



**2000 State Competition**  
**FFA Agricultural Mechanics Contest**  
**University of Missouri**  
**100 points**

**Contestant #** \_\_\_\_\_  
**Contestant Name** \_\_\_\_\_  
**Chapter** \_\_\_\_\_

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## Written Exam

You will have 60 minutes to complete this examination. Answer the questions by selecting the best answer for each question. Mark your answer on the quick-scan sheet provided.

***DO NOT WRITE ON THIS EXAM!!***

### **Repair & Maintenance**

1. Rust may be prevented from forming on metal surfaces by applying
  - a. oil
  - b. water
  - c. saddle soap
  - d. any of these
  
2. Driving tool handles are held in place by
  - a. bolts
  - b. nails
  - c. screws
  - d. wedges
  
3. The best tool(s) to sharpen an ax is a
  - a. bench grinder
  - b. belt sander
  - c. portable disc grinder and bench vise
  - d. half-round file
  
4. When using a steam cleaner, the material that helps steam to dissolve grease is
  - a. fuel
  - b. electricity
  - c. pressure
  - d. a chemical solution

5. When painting with oil-based paints, hazards are greatly increased by
  - a. excessive ventilation
  - b. smoking
  - c. spraying outdoors
  - d. using a respirator
  
6. Corners of doors and frames may be strengthened by using a
  - a. hasp
  - b. butt hinge
  - c. flush plate
  - d. hook and eye bolt
  
7. The best tool for measuring the outside diameter of a pipe in its middle section is the
  - a. try square
  - b. tape measure
  - c. caliper
  - d. divider
  
8. When flat nailing lumber, the strongest nailing method is
  - a. end nailing
  - b. clinching
  - c. toe nailing
  - d. splitting
  
9. A hacksaw is designed to cut on
  - a. the forward stroke only
  - b. the backward stroke only
  - c. both the forward and the backward stroke
  - d. the stroke recommended by the manufacturer
  
10. If you cannot get to both sides of sheet metal, the best rivet to use is the
  - a. split rivet
  - b. copper rivet and burr
  - c. pop rivet
  - d. solid steel rivet

11. When sharpening a drill bit, the correct lip clearance should be
  - a. 5 degrees
  - b. 8 degrees
  - c. 10 degrees
  - d. 12 degrees
  
12. Failure to tack or clamp metal before welding could result in
  - a. poor grounding
  - b. distortion
  - c. a weak bead
  - d. metal becoming too hot
  
13. A new grinding wheel for a bench grinder should be tested by
  - a. hanging the stone with a string and striking it with the plastic handle of a screwdriver
  - b. bouncing on a concrete floor
  - c. pressing in a vise
  - d. the use of the eyes only
  
14. The best method for cutting a used oil barrel is
  - a. a hacksaw
  - b. an Oxy-acetylene torch
  - c. a cold chisel
  - d. an arc welder with high amperage
  
15. When putting threads on a bolt, the correct tool to use is the
  - a. tap
  - b. die
  - c. nut you are going to be using
  - d. hacksaw
  
16. A screw plate consists of
  - a. Phillips and flat head screwdrive
  - b. a plate used to fasten wood together with screws
  - c. taps and dies
  - d. a metal gauge used to determine the pitch of a screw

## Electric Motors

17. Which of the following motors is most easily controlled using a solid state speed control?
- A. Capacitor start, inductor run
  - B. Split phase start
  - C. Capacitor start, capacitor run
  - D. Permanent split capacitor
18. Which of the motors applications would have a wound rotor?
- A. electric drill
  - B. Box fan
  - C. Furnace motor
  - D. Air compressor
19. If a motor is a dual voltage motor and it draws 10 amps on the 115 volt it will draw \_\_\_\_\_ amps on the 230 volts.
- A. 5
  - B. 10
  - C. 20
  - D. 40
20. A 3 phase motor has operated 4 weeks, 6 days per week, and 8 hours per day. If the load was 8 amps, the power factor was .85, and the voltage was 230V, how many kilowatts have you used?
- A. 300
  - B. 353
  - C. 88
  - D. 15
20. If a motor has 2 poles (1 pair) and it is operating at 50 hertz, you would expect the motor to turn at \_\_\_\_\_ rpm. (Assume)
- A. 1435
  - B. 1725
  - C. 3450
  - D. 2850
20. A three phase Wye motor operates using
- A. 208V power
  - B. 240V power
  - C. 115V power
  - D. 12V power

