to chords	2	_____
7. Use of tools, safety and work habits	3	_____
TOTAL	25	<div style="border: 1px solid black; width: 40px; height: 30px; margin: 0 auto;"></div>

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TEAM PROBLEM SOLVING

Your team's task is to design a variable rate nitrogen application plan for a field with the attached spring soil N test results. As you complete the task, use the following assumptions:

1. This year, this field is planted in corn. Last year it was planted with soybeans. No unusually high amount of rain fell prior to soil sampling. See the "Corn after Corn" section on the "Soil Test-based N recommendations" page of the Nitrogen Fertilizer Recommendations reference.
2. Zone boundaries can only run north-south or east-west, therefore, regions directly north/south or east/west of each other with the same N levels should be in the same management zone. Regions with the same N levels that do not touch, or touch only on the diagonals, should not be in the same management zone.
3. The concentration of the liquid nitrogen fertilizer solution you're using is 1.25 lb Nitrogen per gallon (PPG). To convert lb N/acre (PPG) to gallons/acre (GPA), use $GPA = PPA \div PPG$ so that your units cancel out.
4. The fertilizer applicator is traveling at a speed of 4 miles per hour (MPH) with 30 inch nozzle spacing (W).
5.
$$GPM = \frac{GPA \times MPH \times W}{5940}$$
6. You are using a Teejet StreamJet nozzle tip which has a flow rate of 1.5 gallons per minute at pressure of 40 psi (pound per square inch), and nozzle flow rate changes proportionally to the square root of pressure change, i.e. $\frac{Q_1}{Q_2} = \sqrt{\frac{P_1}{P_2}}$ where Q is flow rate and P is pressure.
7. Assume your maximum flow rate (GPM) is a duty cycle of 100% (ie, "full on", or, the nozzle sprays all the time). See page four of the SSM-5-W handout.

Evaluation Score Sheet

<u>Items</u>	<u>Possible</u>	<u>Points</u> <u>Earned</u>
TEAM TOTAL	150	<input style="width: 50px; height: 40px; border: 1px solid black;" type="text"/>
INDIVIDUAL TOTAL (Team Total ÷ 3)	50	<input style="width: 50px; height: 40px; border: 1px solid black;" type="text"/>

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TEAM PROBLEM SOLVING

1. What is the most appropriate critical N concentration to use, given no other information? (See assumption 1) (10)
2. Calculate the four N applications rates needed, according to the soil test results (you'll need them all later). What is the highest N application rate (lbs/acre)? (25)
3. How many N application *zones* would you use in this field for a variable rate design? (See assumption 2) (10)
4. For your highest application rate, how many gallons per acre (GPA) of this fertilizer solution should be applied? (See assumption 3) (20)
5. For the highest GPA, what will be the required flow rate in gallons per minute (GPM) from each nozzle tip? (See assumptions 4 and 5) (20)
6. In order to deliver the required flow rate you calculate in problem 5, what boom pressure you should set up? (See assumption 6) (20)
7. Now, you are asked to set up the modulated spraying nozzle control (MSNC) system to realize the variable application rates that you have decided on. If the MSNC system can be operated at a frequency of 25Hz (i.e., 25 cycles per second), define the duty cycles of each application rate. Also, calculate the nozzle opening time per cycle for every rate. (See assumption 7)

Application Rate	1	2	3	4
Duty Cycle	_____ %	_____ %	_____ %	100 %
Opening time/cycle	_____ sec	_____ sec	_____ sec	_____ sec

