

2003 State Competition
FFA Agricultural Mechanics Contest
University of Missouri
100 points

Name _____
Contestant Number _____
Chapter _____

Written Examination

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. The name given to a switch that is commonly used to control light operation from **one** location is:
 - A. Single pole
 - B. Single pole, single throw
 - C. Single pole, double throw
 - D. Double pole, double throw

2. The type of power typically used to power farms in North America:
 - A. 120 Volt; 40 Hz
 - B. 240 Volt; 60 Hz
 - C. 120 Volt; 60 Hz
 - D. 220 Volt; 50 Hz

3. The type of material commonly used as a **grounding** electrode for the service entrance of a home in North America:
 - A. Aluminum
 - B. Copper
 - C. Cast Iron
 - D. Stainless Steel

4. The color that is acceptable for a **grounding** conductor in a farm shop:
 - A. Bare copper
 - B. Black
 - C. White
 - D. Red

5. The type of electrical wire that is recommend for use when connecting the 220 Volt heater in your heated water fountain (cattle):
 - A. NM 12-2 WG
 - B. UF 12-2 WG
 - C. UF 12-3 WG
 - D. USE 12-2

6. According to the National Electric code, wall duplex receptacles should be placed:
 - A. 12 inches from the floor
 - B. 36 inches from the floor.
 - C. 42 inches from the floor.
 - D. 48 inches from the floor.

7. The largest breaker than can be used to safely protect a 10 gauge wire is:
 - A. 15 AMP breaker.
 - B. 20 AMP breaker.
 - C. 30 AMP breaker.
 - D. 10 AMP breaker.

8. You use an ammeter in a circuit to determine:
 - A. Voltage
 - B. Amperage
 - C. Wattage
 - D. Watt-hours

9. When using a multi-tester to determine voltage, the leads from the multi-tester must be connected in _____ with the device.
 - A. Series
 - B. Parrallel
 - C. Series-parrallel
 - D. None of the above are correct

10. The bare copper conductor is called the:
 - A. Hot conductor.
 - B. Neutral conductor.
 - C. Grounded conductor.
 - D. Grounding conductor.

11. The correct cable to use when wiring a swine farrowing house is:
- A. UF
 - B. NM
 - C. AWG
 - D. TW
12. What combination of switches is needed to control a light from six locations?
- A. six 3-way switches
 - B. two 3-way switches and four 4-way switches
 - C. three 3-way switches and three 4-way switches
 - D. six 4-way switches
13. You have just removed the male end of an extension cord from the wall outlet. The “smaller” of the two “flat” blades should be the:
- A. Grounded wire.
 - B. Neutral wire.
 - C. Hot wire.
 - D. Grounding wire.
14. According to Ohm’s Law, which of the following is true for a series circuit?
- A. $\text{Amps}_T = \text{Amps}_1 = \text{Amps}_2 = \text{Amps}_3 \dots \text{Amps}_N$
 - B. $\text{Volts}_T = \text{Volts}_1 = \text{Volts}_2 = \text{Volts}_3 \dots \text{Volts}_N$
 - C. $\text{Ohms}_T = \text{Ohms}_1 = \text{Ohms}_2 = \text{Ohms}_3 \dots \text{Ohms}_N$
15. If the ohms in the circuit equals 80 and volts equal 120, what is the ampere value?
- A. 2
 - B. 1.5
 - C. 40
 - D. 200
16. When wiring a duplex receptacle:
- A. The white conductor should be connected to a silver screw.
 - B. The black conductor should be connected to the hex-shaped green screw.
 - C. The bare conductor should be connected to a screw which is brass-colored.
 - D. All of the above.