20. If the service factor for a 1/4 hp motor is 1.15, what size fuse is needed if the motor is rated at 6 amps? Assume you are going to use this motor at 100% capacity.
- A. 6 amps
  - B. 6.9 amps
  - C. 8.625 amps
  - D. 7.5 amps
20. What is the power factor of an electric motor if the watt meter read 450 watts. Assume a 115 volt motor is operating at 6 amps.
- A. 85%
  - B. 75%
  - C. 65%
  - D. 55%
20. Which of the following motors does **not** have a starting winding?
- A. Capacitor start, Induction run
  - B. Split phase start, Induction run
  - C. Wound rotor
  - D. Three phase Wye
26. The type of electric motor enclosure that must be used to move grain in a feed bin is:
- A. Totally enclosed
  - B. Drip proof
  - C. Splash proof
  - D. Open enclosure
27. Which Term Does Not Apply to Types of Phase Converters?
- A. Static
  - B. Oscillating
  - C. Rotary
  - D. All of the Above.
28. Squirrel Cage Is a Term Used to Describe
- A. The Shaft.
  - B. The Frame.
  - C. The Windings.
  - D. The Rotor.

29. In a Three-phase Power Line the Voltages on the Three Wires Are
- A. The Same at All Times.
  - B. One Is Always Zero.
  - C. Out-of-step.
  - D. Much Higher than in a Single-phase Line.
30. A One-half Hp Electric Motor with a Service Factor of 1.40 Could Be Expected to Perform a \_\_\_\_\_ Hp Output.
- A. .90
  - B. .30
  - C. .70
  - D. 1.40
31. Insulation Classes for Electric Motors Are Designated by
- A. Letters.
  - B. Numbers.
  - C. Letters and Numbers in Combination.
  - D. None of the Above.
32. If Electric Motors Are Not Cooled Properly Problems Can Occur by
- A. Insulation Breaking down in the Windings.
  - B. Shorts Developing in the Windings.
  - C. An Increase in Amperage Draw Resulting in a Voltage Drop.
  - D. All of the Above.
33. Motors Are Cooled by
- A. Natural Convection Currents.
  - B. Radiation Through Fins and the Case.
  - C. Forced Air Movement with Fans.
  - D. All of the Above.
34. When Removing the End Bell from the Motor Shaft the Shaft Should Be Cleaned with \_\_\_\_\_ to Help Prevent Ruining the Seal or Bearing.
- A. A Mill File
  - B. Emery Paper
  - C. Sandpaper
  - D. Both A and B

## Machinery

35. When corn stalks have become weak, and you are using a corn head to combine the corn, you should:
- A. Re-time the gatherer chain so that the flights are directly opposite each other
  - B. Operate your machine slightly faster (ground speed)
  - C. Operate your machine slightly slower (ground speed)
  - D. You need to do both A and C.
36. Which of the following stock rolls should be used if you are operating in very dry (severe) conditions?
- A. Tapered stock rolls
  - B. Straight Stock rolls
  - C. Knife Stock rolls
  - D. None of the above are correct
37. When combining wheat under wet conditions on should:
- A. Ignore weeds and other trash when cutting, allowing the combine to separate it all.
  - B. Cut your grain as high as possible.
  - C. Cut your grain as low as possible.
  - D. Use as little air blast on the shoe as possible
38. When setting the reel on a wheat cutting platform you should:
- A. Set the reel just slightly below the lowest heads and just ahead of the knife.
  - B. Set the reel near the top of the crop and just ahead of the knife.
  - C. Set the reel so that it rotates at ground speed.
  - D. Set the reel so that it rotates slower than ground speed.
39. The fan speed of a combine (cleaning fan), as a rule of thumb, should be rotating faster if combine is used to combine:
- A. Seed Corn
  - B. Soybeans
  - C. Wheat
  - D. Alfalfa
40. Which rasp bar type should be selected if you intend to harvest food grade corn?
- A. Smooth rasp bar
  - B. Hardened chrome rasp bar
  - C. Hardened non-chrome rasp bar
  - D. None of the above are correct.

