

Energy, Power, and Transportation Technology

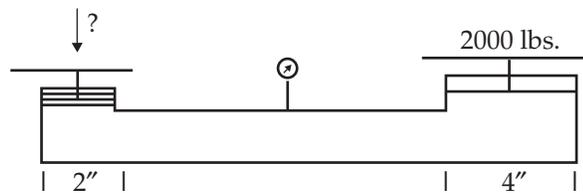
Final Examination Answers

1. A loss of compression could be a result of which of the following?
 - A. A cracked ring.
 - B. Poor valve seating.
 - C. Worn cylinder walls.
 - D. A blown head gasket.
 - E. All of the above.**
2. Petroleum, coal, and wood are similar in that:
 - A. they are all forms of kinetic energy.
 - B. they are all forms of direct energy.
 - C. they are all forms of stored energy found in nature.**
 - D. None of these.
3. A circuit breaker will do which of the following?
 - A. Meter electron flow.
 - B. Restrict electron flow.
 - C. Protect an electrical circuit against excess voltage.
 - D. Protect an electrical circuit against excessive ampere flow.**
4. You are working for the P & E Stone Company, and you have a 200-lb. bucket, which holds 1800 lbs. of No. 9 stone, 50' below the top of the quarry. To make production, you must be able to lift the filled bucket to the top in 30 seconds. What is the horsepower (hp) required to do this? Assume 100% efficiency.
 - A. 181.8 hp
 - B. 150.5 hp
 - C. 6.1 hp**
 - D. 4.5 hp
5. A British thermal unit (Btu) is defined as which of the following?
 - A. The amount of energy required to raise 1 meter of water 1°C.
 - B. The amount of energy required to raise 1 pound of water 1°F.**
 - C. The amount of energy required to raise 1 gallon of water 1°F.
 - D. The amount of energy required to raise 1 gram of water 1°C.
6. Valve springs do which of the following?
 - A. Open the valves.
 - B. Close the valves.**
 - C. Both A and B.
 - D. Rotate the valves.
 - E. None of the above.

7. A pump that is to run at 2500 revolutions per minute (rpm) is to be attached to a 2000-rpm motor with a 30-tooth drive gear. How many teeth must the driven gear have?
 - A. 20 teeth.
 - B. 24 teeth.**
 - C. 27 teeth.
 - D. 30 teeth.
8. Fluid effort is measured on a gauge that is calibrated in which of the following units?
 - A. Pounds (lbs.).
 - B. Pressure.
 - C. Pounds per square inch (psi).**
 - D. Gallons per minute (GPM).
9. How much heat is required to raise the temperature of 100 gallons of H₂O from 45°F to 150°F?
 - A. 4500 Btu.
 - B. 36,000 Btu.
 - C. 84,000 Btu.**
 - D. 900,000 Btu.
10. Energy is defined as which of the following?
 - A. The rating of doing work.
 - B. $\frac{\text{work}}{\text{time}}$
 - C. work \times time
 - D. The ability to do work.**
 - E. $\frac{\text{effort} \times \text{displacement}}{\text{time}}$
11. Which carburetor component is responsible for varying the total combined amount of fuel-air mixture flowing to the combustion chamber on the intake stroke?
 - A. Air cleaner.
 - B. Float.
 - C. Venturi.
 - D. Choke.
 - E. Throttle.**
12. A voltmeter in electrical power, a pressure gauge in fluid power, and a spring scale in mechanical power are similar in what way?
 - A. They all change motion and effort characteristics.
 - B. They all allow power to flow in one direction.
 - C. They all measure effort characteristics of various forms of power.**
 - D. They all measure motion.
13. The average temperature over a 24-hour period, subtracted from 65°F, is defined as which of the following?
 - A. The infiltration rate.
 - B. A heating unit.
 - C. The solar index.
 - D. The district heating factor.
 - E. A heating degree day.**