17. The brass-colored terminals of a receptacle represent the _____ terminals.
- A. Hot
 - B. White
 - C. Neutral
 - D. Ground

Arc Welding

18. Excessive spatter on the top of your weld suggests:
- A. Too short arc length
 - B. Too long arc length
 - C. The rod was wet prior to starting the bead
 - D. None of the above are correct.
19. The letters “MIG” in MIG welding are an abbreviation for _____?
- A. metal inert gas
 - B. metallic inert gas
 - C. metal in gas
 - D. metallic in gas
20. Steel with a carbon range of 0.30 to 0.45 is classified as _____?
- A. low- carbon steel
 - B. medium- carbon steel
 - C. high- carbon steel
 - D. extreme- carbon steel
21. The intermittent weld (also known as the skip weld) is used to prevent _____ when welding?
- A. distortion
 - B. overheating the metal
 - C. excess stress on metal
 - D. All of the above are correct
22. Which of the following is **NOT** a basic type of weld joint?
- A. surfacing
 - B. fillet
 - C. groove
 - D. corner

23. If a welder has a duty cycle of 30%, how many minutes in one hour can this welder weld?
- A. 10 minutes
 - B. 15 minutes
 - C. 18 minutes
 - D. 30 minutes
24. When welding in the overhead position with an AC welder it is best to have the welder set on which polarity?
- A. reverse
 - B. straight
 - C. negative
 - D. positive
 - E. None of the above are correct
25. When using an E-6011 electrode, the third number, "1" is used to classify what?
- A. welding position
 - B. tensile strength
 - C. electrode
 - D. special characteristics
26. Which of the following factors is **NOT** used to get proper penetration while arc welding?
- A. electrode
 - B. arc length
 - C. current
 - D. voltage
27. Undercutting is a condition that results when your welding _____?
- A. current is set too low
 - B. current is set too high
 - C. voltage is set too low
 - D. voltage is set too high
28. When the thickness of the metal exceeds ____ the edges of a butt joint should be beveled when arc welding? (Assume you have an 1/8" diameter electrode)
- A. 1/16"
 - B. 3/32"
 - C. 1/8"
 - D. 1/4"

29. When arc welding the cover pass on a flat weld, the height of the bead should not extend more than ___ above the surface of the plate?
- A. 1/16"
 - B. 3/32"
 - C. 1/8"
 - D. 1/4"
30. When attempting to weld a horizontal weld, the proper **work** angle for the electrode is _____?
- A. 0 - 5 degrees
 - B. 5-10 degrees
 - C. 10-15 degrees
 - D. 15-20 degrees
31. The shielding gas that promotes the most penetration when used unmixed with other shielding gases is _____?
- A. argon
 - B. helium
 - C. oxygen
 - D. carbon dioxide
32. When MIG welding, this current is used to maximize efficiency?
- A. ACRP
 - B. ACSP
 - C. DCRP
 - D. DCSP
33. Given ER 70 S 4, what does the "S" stand for:
- A. electrode
 - B. solid
 - C. tensile strength
 - D. shielding gas

Machinery

34. A baler designed to be operated with a 540 RPM PTO shaft:
- A. Can only be operated at 540 rpm
 - B. Can be operated at 1000 rpm
 - C. Would have a 20 spline receiver
 - D. Would have a 21 spline receiver

35. A planter is commonly used to plant which of the following crops?
- A. Wheat
 - B. Barley
 - C. Oats
 - D. Soybeans
36. A water tank on a field sprayer that is there so that you can wash your hands is:
- A. Nurse tank
 - B. Main tank
 - C. Rinse tank
 - D. None of the above are correct.
37. The agitators commonly found on field sprayers for small grains are:
- A. Jet
 - B. Hydraulic
 - C. Mechanical
 - D. All of the above are correct.
38. You have just plugged the cylinder on your combine and killed your turbocharged diesel engine. You should:
- A. remove the shielding and unplug the combine
 - B. immediately start the engine and allow it to idle
 - C. if possible, manually reverse the machine
 - D. resolve to never slug the machine again
39. How many acres can you work in an eight hour period if you average 6 miles per hour with a 26 foot chisel plow? (Assume 90 percent efficiency)
- A. 151 acres
 - B. 136 acres
 - C. 125 acres
 - D. None of the above are correct
40. Reel speed on a combine should be _____ percent faster than the ground speed of the combine.
- A. 15 %
 - B. 25 %
 - C. 35 %
 - D. none of the above

