



2005 State Competition
FFA Agricultural Mechanics Contest
University of Missouri
100 points

Contestant # _____
Contestant Name _____
Chapter _____

Instructions: Select the most correct answer by darkening in the corresponding oval on the answer sheet provided. **DO NOT WRITE ON THIS EXAM!!!!**

Electrical Circuits

1. Wire diameter, exclusive of insulation, is generally expressed using:
 - a. Tenth of an inch
 - b. Sheet metal gauge
 - c. Standard Wire Gage
 - d. American Wire Gage

2. How many outlets are required in a room with 390 square feet when one outlet is required for each 150 square feet?
 - a. 1 outlet
 - b. 2 outlets
 - c. 3 outlets
 - d. 4 outlets

3. What formula is used to determine the relationship of voltage, resistance, and current?
 - a. Ohm's Law
 - b. Newton's 2nd Law
 - c. Bernelli's Law
 - d. Homer's Law

4. Which of the following conduits should be used for severe corrosive environment?
 - a. rigid steel
 - b. rigid non-metallic
 - c. rigid aluminum
 - d. electrical metallic tubing (EMT)

5. What two wires are required for 120-V single phase load?
 - a. two ungrounded
 - b. two grounded
 - c. one grounded and one neutral
 - d. one ungrounded and one neutral

6. What is the resistance of an electrical heater which draws 8.7 amps when operating at 120 V? (Assume a power factor of one.)
- 0.07
 - 13.8
 - 15
 - 13.4
7. What is a common name for a 4-way switch?
- double pole single throw
 - single pole single throw
 - snap switch
 - double pole double throw
8. If three incandescent light bulbs, 100 watts, 200 watts, and 300 watts, are connected in series to 115 volts, which of the following is true?
- each light operates at the same brightness
 - the 100 watt light is brightest
 - the 200 watt light is brightest
 - the 300 watt light is brightest
9. If three incandescent light bulbs, 100 watts, 200 watts, and 300 watts, are connected in parallel to 115 volts, which of the following is true?
- each light operates at the same brightness
 - the 100 watt light is brightest
 - the 200 watt light is brightest
 - the 300 watt light is brightest
10. If three incandescent light bulbs, all rated at 75 watts, are connected in parallel to 110 volts, which of the following is true?
- each light operates at a different voltage
 - each light operates at a different amperage
 - each light operates at a different wattage
 - none of the above are correct
11. A GFCI is required in all but one of these locations:
- outlets 1-2 feet off the floor in a garage
 - outlets on the ceiling in a garage
 - near the kitchen sink
 - near the bathroom sink
12. Grounding clips are **“NOT”** required when installing electrical wire such as:
- (Romex) NM cable with metal boxes
 - UF (underground feeder) cable with metal boxes
 - THHN (wire for conduit) with EMT
 - THHN (wire for conduit) with plastic conduit

13. The type of cable that must be used when electrical wire will be placed under ground is:
- 12/2 with ground NM cable
 - Romex
 - USE or UF
 - 14/2 NM cable
14. If you have sixteen 250 watt heat lamps in your farrowing barn, what do you expect the electrical bill to be if you operate the lights 8 hours each day? Assume there are 30 days in a month and that the electricity costs 8.5 cents/kilowatt.
- \$5.10
 - \$10.20
 - \$81.60
 - \$816.00
15. The silver colored terminals of a duplex receptacle represents the _____ terminal.
- neutral
 - grounding
 - hot
 - black
16. When mounting a duplex receptacle in a residential dwelling the device box should be approximately _____ off the floor.
- .5' (6")
 - 1' (12")
 - 1.5' (18")
 - 2.0' (24")
17. In order to control a lamp from 4 locations you will need to install:
- 4 - 3-way switches
 - 2 - 3-way and 2 - 4-way switches
 - 4 - 4-way switches
 - 2 - 2-way and 2 - 3-way switches

Small Engine Power

18. According to Briggs and Stratton recommendations, how often should you check the oil?
- Every 2 hrs of operation
 - Every 4 hrs of operation
 - Every 8 hrs of operation
 - Every 16 hrs of operation
19. At what intervals should you check valve clearance on a Briggs and Stratton single cylinder engine?
- Monthly
 - Daily
 - Every 100 hrs of operation
 - Yearly

