2010 Examination for the National Agricultural Mechanics Career Development Event: INTEGRATED PEST MANAGEMENT

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

SECTION 1: MACHINERY & EQUIPMENT SYSTEMS Question 1-20

1. Which one of the following must be present in the soil for seed germination?
A. Water
B. Nitrogen
C. Potassium
D. Phosphorous

2. When moving a tractor up a steep incline, which of the following techniques is recommended?
A. Back up the incline
B. Steer straight while driving up the incline
C. Angle about 45 degree along the slope while driving up the incline
D. Have someone stand on the front of the tractor while driving up the slope

3. What is the purpose of a press wheel on a planter?
A. Opens the soil for seed planting
B. Firms the soil after the seed is covered
C. Presses the seed to the bottom of the groove
D. Distributes the seed evenly throughout the groove

4. Which of the following variables directly influence power output of a tractor's power takeoff (PTO)?
A. PTO torque and rotational speed
B. Tractor travel speed and direction
C. Tractor wheel diameter and travel speed
D. PTO diameter and tractor engine oil pressure

5. How many splines are on the shaft of a 540 rpm PTO stub?
A. 6 splines
B. 10 splines
C. 20 splines
D. 21 splines

6. Which of the following factors directly influence the field capacity of agricultural equipment?
A. Power takeoff (PTO) speed and temperature
B. Machine weight and ground clearance
C. Travel speed and operating efficiency
D. Machine height and length

7. How does an underinflated ground driven planter drive tire affect the number of seeds planted per acre?
A. No affect
B. Over planting occurs
C. Under planting occurs
D. Correct amount of seed is planted per acre

8. When an engine is operated in an enclosed shed, what exhaust gas presents a hazard to people and animals?
A. Hydrogen Peroxide
B. Carbon Monoxide
C. Hydrogen Sulfide
D. Carbon Dioxide

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9. When a tractor is equipped with a rollover protective structure (ROPS) and a seat belt, what is the purpose of the ROPS?
A. Lower the tractor's center of gravity
B. Prevent head injuries caused by falling objects
C. Limit most rollovers to 90 degrees and when the seatbelt is worn, to protect the operator
D. Limit most rollovers to 180 degrees and when the seatbelt is not worn, to protect the operator

10. Which of the following is an acceptable way to dispose of empty herbicide containers after use?
A. Rinse once and burn on site
B. Reuse the container to store nontoxic liquids
C. Triple rinse and puncture
D. Cut the top out and reuse for food storage

11. What is the term for a herbicide that is applied to kill a plant before it emerges from the surface of the soil?
A. Post emergence
B. Pre-emergence
C. Incorporated
D. Aerated

12. What type of pest management systems relies on the physical removal of pests such as hoeing weeds?
A. Biological
B. Chemical
C. Incorporated
D. Mechanical

13. Applying insecticide often eliminates natural enemies of the pest insects; what term describes the process where a pest population recovers from a pesticide treatment?
A. Resurgence
B. Residual
C. Reactant
D. Mechanical

14. What is the term/practice for planting a different crop to prevent the buildup of pest organisms that feed on a particular type of plant?
A. Multiple cropping
B. Strip cropping
C. Crop rotation
D. Intercropping

15. Which of the following terms describes the inspection of a field to determine if there is a pest problem?
A. Scouting
B. Eradication
C. Cultural control
D. Resistance

16. Using living organisms to control pest populations is known as what type of control system?
A. Biological
B. Chemical
C. Mechanical
D. Physical

17. The use of botanical and synthetic pesticides is known as what type of control system?
A. Biological
B. Chemical
C. Mechanical
D. Physical

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18. A planter has a 20-foot effective swath width, travels at 5 miles per hour, and operates with a field efficiency of 80 percent. What is the approximate effective field capacity (EFC) of the planter in acres per hour?