41. Which of the following farm tools is recommended for operation at speeds that exceed 8 - 10 miles per hour?
- combine
 - disk plow
 - chisel plow
 - field sprayer
42. The name given to the seed metering device on some row crop planters.
- hand-pickup
 - finger-pickup
 - double disk
 - none of the above
43. A farmer is operating his/her 8 row 30" planter at 6.5 mph at 85% field efficiency. How many acres will the farmer cover in a 10 hour workday?
- 158 acres/day
 - 134 acres/day
 - 15.8 acres/day
 - none of the above
44. How many tons per hour would a farmer bale if he/she is baling a 20' windrow that yields 2 tons/acre? Assume he/she is driving 4 mph and operating at 80% efficiency.
- 19.39 tons/hr
 - 9.70 tons/hr
 - 15.52 tons/hr
 - 20 tons/hr
45. The outer end (tip) of a mower cutter bar:
- Should lead or be set ahead of the inner end of the cutter bar.
 - Should lag or be set behind the inner end of the cutter bar.
 - Should neither lag nor lead the inner end of the cutter bar.
 - Should be ignored when adjusting your mower.
46. The type of machinery **LEAST** sensitive to variations in travel speed is:
- ground wheel driven
 - power take-off driven
 - constant delivery
 - none of the above

47. The type of spray tip that you would expect to find mounted on a planter is:
- Flat fan
 - Even flat fan
 - Hollow Cone
 - None of the above are correct.
48. If a farmer switches from an 80 degree spray tip to a 110 degree spray tip, they will be able to operate the boom:
- Farther from the crop canopy to get adequate coverage.
 - Closer to the crop canopy to get adequate coverage.
 - About the same. No allowances should be made when switching tips out.
 - Two times as far away from the crop canopy as compared to 80 degree tip.
49. The hydraulic cylinder that is used to lift the frame of your chisel plow has two hydraulic hoses connected to it. This cylinder is most likely a:
- Single acting hydraulic cylinder
 - A dual acting hydraulic cylinder
 - Single staging hydraulic cylinder
 - None of the above are correct.
50. Your hydraulic system on your tractor seems to have erratic pressure. These changes in pressure are most likely caused by:
- Fatigued spring
 - Dirt in the oil
 - Drain line is not open freely to the reservoir
 - All of the above can cause erratic pressure.

Small Gas Engines

51. In the 2-cycle small gas engine, how many complete revolutions of the crankshaft are needed to complete one cycle?
- One
 - Two
 - Three
 - Four

52. The spark plug on a 4-stroke Briggs & Stratton single-cylinder engine fires:
- Every time the piston reaches TDC
 - Every other time the piston reaches TDC
 - Every other time the piston reaches BDC
 - None of the above are correct.
53. When setting the armature air-gap you should use a/an:
- Flat feeler gage.
 - Inside micrometer.
 - Vernier caliper.
 - Round feeler gage.
54. The recommended oil change interval on a **20 year old** Briggs & Stratton engine is:
- 10 hours.
 - 25 hours.
 - 50 hours.
 - 100 hours.
55. When turning the needle valve clockwise on the carburetor you are:
- Leaning out the fuel:air mixture
 - Leaning out the lube-oil:air mixture
 - Enriching the fuel:air mixture
 - None of the above are correct
56. After adjusting the needle valve, and the engine does not accelerate smoothly, then you should:
- Enrichen the fuel:air mixture
 - Lean out the fuel:air mixture
 - Change the oil
 - Clean the air cleaner
57. When running a Briggs & Stratton engine on kerosene, fuel consumption will be:
- Better than if run on gasoline
 - Worse than if run on gasoline
 - These engines cannot run on kerosene