20. What should you use to wash a small gas engine?
- Cloth
 - Brush
 - High pressure hose
 - All of the above
21. Oil should be changed every _____ hrs of operation according to Briggs and Stratton recommendations.
- 100
 - 50
 - 75
 - 65
22. What is the proper way to stop a keyed electric-start engine?
- Turn the key or switch to off position when motor is at full speed
 - Grounding out the spark plug with a screwdriver
 - Pulling on the choke to flood the engine
 - By moving throttle to slow position and turning key to the off position
23. How often does Briggs and Stratton recommend to change the spark plug?
- 50 hrs of operation
 - 75 hrs of operation
 - 100 hrs of operation
 - 125 hrs of operation
24. Which case is most appropriate to add fuel to the fuel tank?
- When engine is cool and not running
 - When engine is running at idle
 - When engine is at full speed
 - When engine is at operating temperature
25. Overfilling the crankcase of a small vertical shaft (lawn mower) gasoline engine is:
- a common practice - it's ok
 - not acceptable as the engine will force oil out the top of the engine
 - not acceptable as the engine will force oil out the PTO journal of the engine
 - none of the above are correct
26. You were mowing with a push mower and hit a rock. The engine died immediately and will not start. The most likely cause for this is:
- the engine is "out of time"
 - the engine is out of gas
 - the engine is out of oil
 - the spark plug needs to cool down

27. The correct viscosity engine oil to use when the temperature outdoors is 80⁰F is: (Assume this is a 4-stroke engine.)
- 10W-30
 - 30W
 - 20W-45
 - 90W
28. You are about to prep your lawn mower for winter storage. Which of the following is most important?
- changing your spark plug
 - cleaning the air cleaner
 - removing the debris off the deck of the mower
 - putting a stabilizer in the gasoline
29. In a Briggs and Stratton 4-stroke engine, the spark plug fires:
- every time the piston moves toward the head
 - every other time the piston moves toward the head
 - every fourth time the piston moves toward the head
 - every time the piston changes its direction of travel
30. According to Briggs & Stratton the most acceptable solvent to clean a foam style air cleaner is:
- cold soapy water
 - diesel fuel (#2)
 - gasoline
 - hot soapy water
31. The type of valve used by most 2-stroke engines is a :
- port valve
 - reed valve
 - needle valve
 - none of the above – they do not have valves.
32. A lawn mower engine (4-stroke) found on a riding mower would be lubricated by:
- an oil pump
 - mixing oil in the gas
 - splash lubrication
 - either A or C are correct
33. The correct tool to measure the gap of a spark plug is:
- flat feeler gauge
 - wire-type feeler gauge
 - either tool is recommended
 - sorry, spark plugs do not need to be adjusted

34. The correct tool to use when determining if the cylinder of a small gasoline engine is out of round:
- a. telescoping gauge and micrometer
 - b. telescoping gauge and dial caliper
 - c. telescoping gauge and a try square
 - d. small hole gauge and micrometer

Agricultural Machinery

35. On a sickle bar mower what type(s) of materials are the guards made of?
- a. cast iron
 - b. malleable iron
 - c. forged steel
 - d. all of the above
36. There are two methods to measure the primary lead on a cutter bar mower. The first is called a parallel-line method and the second method is called the _____ method?
- a. straight-line
 - b. straight-board
 - c. parallel-board
 - d. none of the above
37. According to popular press, when spraying for Asian Soybean Rust what type of nozzle is recommended?
- a. Twin Jet Flat Fan
 - b. Even Flat Fan
 - c. Turbo Jet
 - d. Flood Jet
38. What type of drive belt is the most common means of driving light loads using pulleys for farm machines?
- a. Round
 - b. V
 - c. Flat
 - d. None of the above
39. What type of drive chain should be used at the end of a grain auger?
- a. roller
 - b. plain
 - c. silent
 - d. detachable link

40. What electrical measurement should always be the same for exterior lighting on a combine that is equipped with a 12 volt system?
- wattage
 - amperage
 - voltage
 - power
41. As sprayer nozzle tips wear, the chemical application rate that the nozzles are capable of applying _____?
- increases
 - decreases
 - stays the same
 - the nozzles should not wear down because they are ceramic
42. Round balers have completely redesigned the hay industry as we know it today. The machines that produced these “large round bales” of hay were first marketed?
- during a the 1920s and ‘30s
 - during the 1940s and ‘50s
 - during the 1950s and ‘60s
 - during the 1960s and ‘70s
43. You have been baling hay with your small square baler when you notice that the bales seem to light. What might be a possible cause for this problem?
- tension cranks are too tight
 - tension cranks are too loose
 - hay is very wet or green
 - too many side restrictors are being used
44. What type(s) of hay conditioner(s) is/are sold on the market today to aid in the drying process?
- presser
 - crimper
 - crusher
 - both b and c
45. A broadcast fertilizer spreader is driven over the top of a 15-foot by 15-foot tarpaulin placed on the ground. If 8 pounds of fertilizer is collected on the tarp, what is the approximate application rate in pounds per acre? Note: 1 acre = 43,560 square ft.
- 16 pounds per acre
 - 188 pounds per acre
 - 1050 pounds per acre
 - 1549 pounds per acre