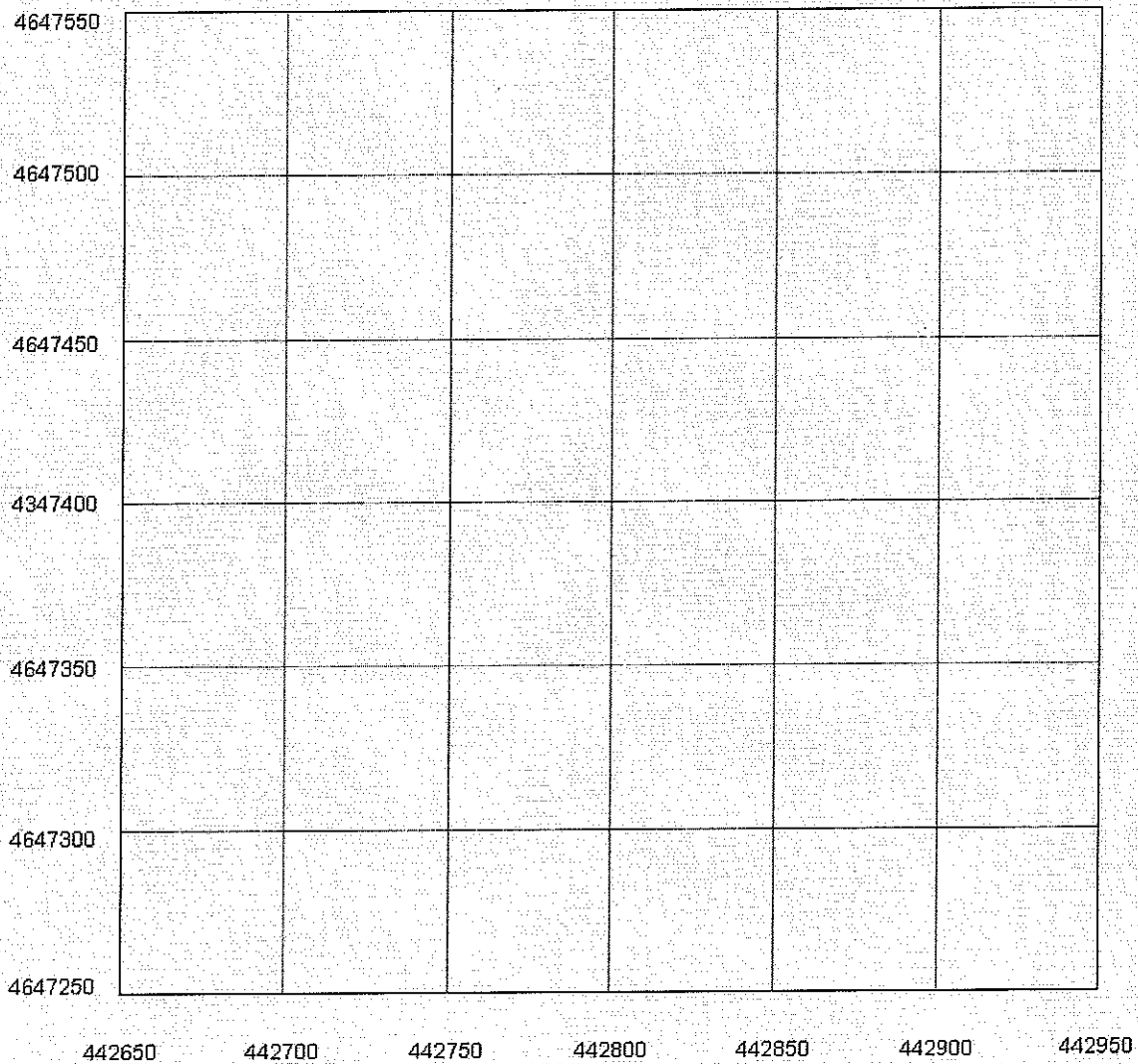
..... (30)

8. If you are given a micro computer with a timer counter having 1 millisecond resolution, what will be the finest flow rate adjustment (in GPM) you can make by using this MSNC system? (Hint: this would mean, for example, that your smallest possible opening time per cycle is 0.001 seconds. See page 6 of the SSM-5-W handout.) (15)

Soil N test results:

UTM Zone 15 coordinates (m)		Nitrate-N level (ppm)
Easting	Northing	
442700	4647300	25
442800	4647300	25
442900	4647300	22
442900	4647400	19
442800	4647400	22
442800	4647400	22
442700	4647500	19
442800	4647500	15
442900	4647500	15

Field Layout:



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TEAM PROBLEM SOLVING - KEY

1. What is the most appropriate critical N concentration to use, given no other information? (See assumption 1) 25 ppm (10)
2. Calculate the four N applications rates needed, according to the soil test results (you'll need them all later). What is the highest N application rate (lbs/acre)? 80 (25)
3. How many N application *zones* would you use in this field for a variable rate design? (See assumption 2) 6 (10)
4. For your highest application rate, how many gallons per acre (GPA) of this fertilizer solution should be applied? (See assumption 3) 64 (20)
5. For the highest GPA, what will be the required flow rate in gallons per minute (GPM) from each nozzle tip? (See assumptions 4 and 5) 1.29 (20)
6. In order to deliver the required flow rate you calculate in problem 5, what boom pressure you should set up? (See assumption 6) 29.6 psi (20)
7. Now, you are asked to set up the modulated spraying nozzle control (MSNC) system to realize the variable application rates that you have decided on. If the MSNC system can be operated at a frequency of 25Hz (i.e., 25 cycles per second), define the duty cycles of each application rate. Also, calculate the nozzle opening time per cycle for every rate. (See assumption 7)

Application Rate	1	2	3	4
Duty Cycle	(2.5 pts) <u>0</u> %	(5 pts) <u>30</u> %	(5 pts) <u>60</u> %	<u>100</u> %
Opening time/cycle	(2.5 pts) <u>0</u> sec	(5 pts) <u>0.012</u> sec	(5 pts) <u>0.024</u> sec	(5 pts) <u>0.04</u> sec

..... (30)

8. If you are given a micro computer with a timer counter having 1 millisecond resolution, what will be the finest flow rate adjustment (in GPM) you can make by using this MSNC system? (Hint: this would mean, for example, that your smallest possible opening time per cycle is 0.001 seconds. See page 6 of the SSM-5-W handout.) 0.032 (15)