41. The tillage tool that is most likely used to cut up corn stalks residues prior to tillage with a light duty chisel plow is:
- A. Heavy duty chisel plow
  - B. Tandem disk
  - C. Coil tine harrow
  - D. Spring tooth harrow
42. Which of the following pump types is used most often on agricultural field sprayers?
- A. Piston
  - B. Centrifugal
  - C. Diaphragm
  - D. Roller
43. Which of the following is **NOT** a type of chemical agitation that is used in field sprayers?
- A. Mechanical
  - B. Fluid (spray solution circulated into the tank)
  - C. Air (air is forced into the spray solution)
  - D. All of the above are used to agitate chemicals for agricultural sprayers.
44. If the shovel on a light duty chisel plow has a sharp stem angle. As such the shovel will:
- A. Not penetrate
  - B. Penetrate too much at times
  - C. Not be impacted by the stem angle
45. A combine operator notes an excessive amount of threshed grain behind the combine straw chopper. This is most likely a result of:
- A. The sieve and chaffer are set too tight
  - B. The sieve and chaffer are set too wide
  - C. The fan RPM is set too slow for the given crop
  - D. None of the above
46. The baler operator has just “dumped” a lop-sided large round bale. This is most likely a result of:
- A. The twine arm NOT feeding correctly.
  - B. The monitor is not allowing the baler to “fill” the chamber
  - C. The operator did not “weave” in and out as he/she was baling
  - D. Normal operation of the baler

47. A grain drill is commonly used to plant:
- A. Wheat
  - B. Corn
  - C. Soybeans
  - D. Both A & C are correct
48. A farmer loses a rasp bar in his combine. The bolts sheared as a rock was pushed into the rock trap. The bar must be replaced. He/she should:
- A. Replace the damaged rasp bar and the bar opposite the damaged the rasp bar.
  - B. Replace the bolts on the remaining raspbars as well.
  - C. Only replace the missing raspbar.
  - D. Do both A & B.
49. If you have twelve 30" rows, you are covering \_\_\_\_ feet with one pass through the field.
- A. 30
  - B. 24
  - C. 21
  - D. 16
50. Bale Density on a small square baler is adjusted by:
- A. Increasing ground speed
  - B. Slowing ground speed
  - C. Increasing the length of the plunger
  - D. None if the above are correct

### **Tractor Power**

51. If a battery is frozen, it should be warmed to \_\_\_\_ degrees before charging. This will reduce the chance of an explosion.
- A. 30 degrees
  - B. 40 degrees
  - C. 50 degrees
  - D. 60 degrees
52. If battery acid has been inhaled, one should:
- A. Induce vomiting
  - B. Drink as much water or milk as you can
  - C. Drink no more than 2 quarts of milk or water
  - D. Not be worried, only a small amount of heartburn will be noted.

53. The name of a tool that should be used to determine if a hydraulic leak is present is:
- A. Cardboard
  - B. Delco oil leak sniffer
  - C. Use a match to see if it flares
  - D. None of the above should be used.
54. Which of the following issues does not impact the engine operating temperature such that the engine could/would overheat?
- A. timing
  - B. head gasket
  - C. Viscous fan
  - D. All of the above can impact the engine operating temperature
55. The primary air cleaner element on a tractor engine filters:
- A. All of the dust/dirt from the air that is used by the engine
  - B. Only a small amount of dust/dirt from the air that is used by the engine.
  - C. Only filters the “larger” particles, and relies on the secondary element to clean the air.
  - D. None of the above are correct.
56. Which of the four choices is not an essential element of a dynamometer?
- A. Means for controlling torque
  - B. Means for measuring torque
  - C. Means to reclaim power
  - D. Means for measuring speed
57. As defined by ASAE standards, which of the following is not a type of PTO drive:
- A. Transmission-driven PTO
  - B. Free-wheeling PTO
  - C. Independent PTO
  - D. Continuous-running PTO
58. The type of oil or fluid used in a wet clutch is:
- A. Motor oil
  - B. Mineral oil
  - C. Water
  - D. Hydraulic oil
59. Which of the following is not considered a type of engine lubrication system?
- A. Full Pressure
  - B. Splash
  - C. Pressure feed and Splash
  - D. Wet Bath