46. If a hydraulic system on an off-highway vehicle has foaming hydraulic oil, what is most likely the problem?
- the oil is dirty
 - water is in the oil
 - the oil level is too low
 - the hydraulic pump is going bad
47. Which of these factors is least likely to affect field capacity?
- size of machine
 - travel speed
 - crop being planted
 - condition of soil
48. A pull behind chisel plow would be considered what type of tillage tool?
- seeding
 - cultivation
 - primary
 - secondary
49. The four types of common seed covering devices are?
- shovel, knife, disk, and chain
 - shovel, knife, wheel, and disk
 - knife, wheel, disk, and chain
 - wheel, disk, chain, and shovel
50. The average size of droplets for a crop sprayer is affected by the nozzle type and size, but what is another factor that affects droplet size?
- calibration technique
 - pressure
 - crop being sprayed
 - all the above
51. What application(s) are hollow cone and solid cone spray tip patterns used for?
- row crop spraying of herbicides, fungicides, and insecticides
 - broadcasting fertilizers, insecticides, and herbicides
 - band spraying behind a planter
 - spraying herbicides to control broadleaves in pastures

Arc Welding

52. While arc welding, you hear loud cracking and your flux melts too rapidly resulting in a wide thin bead. What is the cause of this problem?
- Arc length too great
 - Current too great
 - Poor ground
 - Not enough current for electrode

- 53 What is the recommended shade of lens for arc cutting/welding (180-250 amps)?
- 7
 - 8
 - 10
 - 12
- 54 What is a typical measurement of wire diameter used in a MIG welder?
- 3.5 in
 - 0.35
 - 0.035
 - 0.0035
- 55 What does MIG stand for?
- Manage Intense Gas
 - Mild Inert Gas
 - Metal Inert Gas
 - Metallic Intense Gas
- 56 Which is NOT an example of a shielding gas?
- Argon
 - Oxygen
 - Carbon Dioxide
 - Helium
57. How do you adjust amperage on a MIG welder?
- Wire Speed
 - PSI of Shielding Gas
 - Voltage
 - Wire Size
58. What should be used to chip the slag off a MIG bead using solid wire?
- Slag Hammer
 - Wire Brush
 - Angle Grinder
 - None of the above
59. The best shielding gas to use when welding aluminum is:
- Nitrogen
 - Argon
 - Neon
 - Carbon dioxide
- 60 A rod such as an E7018 should be stored:
- At room temperature
 - At 250-300 degrees Fahrenheit
 - At 500-700 degrees Fahrenheit
 - At or near freezing temperatures

61. The _____ electrode is preferred when welding rusty, painted mild steel.
- E6011
 - E6013
 - E6049
 - E7018
62. If arc gap is too long:
- Excessive spatter and poor penetration will occur
 - Excellent penetration will occur
 - Electrode will stick to the metal
 - Excessive slag will form
63. An E6013 rod should be stored:
- at room temperature
 - at 250-300 degrees F
 - at 350-400 degrees F
 - none of the above
64. The proper lens shade to wear when operating a Mig welder is:
- 8
 - 10
 - 12
 - 14
65. The number "2" on an E7024 electrode means/refers to:
- position rod can be used in
 - tensile strength of the rod
 - special qualities of the flux
 - that this is an electrode
66. The minimum number of passes that should be used when arc welding ¼ mild steel with a 1/8" E6013 electrode?
- 1
 - 2
 - 4
 - either b or c is correct
67. The first pass when welding multiple passes on heavy steel is called:
- cap
 - root
 - initial
 - none of the above

68. Which of the following techniques will NOT prevent distortion when arc welding?
- a. tack welding
 - b. weld every 6 inches
 - c. use a ¼" bead rather than 3/8"
 - d. long continuous beads

Woodworking & Carpentry

69. What type of saw is used for sawing with the grain of the wood?
- a. crosscut saw
 - b. compass saw
 - c. ripsaw
 - d. none of the above
70. A high R-Value for insulation material indicates?
- a. high ability to conduct heat through the insulation material
 - b. high resistance to the flow of heat through the insulation material
 - c. high fire resistance
 - d. both b and c
71. How many board feet are in four pieces of 1x8 inches that are 12' long?
- a. 10
 - b. 18
 - c. 36
 - d. 32
72. Which type of nail is used for nailing stock that splits easily?
- a. common nail
 - b. casing nail
 - c. box nail
 - d. concrete nail
73. How many points per inch does a crosscut saw have?
- a. 6-14
 - b. 12-18
 - c. 4-7
 - d. 18-24
74. When using a hand ripsaw it should be held at what angle to the wood?
- a. 30 degrees
 - b. 60 degrees
 - c. 45 degrees
 - d. 50 degrees