Note: EFC in acres per hour = $\frac{\text{width of implement in feet x speed in miles per hour x efficiency}}{8.25}$

A. 7.3 acres per hour
B. 8.0 acres per hour
C. 9.7 acres per hour
D. 11.0 acres per hour

19. What is the approximate speed, in miles per hour, of a planter that travels 200 feet in 25.6 seconds?

Note: 5,280 ft = 1 mile 3600 seconds = 1 hour

A. 3.9 miles per hour
B. 5.3 miles per hour
C. 6.5 miles per hour
D. 8.7 miles per hour

20. If a farm cooperative charges $17.00 per acre to apply pesticide, what is the total cost to treat six fields with the following acreages: 139 acres, 245 acres, 180 acres, 375 acres, 607 acres, and 495 acres?

A. $34,697.00
B. $45,831.00
C. $52,488.00
D. $61,625.00

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SECTION 2: INDUSTRY AND MARKETING SYSTEMS Question 21-40

21. Which of the following would be considered a liability in farm accounting?

A. The herbicide bill that you owe to the farm supply store
B. Money in your checking account
C. A debt owed to you by another farmer
D. The cash value of your life insurance policy

22. What is the name for the decrease in the value of a capital asset that occurs over time?

A. Repair and maintenance
B. Obsolescence
C. Depreciation
D. Capital accrual

23. In economics, applying any production input, such as herbicides, in excess of the required amount, leads to which of the following?

A. Diminishing returns
B. Profit maximization
C. Differentiated input function
D. Liquidity

24. Which of the following correctly describes the owner(s) of the cooperative?

A. Stockholders
B. Private investors
C. Member-patrons of the cooperative
D. A sole proprietor

25. Which type of pesticide can only be purchased by a certified pesticide applicator?

A. General use pesticide
B. Special use pesticide
C. Reserve use pesticide
D. Restricted use pesticide

26. What type of insurance gives a farmer protection against financial loss if a chemical application drifts onto an adjacent farm and damages a neighbor's crop?

A. Accident insurance
B. Property insurance
C. Liability insurance
D. Crop insurance

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27. In economics, a product or service has this characteristic if it satisfies a consumer's need.
A. Elasticity
B. Leverage
C. Parity
D. Utility

28. What type of business arrangement gives a farmer the right to use a self-propelled spray rig owned by a machinery dealership for a certain period of time in exchange for one or more payments?
A. Barter
B. Exchange
C. Lease
D. Sale

29. Which of the following is a variable cost associated with owning fertilizer application equipment?
A. Depreciation
B. Chemical expense
C. Interest expense
D. Annual taxes

30. Which type of fuel is most efficiently converted into work by a tractor's engine?
A. Gasoline
B. Diesel fuel
C. LP-gas
D. Ethanol

31. Which of the following is an example of a variable cost for a grain elevator employing seasonal workers?
A. Monthly telephone charge for local calls
B. Property tax on elevator
C. Depreciation on a grain auger
D. Overtime wages paid to hired labor

32. Which of the following is a variable cost associated with owning grain handling equipment?
A. The operating costs not declared on income tax expenses
B. Depreciation costs
C. Fuel/energy costs
D. Principal payment on a fixed loan

33. Which of the following is an example of a variable cost for a pesticide company that is hiring certified applicators?
A. Fuel cost
B. School tax on the company's property
C. Casualty insurance on transport trailers
D. Depreciation on a new semi-truck with tanker

34. In this accounting system, an expense is recognized as an expense before cash is paid.
A. Cash accounting system
B. Accrual accounting system
C. Liability accounting system
D. Expense accounting system

35. Which of the following are all fixed costs associated with operating a farm?
A. Soil conservation losses, lost crop repayments, death benefits, and federal incentive payments
B. The opportunity and entertainment costs not declared on Schedule F of the IRS 1040 Form
C. Shelter, interest, taxes, depreciation, and insurance
D. Livestock depreciation and all operating costs

36. Which one of the following costs is generally considered to vary with individual operator use?
A. Annual cost for repairs
B. Annual cost for equipment shelter
C. Annual cost for equipment taxes
D. Annual cost for the interest on the loan for the equipment's purchase

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37. Which of the following 2WD tractor weighting schemes is most agreed upon for a heavy duty chisel plow?
A. 50 percent on the front and 50 percent on the rear
B. 40 percent on the front and 60 percent on the rear
C. 35 percent on the front and 65 percent on the rear
D. 25 percent on the front and 75 percent on the rear