58. The actual output of a 5 horsepower small gasoline engine:
- Increases at 5000 feet above sea level.
 - Decreases at 5000 feet above sea level.
 - Remains about the same as if operated at 1000 feet above sea level.
59. The recommended spark plug electrode gap on most all Briggs & Stratton Electronic engines is:
- 0.020 inches.
 - 0.030 inches.
 - 0.200 inches.
 - None of the above are correct
60. When re-boring the cylinder on a Briggs & Stratton engine, you should oversize the standard bore size by:
- .010 inches
 - .020 inches
 - .030 inches
 - Any one of the above.
61. When examining the cylinder to determine if it is out of round, you should take:
- One reading at the top of the cylinder
 - Two readings at the top of the cylinder
 - One reading at the top, one reading midway down the cylinder
 - Two readings at the top, two reading at the bottom and two in the middle
62. According to Briggs & Stratton, when cleaning the cylinder and crankcase after boring the cylinder out, the block should be cleaned with:
- Mineral spirits
 - Cleaning solvent (parts washer)
 - Hot soapy water
 - None of the above are correct
63. When connecting a battery charger to your Briggs & Stratton engine starting battery:
- The positive lead should be connected first
 - The positive lead should be connected last
 - The negative lead should be connected first
 - None of the above are correct.

64. The name of the cleaning liquid that is recommended when cleaning the foam air cleaning element for a Briggs and Stratton engine is:
- a. cold water
 - b. hot soapy water
 - c. gasoline
 - d. mineral spirits
65. The condenser on your Briggs & Stratton has failed. The recommend repair procedure your Briggs & Stratton dealer will bring to your attention is for you to:
- a. buy a new engine.
 - b. replace the condenser.
 - c. install a magnatron ignition system.
 - d. install an off-brand condenser.
66. The camshaft of a 4-stroke gasoline engine rotates:
- a. twice as fast as the crankshaft in a four-stroke engine.
 - b. $\frac{1}{2}$ as fast as the camshaft in a two-stroke engine.
 - c. $\frac{1}{4}$ as fast as the camshaft in a two-stroke engine.
 - d. none of the above are correct.
67. You have a 120V electric starter for your Briggs & Stratton engine. The grounding conductor is connected directly to:
- a. Nothing, it's a double insulated device
 - b. The fuel tank
 - c. The mower deck
 - d. The motor housing

Carpentry

68. The type of saw that should be used to cut against the grain of the wood is:
- a. A rip saw
 - b. A cross-cut saw
 - c. A hack saw
 - d. A buck saw

69. The size of a bench saw is determined by the:
- Size of the table
 - Size of the guard
 - Size of the arbor
 - Size of the blade
70. The type of wood saw blade that is used to cut a 1/2" groove in a single pass. Note: this groove might be used to support a shelf.
- Combination saw blade
 - Dado saw blade
 - Rip saw blade
 - Cross-cut saw blade.
71. You have just conducted a silt test on your sand for your concrete work. After allowing the silt to settle you measure 1/4 inch of silt.
- This is acceptable, use the sand
 - This is **NOT** acceptable- do **NOT** use the sand.
 - Silt tests are **NOT** used prior to mixing the sand
72. You are about to call the local concrete redi-mix company to pour a sidewalk that measures 100' long, 3.5' wide, and 6" deep. How much concrete must you order to pour the sidewalk? Use a waste factor of 10%
- 17.5 yards
 - 7 yards
 - 7.5 Yards
 - 8 yards
73. How many studs are needed for a 16' wall if the studs are placed 16" on center? (Note: Double studs will be placed at each end of the wall.)
- 12
 - 13
 - 14
 - none of the above are correct
74. The horizontal members that roofing attaches to in post-frame (pole) building construction are called:
- girts.
 - poles.
 - purlins.
 - headers.

75. If you have 10-2"x4"x8' lumber, how many board feet do you have?
- 53.3
 - 4.44
 - 35
 - none of the above are correct
76. A ridge board is commonly found in this location.
- near the fascia board.
 - near the peak or top of the roof.
 - near the eave of the roof.
 - near the top plate.
77. The type of saw that should be used to cut mop boards when finishing a house is:
- copied saw.
 - ripsaw.
 - crosscut saw.
 - back saw.
78. The most important safety rule to remember when ripping with the bench/table saw is:
- Always use a cross-cut blade.
 - That the anti-kickback fingers must be positioned at least 2 inches above the stock.
 - The material is fed into the saw in the same direction that the blade is rotating.
 - The material is fed into the saw in the opposite direction that the blade is rotating.
79. How many "square" of roofing material must be purchased to cover a roof that measures 28' x18'?
- 4.67
 - 5.00
 - 5.33
 - 5.67
80. The minimum length board that can be safely worked using a planer is:
- 14 inches.
 - 12 inches.
 - 10 inches.
 - 8 inches.