75. How long is a sixteen penny nail?
- 3''
 - 3 ¼''
 - 3 ½''
 - 3 ¾''
76. What is the dressed width of a 2 x 6?
- 5''
 - 5 ½''
 - 6''
 - 6 ½''
77. Which of the following spacing are acceptable for wall studs?
- 14''
 - 16''
 - 20''
 - Both B and C
78. A double header is used where?
- Above a door opening
 - On a rafter
 - Above a window opening
 - Both A and C
79. What is the recommended rise of each step on a stair stringer?
- 4 ½ to 5 ¼ inches
 - 5 ¼ to 6 ¼ inches
 - 6 ¾ to 7 ¾ inches
 - 8 to 10 inches
80. A countersink bit is used to?
- Make holes for door knob
 - Prevent removal of screws
 - Make a tapered hole for a screw head
 - Aid in installing a sink in a counter
81. Final sanding should be with?
- Coarse sandpaper
 - The grain of the wood
 - Medium sandpaper
 - A file

82. A clear, durable, water-resistant finish that is brushed on and requires no separate sealer is a?
- Polyurethane
 - Shellac
 - Stain
 - Wax
83. When two large pieces of wood are added to frame an opening in an existing dwelling and they must be fastened at right angles, they may need to be:
- toe nailed
 - box nailed
 - flat nailed
 - nailed and clinched
84. The tool that is recommended for shortening a 20' 2 x 6 to 8' is:
- router
 - jig saw
 - table saw
 - radial arm saw

Soil & Water Management

85. A farm pond contains about 5.5 acre-feet of water. What is the total approximate gallons?
- 2,535,000.52
 - 4,544,000.70
 - 1,792,180.50
 - 902,560.43
86. The abbreviation "FS" is taken
- Looking at a known elevation.
 - Looking at an unknown elevation.
 - To determine the height of the instrument.
 - By the rear chainman.
87. A "rod" measurement is how many feet?
- 12 feet
 - 8 feet
 - 16.5 feet
 - 22 feet
88. The "HEL" designation made by the county Farm Service Agency stands for:
- Hills and Elevated Lands
 - Huge Environmental Liability
 - High Elevation Levee
 - Highly Erodible Lands

89. A common problem among no-till farmers is:
- Nitrogen Stratification
 - Lower Organic Matter levels, due to lack of residue incorporation
 - Phosphorus Stratification
 - Both A and B
90. What does “ENM” refer to when figuring an adjusting rate for soil pH?
- Effective Neutralizing Material
 - Exact Numerical Metric
 - Every Nutrient Matters
 - Equal Nitrogen Midpoint
91. The R in the Universal Soil Loss equation $A=RKLSCP$ is:
- Rise Factor
 - Repeatability Factor
 - Rainfall and Runoff Factor
 - Reliable Constant
92. Soil erosion channels that can be obliterated by tillage are called:
- Rill erosion
 - Gully erosion
 - Sheet erosion
 - Wind erosion
93. A farmer who uses a twin-gang disc-harrow in the spring to level fall chiseled cornstalks would most likely be implementing which type of tillage practice:
- Minimum tillage
 - Strip tillage
 - No tillage
 - Conventional tillage
94. The average grade necessary for satisfactory operation of a tile drainage system is 3 to 6 percent. How much drop in elevation should be planned for a 300 foot tile drain?
- 5 to 10 feet
 - 9 to 18 feet
 - 10 to 20 feet
 - None of the above
95. Farm pond shore-sides generally require a ____ slope.
- 2:1
 - 3:1
 - 1:1
 - None of the above

96. When building a farm pond, clay is desirable for:
- the core of the dam.
 - the outside surface of the dam, as it will be less likely to absorb water.
 - the bottom of the pond.
 - both A and C.
97. A ten-year rainfall event will:
- have more precipitation than a fifty-year storm.
 - be of such size that on average will be equaled or exceeded once every 10 years.
 - occur in less than or equal to once every 10 years.
 - occur exactly once every 10 years.
98. When asked by a telephone survey person how much land he farmed, Farmer Jim Dandy replied that he currently farmed 3 sections, but had plans to add at least another 3 quarters for the next growing season. How many acres is Jim farming now, and how many total acres does he hope to farm in the next season?
- 1920, 2400
 - 2400, 2640
 - 1920, 3840
 - 480, 960
99. Jim Dandy just bought one of the sections that he mentioned he was going to farm the next growing season. Jim wants to put in some contoured terraces that are steep enough to break the flow of machinery traffic. He has a 12row 30 in. planter, a 20 foot bean platform, and a 60ft spray boom. Which terrace spacing will be the most conducive to his farming operations?
- 60ft
 - 90ft
 - 120ft
 - 110ft
100. Assume the terrace spacing is 180 ft, which of the following planters would provide the best field efficiency.
- 20
 - 30
 - 40
 - 60