38. If sales tax is 7.25 percent, what is the approximate total cost including the sales tax, for an item marked $636.94?
A. $225.58
B. $319.63
C. $497.36
D. $683.12

39. It costs $5.45 per acre per year to have a crop service scout for insect pests. What will be the approximate yearly charge to scout a field measuring 2588 feet wide and 2409 feet long? Note: 1 acre = 43,560 square feet
A. $679 per year
B. $780 per year
C. $867 per year
D. $987 per year

40. A label specifies that pesticide formulation be applied at the rate of 6.5 ounces per acre. Approximately how many acres will one gallon of this pesticide formulation treat? Note: 1 gallon = 128 ounces
A. 16.5 acres per gallon
B. 19.7 acres per gallon
C. 22.9 acres per gallon
D. 25.3 acres per gallon

SECTION 3: ENERGY SYSTEMS Question 41-60

41. What material provides great resistance to the flow of electricity?
A. Insulator
B. Conductor
C. Filament
D. Commutator

42. What type of wire can be used for direct burial in soil?
A. Type T
B. Type TW
C. Type UF
D. Type THWN

43. What type of variable resistor is used to control voltage?
A. Voltmeter
B. Ammeter
C. Oscilloscope
D. Potentiometer

44. What device converts light energy into electrical energy?
A. Photodiode
B. Phototransistor
C. Photovoltaic cell
D. Photoconductive cell

45. A white wire that is connected to the screw of a 3-way switch is:
A. Hot.
B. Neutral.
C. A grounding conductor.
D. Is not accepted according to the National Electric Code.

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46. When an electrical wiring system provides power to a 230-volt motor, why is the frame of the motor grounded?
A. To complete the branch circuit
B. To prevent the motor from turning in reverse
C. To physically connect the motor to equipment frames
D. To ground the motor and reduce the likelihood of electrical shock

47. The grounded conductor in an electrical wiring system serves what purpose?
A. It is the neutral conductor for the electrical system
B. It is a noncurrent carrying conductor for most appliances
C. It is the unnecessary connection of an electrical conductor to earth
D. It is the only possible electrical connection between the electrical system and the earth

48. What type of switch is used to control water levels in livestock water tanks and other areas where liquid levels must be controlled?
A. Timer switch
B. Actuator switch
C. Thermocouple
D. Float switch

49. If a wiring circuit has a path through which electricity can flow, it is said to have what property?
A. Switched
B. Parallel
C. Power
D. Continuity

50. When measuring an unknown voltage with a multimeter that requires you to select a voltage, what is the recommended procedure?
A. Select the highest voltage range and work your way down
B. Select the lowest voltage range and work your way up
C. Select the voltage range closest to the voltage you expect
D. Select 120 volts

51. When measuring resistance with a multimeter what is the name of the units of the value measured?
A. Voltage
B. Amperage
C. Ohms
D. Continuity

52. In an irrigation electrical wiring system, what is the result of broken and/or damaged electrical wires?
A. A closed circuit.
B. A complete circuit.
C. An open circuit.
D. A long circuit.

53. How do ohm meters work?
A. By combining the amperage and the wattage measurement of the circuit
B. By measuring the current of a component being tested
C. By passing current through the component being tested
D. By combining the voltage and the amperage measurement of the circuit

54. What is the purpose of the ground fault circuit interrupter (GFCI)?
A. Provide protection from electrical shock
B. Signal the probability of an earthquake
C. Step up the output voltage of equipment
D. Measure stray voltage

55. What function do sprinkler control valves perform in a sprinkler system?
A. Control the amount of water in the system
B. Direct the flow of water
C. Turn the flow of water on or off
D. Allow the water in the system to drain during cold weather

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56. What type of zone control valve should be used underground?
A. Anti-siphon valve
B. In-line valve
C. A UL listed gate valve
D. A UL listed solenoid actuated anti-siphon valve

57. Which of the following types of valves, when properly installed, is most effective at preventing back flow?
A. Anti-siphon valve
B. In-line valve
C. A gate valve
D. A pressure limiting safety valve