81. The actual size of a nominal sized 2x12 is:
- a. 2"x12"
 - b. 1.5"x11.25"
 - c. 1.75"x11.5"
 - d. 1.75"x12"
82. The primary function of a vapor barrier on a residential dwelling is to:
- a. keep rain from leaking through the walls and ceiling.
 - b. keep water vapor from moving from high to low humidity areas.
 - c. reduce drafts through the wall.
 - d. allow water vapor to pass through but prevent water leaks.
83. A post and frame building that will be used for a livestock shed:
- a. needs a footing poured beneath each post.
 - b. needs a footing poured beneath every other post.
 - c. does not require a footing.

Soil and Water Conservation

84. Which of the following is a result of Soil Erosion?
- a. Improved infiltration rate
 - b. reduction in soil insect population
 - c. fewer pesticides are needed.
 - d. reduced nutrient storage capacity.
85. Identify which of the following will reduce wind erosion.
- a. windbreaks
 - b. strip cropping
 - c. no till planting
 - d. all of the above can reduce wind erosion
86. While working your field in the spring you notice a gully that measures 2' deep. This is considered a _____ gully.
- a. small
 - b. medium
 - c. large
 - d. this is not a gully

87. What is the amount of error that must be considered when looking at an object 200 ft. away with a hand level (assume the approximate error is .1 per 30 ft)?
- 1 ft.
 - 5 in.
 - 6 in.
 - 8 in.
88. The name of the farming practice where tillage occurs perpendicular to the slope.
- strip cropping
 - contour farming
 - no-till farming
 - crop rotation
89. How many rods are in 1 mile?
- 160
 - 320
 - 80
 - 40
90. A farm pond contains 2 million gallons of water. How many acre-feet does it contain?
- 6.15
 - 12.00
 - 50.25
 - 106.00
91. How many acres are covered by a piece of land 5280 ft by 1 rod?
- 1 acre
 - 2 acres
 - 3 acres
 - 4 acres
92. Which of the following soil types listed below is most likely to erode (assuming soil moisture is constant)?
- fine sandy loam
 - loam
 - clay
 - wind erosion affects each soil type about the same

93. The abbreviation "BS" is taken:
- Looking at a known elevation.
 - Looking at an unknown elevation.
 - To determine the height of the instrument.
 - by the rear chainman.
94. The average grade necessary for the 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?
- 3 - 6 feet
 - 6 - 12 feet
 - 7.5 - 15 feet
 - 9 - 18 feet
95. The most important factor affecting runoff rate is:
- tillage proactive
 - vegetative cover
 - slope of land
 - time of concentration
 - none of the above
96. Under similar soil conditions, which of the following crops would provide the best protection against soil erosion?
- cultivated corn
 - hard red winter wheat
 - cultivated soybeans
 - none of the above
97. The formula to determine an allowable error for the differential leveling exercise is:

$$0.0014 * \sqrt{\frac{\text{Distance Traveled in Feet}}{1000}}$$

If your differential leveling exercise covered 200 feet and the actual error calculated from your field notes was .05, should you rerun the leveling exercise?

- yes, the error was too great
- no, its ok

98. Erosion produced channels that can be obliterated by tillage are called:
- gully erosion.
 - rill erosion.
 - sheet erosion.
 - wind erosion.
99. When using the universal soil-loss equations $A = RKLSCP$, the term “L” is a function of:
- rainfall
 - soil erodibility
 - slope length
 - slope gradient
 - none of the above
100. A 25 year frequency storm compared to a 15 year frequency storm will:
- Be of lower average intensity.
 - Be of greater average intensity.
 - Will occur more often.