60. The boiling point of ethylene glycol based antifreeze is:
- A. Higher than water
  - B. Lower than water
  - C. Same as water
61. Too high oil pressure is not caused by:
- A. Oil that is too heavy
  - B. Stuck regulating valve
  - C. Regulating valve that is out of adjustment
  - D. A low oil level
62. How often should crank case oil level be checked?
- A. Once a week
  - B. Every 10 hours of operation
  - C. Daily
  - D. Never
63. Which of the following is not a function of engine oil?
- A. Suspend water
  - B. Reduce friction and wear
  - C. Cool moving parts
  - D. Keep parts clean
64. The function of a governor is:
- A. Limit low speed idle
  - B. Maintain a constant engine speed under varying load conditions
  - C. Regulate electrical voltage
  - D. None of the above
65. Good performance by the engine depends on which of the following:
- A. Adequate supply of clean air and fuel
  - B. Good compression
  - C. Proper valve and ignition timing
  - D. All of the Above
66. If an engine's crankshaft is positioned in the engine in such a way that it is parallel with the earth, it would be classified as a:
- A. vertical shaft engine
  - B. vertical drive engine
  - C. horizontally driven engine
  - D. horizontal shaft engine

67. If an engine's's owners manual specifies the use 10W oil, it is perfectly acceptable to use:
- A. 10w -30
  - B. 5w - 20
  - C. 15w - 40
  - D. None of the above are correct.

### **Concrete and Plumbing**

68. When conducting an organic matter test, one must wait \_\_\_\_\_ hours before you can complete the test.
- A. 4
  - B. 8
  - C. 16
  - D. 24
69. Bulking of sand in concrete work refers to:
- A. Changes in volume due to small amounts of moisture
  - B. Changes in weight due to small amounts of moisture
  - C. Sand that is dripping wet.
  - D. None of the above are correct.
70. Lightweight concrete is made by using:
- A. Less water during mixing
  - B. Mica or pumice as an aggregate.
  - C. Sand or gravel as aggregates.
  - D. This is a myth. There is no such thing
71. A concrete mix of 1:2:3-6:
- A. Is one part sand, two parts gravel, and three parts cement.
  - B. Has 3 gallons of water per sack of concrete.
  - C. Has 6 gallons of water per yard of sand.
  - D. None of the above are correct.
72. Name given to a tool that is used to smooth the concrete between concrete blocks is:
- A. Pointing trowel
  - B. Brick trowel
  - C. Finishing trowel
  - D. Jointing trowel

73. Reinforcement is placed in concrete to compensate for poor \_\_\_\_\_ strength.
- A. Compressive
  - B. Tensile
  - C. Bulk
  - D. None of the above are correct.
74. The recommended type of plywood that should be used when constructing concrete forms is:
- A. Select
  - B. Plyform
  - C. CCA
  - D. CDX
75. The weather is extremely hot, exceeding 100 degrees and 75% relative humidity. The best way to control setting time is to:
- A. Elevate the temperature of the water prior to mixing
  - B. Cool the water prior to mixing.
  - C. Try to keep the subgrade as dry as possible.
  - D. None of the above are correct
76. The name given to a device that allows you to put a hole in concrete is:
- A. Star drill
  - B. Spade bit
  - C. High speed steel twist drill bit
  - D. Wood auger bit
77. The type of valve that is designed to allow fluid/gas to flow in only one direction:
- A. Gate valve
  - B. Check valve
  - C. Globe valve
  - D. Pressure regulating valve
78. The maximum percent of lead for solder that will be used to seal tubing for potable water systems is:
- A. .2%
  - B. 1%
  - C. 20%
  - D. 50%