58. The monthly charge to operate a pivot irrigation system is 8 cents per kilowatt hour (KWH) for the first 1000 hours and 7.75 cents for each hour greater than 1000 hours. If the irrigation system uses 1785 KWHs of electricity during a single month, what is the monthly cost, in dollars, to operate the irrigation system? (1 Kilowatt = 1000 Watts)
A. $113.84
B. $140.84
C. $162.84
D. $191.84

59. If a wattmeter measures 5800 watts of power being used by a five horsepower electric motor, operating at 230 volt, and 28 amps, what is the power factor for the motor?
Formula: Wattage = Voltage x Amperage x Power Factor
A. 0.123 or 12% power factor
B. 0.252 or 25% power factor
C. 0.901 or 90% power factor
D. 0.972 or 97% power factor

60. An 120-volt electrical circuit will operate a 2400-watt resistance heater and ten 300-watt incandescent light bulbs. If the circuit is operated 10 hours each day for 300 days, how many kilowatt hours will the electrical system use during the time period? **Note: Kilowatt hours = $\frac{\text{Total Watts x Total hours}}{\text{1000 Watts/Kilowatt}}$**
A. 10,900 kilowatts hours
B. 13,700 kilowatts hours
C. 16,200 kilowatts hours
D. 19,400 kilowatts hours

SECTION 4: STRUCTURAL SYSTEMS Questions 61-80

61. What is another name for metallic inert gas welding (MIG)?
A. Stick welding
B. Gas tungsten arc welding (GTAW)
C. Shielded metal arc welding (SMAW)
D. Gas metal arc welding (GMAW)

62. What is the name of the tool used to cut internal threads?
A. Tap
B. Die
C. Drill
D. Reamer

63. What is the most common shielding gas used for TIG welding aluminum?
A. Carbon dioxide
B. Argon
C. Nitrogen
D. Carbon dioxide/argon mix

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64. What is indicated by the two (sometimes three) digits immediately to the right of the E of shielded metal arc welding electrodes?
A. Weld position
B. Tensile strength
C. Compression strength
D. Special electrode characteristic

65. What is the maximum safe working pressure for acetylene?
A. 15 psi
B. 20 psi
C. 25 psi
D. 30 psi

66. What is the process by which base metals are fastened with a filler metal that melts at temperatures below 840° F?
A. Brazing
B. Braze welding
C. Soldering
D. Welding

67. What type welding uses an arc surrounded by a layer of flux and is established and maintained between a continuously fed wire and the work piece?
A. Flux cored arc welding (FCAW)
B. Submerged arc welding (SAW)
C. Plasma arc welding (PAW)
D. Laser beam welding (LBW)

68. What is the typical arc length for a 1/8" diameter E6011 electrode used in SMAW for the flat position?
A. The electrode should touch and drag along the base metal
B. 1/32"
C. 1/8"
D. 3/8"

69. What device can be installed on oxy-fuel equipment to prevent a flame from traveling back up the torch/hose, past the point of installation?
A. Regulator
B. Cylinder valve
C. Flashback arrester
D. Reverse flow check valve

70. What type of flame is formed when oxygen is added to a neutral flame?
A. Neutral flame
B. Oxidizing flame
C. Carburizing flame
D. Pure acetylene flame

71. Which of the following is the fuel gas that can be used for welding purposes?
A. MAPP
B. Propane
C. Acetylene
D. Propylene

72. What is the safe gas withdrawal rate for an acetylene cylinder?
A. 1/7 of the cylinders capacity per hour
B. 1/4 of the cylinders capacity per hour
C. 1/2 of the cylinders capacity per hour
D. 2/3 of the cylinders capacity per hour

73. What fuel gas has the highest flame temperature when burned with oxygen?
A. Acetylene
B. Natural Gas
C. MAPP Gas
D. Propylene

74. According the American Welding Society (AWS), what is the color code for pure tungsten electrodes (EWP) that are used with the Gas Tungsten Arc Welding process?
A. Green
B. Orange
C. Black
D. Yellow

75. According to the American Plywood Association, which of the following grades of veneer is the highest (best) quality?
A. Grade A
B. Grade B
C. Grade 1
D. Grade 2

76. What is the name of a single board that supports a section of a roof on truss type building construction?
A. Girder
B. Column
C. Subfloor
D. Rafter

77. What is the concrete base that provides a solid, level foundation for brick, stone, or block walls?
A. Form
B. Footer
C. Control joint
D. Moisture barrier

78. If 180 feet of steel rod is used to construct a hay feeding rack and the rod weighs 0.385 pounds per foot of length, what is the approximate weight of the hay feeding rack?
A. 69 pounds
B. 91 pounds
C. 155 pounds
D. 260 pounds

79. Steel angle iron is sold for $2.45 per linear foot, steel rod is sold for $1.93 per linear foot, and steel pipe is sold for $2.79 per linear foot. If 18 feet of angle iron, 25 feet of rod, and 28 feet of pipe are purchased, what is the total price for the metal before taxes?
A. $ 83.75
B. $110.23
C. $138.61
D. $170.47

80. What is the volume, in cubic inches, of a cylinder with a diameter of 10 inches and a length of 3 feet?
Note: Volume of Cylinder = π x (radius)^2 x (length) $\pi = 3.14$ (dia./2) = radius 1 foot = 12 inches
A. 1,384 cubic inches
B. 1,826 cubic inches
C. 2,044 cubic inches
D. 2,826 cubic inches

SECTION 5: ENVIRONMENTAL AND NATURAL RESOURCE SYSTEMS Question 81-100

81. What is the primary purpose of the spinner located below the feed chute on a granular fertilizer spreader?
A. Force air through the hopper and aid the gravity feed process
B. To improve the uniform distribution of the granular fertilizer
C. Vary the distance that fertilizer is thrown during turns and stops
D. Mix fertilizer and water together prior to injection in the soil

82. Which of the following statements describes effective swath width for a broadcast granular fertilizer spreader?
A. The maximum distance that fertilizer is thrown directly below the hopper of a spreader
B. The maximum distance that fertilizer is thrown behind a granular fertilizer spreader
C. The width of the application that achieves uniform deposition rates with appropriate overlap between adjacent passes
D. The width of the application that achieves maximum deposition rates without having to overlap between adjacent passes

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83. Which of the following describes the benefit of conducting a spread pattern test for a granular fertilizer spreader?
A. It evaluates the uniformity of the fertilizer distributed over the effective swath width by the spreader
B. It determines the volume of the fertilizer that is distributed directly in front of the power unit towing the fertilizer spreader
C. It measures the width of a fertilizer application that also achieves the maximum soil deposition rates
D. It accounts for the number of pounds of fertilizer that are distributed beyond the spreader's effective swath width

84. Which of the following statements is correct with regard to how the spinner's rotating speed effects granular fertilizer distribution?
A. Increasing spinner speed (revolutions per minute) decreases the distance that granular fertilizer is thrown
B. Increasing spinner speed (revolutions per minute) increases the distance that granular fertilizer is thrown
C. Decreasing spinner speed (revolutions per minute) increases the flow rate of the fertilizer from the hopper
D. Decreasing spinner speed (revolutions per minute) decreases the flow rate of the fertilizer from the hopper

85. How will a 6 mile per hour wind, blowing perpendicular to the direction of travel, effect the distribution of a liquid hebicide being applied by a spray boom positioned 30 inches above the ground?
A. Increases off target fertilizer movement
B. Decreases off target fertilizer movement
C. Increases the uniform effectiveness of fertilizer application
D. Decreases the amount of fertilizer required for a application

86. Which of the following is the best option to reduce the off target movement of a liquid fertilizer being applied by a boom sprayer?
A. Reduce the height of the spray boom above the ground
B. Use fertilizer spray nozzles that produce smaller spray droplets
C. Increase the spray pressure (pounds per square inch) being used to deliver the fertilizer
D. Increase the travel speed (miles per hour) of the fertilizer application

87. What values are used to calculate the application rate of granular applications in pounds per acre?
A. Use travel speed in miles per hour, effective swath width in feet, and delivery rate in pounds to calculate application rate
B. Use effective swath width in feet, delivery rate in pounds, and granular size in inches to calculate application rate
C. Use delivery rate in pounds, granular size in inches, and travel speed in miles per hour to calculate application rate
D. Use granular size in inches, travel speed in miles per hour, and hopper volume to calculate application rate