79. The type of pipe cutter that does not need to rotate completely around a pipe in order to cut the pipe is:
- A. Single wheel
  - B. Two wheel
  - C. Four wheel
  - D. All cutters must rotate completely around the pipe.
80. A standard wall pipe is the same thickness as a :
- A. Schedule 40 pipe
  - B. Schedule 80 pipe
  - C. Schedule 120 pipe
  - D. Schedule 20 pipe
81. The material which is applied to unprotected steel pipe to prevent rust is:
- A. Varnish
  - B. Zinc
  - C. Plastic
  - D. All of the above are correct
  - E. Only A & B are correct
82. The smallest diameter copper tubing that can be used to plumb a house is:
- A.  $\frac{1}{2}$ " OD
  - B.  $\frac{1}{2}$ " ID
  - C.  $\frac{1}{4}$ " OD
  - D.  $\frac{1}{4}$ " ID
83. The most common "standard" length of galvanized pipe is:
- A. 16 feet
  - B. 21 feet
  - C. 24 feet
  - D. 48 feet
84. Most leaky faucets can be repaired by replacing:
- A. Washers
  - B. Disks
  - C. Turning the washer over
  - D. All of the above are correct

85. A 90 degree street elbow has:
- A. Male threads on each end
  - B. Male threads on one end, and female on the other
  - C. Female threads on each end
  - D. Does not have any threads
86. The type of pipe that should NOT be used to plumb a diesel fuel storage tank:
- A. Galvanized
  - B. Black pipe
  - C. Stainless Steel
  - D. None of the above are correct.

### **Oxy-Acetylene Welding**

87. The oxygen cylinder has this type of safety device:
- A. Bursting disk
  - B. Fusible plugs
  - C. Long fibre asbestos
  - D. Monolithic filler
88. This type of regulator is recommended for use with a manifold system:
- A. Single stage
  - B. Two stage
  - C. Three stage
  - D. Four stage
89. The oxygen hose is colored:
- A. Black
  - B. Green
  - C. Red
  - D. Blue
90. The procedure that should be used when fusion welding 1/4 inch steel with an oxyacetylene welder.
- A. Backhand
  - B. Forehand
  - C. Uphand
  - D. Sidearm

91. Which of the following is NOT an approved way to light an Oxy-acetylene torch?
- A. Farmers Match
  - B. Striker
  - C. Hot metal
  - D. A & B & C are correct
  - E. Only A & C are correct
92. Which of the following gases produces the hottest flame when mixed with oxygen?
- A. MAPP
  - B. Propane
  - C. Carbon Dioxide
  - D. Acetylene
93. Which of the following flame types produces a flame that reaches 6300 degrees F?
- A. Neutral
  - B. Oxidizing
  - C. Carburizing
  - D. Neutral-Carburizing
94. You must take your Oxy-acetylene welder out to the field. And, you did not have a choice, you had to lay the cylinders down. How long must you wait once you get out there before it is safe to use the equipment?
- A. 15 min.
  - B. 30 min.
  - C. 60 min
  - D. 120 min
95. Which cylinder has a bronze valve?
- A. Oxygen
  - B. Acetylene
96. Which of the following should NOT be used to lubricate fittings on an oxygen cylinder?
- A. WD-40
  - B. Beeswax
  - C. Soap
  - D. Glycerine
97. The maximum acetylene working pressure that can be used when cutting steel is:
- A. 5 psi
  - B. 15 psi
  - C. 30 psi
  - D. 60 psi

98. When using heat from a torch to help remove a stuck bolt that you will reuse, it is best to heat the head of the bolt till
- A. the head of the bolt is bright red and the metal begins to bubble
  - B. the head of the bolt begins to redden in color
  - C. it is never recommended to use a torch to help remove a bolt you may possibly reuse.
99. Braze welding takes place at temperatures at or exceeding
- A. 1150 C
  - B. 1500 F
  - C. 150 F
  - D. 840 F
100. Aluminum is an example of a/an
- A. nonferrous metal
  - B. ferrous metal
  - C. alloy metal
  - D. corrosive metal