88. Which of the follow correctly describes the relationship between application rate (pounds per acre) and the overlap between multiple passes of a granular fertilizer spreader?
A. Less overlap between passes will increase the travel speed requirements for the application
B. Less overlap between passes will decrease the travel speed requirements for the application
C. Greater overlap between passes will increase the overall application rate
D. Greater overlap between passes will decrease the overall application rate

89. When liquid pesticide is applied with a traditional boom sprayer, if all other variables remain constant, which of the following will result in a decreased chemical application rate?
A. Reduce the travel speed of the sprayer
B. Increase the travel speed of the sprayer
C. Replace the existing nozzles with nozzles having a larger tip size
D. Increase the spray pressure at the nozzle

90. Which of the following pesticide spray equipment components can directly control and vary the pressure developed at the sprayer nozzle and the quantity of spray delivered to the nozzles?
A. Strainer
B. Screen
C. Nozzle body
D. Pressure regulator

91. Which of the following is a true statement with respect to groundwater and liquid chemical contamination?
A. Groundwater is easily cleaned after it becomes contaminated
B. Chemicals are not transported into groundwater by leaching
C. Shallow groundwater is more susceptible to contamination than deeper groundwater
D. Contamination is more likely with clay soils than with sandy soils

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92. If other variables remain constant, which of the following adjustments to spray equipment will result in the greatest increase in application rate?
A. Increase the travel speed 20 percent
B. Decrease the travel speed 20 percent
C. Increase the spray pressure 10 percent
D. Decrease the spray pressure 10 percent

93. If other variables remain constant, which of the following adjustments to spray application equipment will have the described effect?
A. Doubling the travel speed will double the spray application rate
B. Doubling the spray pressure will double the spray application rate
C. Doubling the travel speed will reduce the application rate by one-half
D. Doubling the spray pressure will reduce the application rate by one-half

94. Which of the following conditions are most likely to reduce the likelihood of off target movement by liquid chemical?
A. High spray pressure, high temperature, no wind, and high humidity
B. Low spray pressure, low temperature, low wind speed, and high humidity
C. High spray pressure, low temperature, high wind speed, and low humidity
D. Low spray pressure, high temperature, high wind speed, and low humidity

95. Which of the following is typically the reason why inexperienced operators apply granular fertilizer incorrectly with a pull-behind/towed spreader?
A. Improper fertilizer is applied for the crop being treated
B. Improper loading of the spreader resulting in poor operation of the hopper delivery system
C. Improper overlap distance between passes resulting in under or over application
D. Improver and/or inconsistent travel speed when operating wheel driven spreaders

96. Which of the following statements is true with regard to granular fertilizer spreaders?
A. Two fertilizers with different densities will have the same rate of flow and distance of throw
B. Operating spreaders with low quantities of fertilizer does not influence application rate
C. Two fertilizers with different particle sizes have the same rate of flow and distance of throw
D. When a spreader with spinners is operated over sloped terrain, the fertilizer is not uniformly applied

97. Which of the following results in feed problems from the hopper to the spinner of a fertilizer spreader?
A. Normal motion and agitation of the spreader during operation
B. Uniform granule size and density
C. Wet or damp fertilizer granules
D. Fine rather than course granular fertilizer is used

98. Approximately how many acres are in a rectangular field measuring 1200 yards by 2360 feet?
Note: 1 acre = 43, 560 square feet 1 yard = 3 feet
A. 141 acre
B. 195 acres
C. 256 acres
D. 320 acres

99. What is the approximate speed, in miles per hour, of a granular pesticide spreader that travels 275 feet in 0.75 minutes? Note: 5,280 ft = 1 mile 60 minutes = 1 hour
A. 4.2 miles per hour
B. 5.0 miles per hour
C. 6.4 miles per hour
D. 8.6 miles per hour

100. A pesticide label specifies that 1.5 pints of pesticide concentration, mixed with 20 gallons of water, are to be applied per acre. Approximately how many gallons of pesticide concentration are required to treat a 320-acre field?
Note: 128 ounces = 1 gal 16 ounces = 1 pint
A. 20 gallons
B. 45 gallons
C. 60 gallons
D. 85 gallons

End of Examination