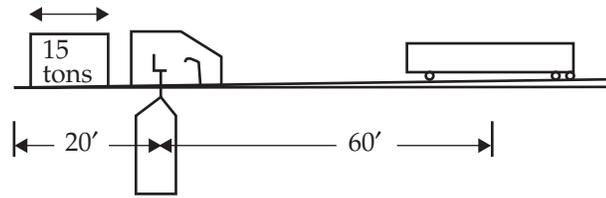
14. Which of the following does *not* belong?
- A. Crankshaft.
 - B. Connecting rod.
 - C. Piston.
 - D. Wrist or piston pin.
 - E. **Valve.**
15. How much heat is required to raise the temperature of 2000 ft³ of air from 38°F to 70°F?
- A. **1280 Btu**
 - B. 64,000 Btu
 - C. 512,000 Btu
 - D. 76,000 Btu
 - E. 24,000 Btu
16. If an electric motor is rated at 220 V, 2 A, what is the maximum theoretical hp that can be provided?
- A. **.59 hp**
 - B. .75 hp
 - C. 2.32 hp
 - D. 1 hp
 - E. .96 hp
17. When selecting an electrical carrier, thickness (gauge) is determined by which of the following?
- A. Amount of voltage carried.
 - B. Amount of restriction required.
 - C. **Amount of amperage carried.**
 - D. All of the above.
 - E. None of the above.
18. Approximately 95% of America's energy comes from which four sources?
- A. Coal, natural gas, oil, and hydrogen.
 - B. Coal, oil, wood, and nuclear.
 - C. **Coal, oil, natural gas, and nuclear.**
 - D. Coal, oil, nuclear, and solar.
 - E. Kerosene, oil, natural gas, and nuclear.
19. What is a check valve's main function?
- A. **Prevent flow in one direction.**
 - B. Meter flow in a circuit.
 - C. Turn flow on or off.
 - D. Change the direction of flow.
 - E. Measure fluid pressure.
20. What is the resistance of a system that uses 4360 W at 208 V?
- A. 1096 ohms.
 - B. **10 ohms.**
 - C. 20 ohms.
 - D. 1 ohm.
 - E. Infinite.

21. What is the camshaft responsible for?
- Opening the valves.**
 - Transmitting power to the crankshaft.
 - Converting linear mechanical power to rotary mechanical power.
 - All of the above.
 - None of the above.
22. What does the term *R-value* refer to?
- The value given to the radiation of a material.
 - An insulation material resistant to temperature changes or heat flowing through it.**
 - The value given to the infiltration of a material.
 - An insulation material resistant to infiltration over time.
 - An insulation material resistant to convection over time.
23. No matter which power transmission media—fluid, mechanical, or electrical—we use the basic measurement expressed in which of the following?
- effort × rate = power**
 - volts × amps = watts
 - $\frac{.000583 \times 1 \times 746}{1714} = \text{hp}$
 - $\frac{\text{ft.-lbs.}}{\text{sec.}} = \frac{\text{ft.-lbs.}}{\text{sec.}}$
24. Approximately what input force is required to lift a 2000-lb. weight, in a fluid system employing an input cylinder with a 2" diameter and an output cylinder with a 4" diameter? (Area = πr^2 , F = P × A)



- 1000 lbs.
 - 500 lbs.**
 - 12.5 lbs.
 - 159 lbs.
25. A hydraulic door opener requires a fluid flow of three GPM at 50 psi to open a door in 2.5 seconds. What is the hp output of the system, assuming 100% efficiency?
- .087 hp.**
 - .53 hp.
 - .078 hp.
 - .45 hp.
 - .030 hp.

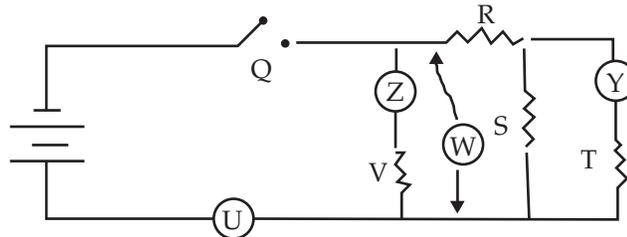
26. The crane depicted below must lift an 8000-lb. tractor-trailer body for loading purposes. Based on the dimensions of the crane, at what point should the moveable 15-ton balance weight be positioned from the fulcrum?



- A. 16'.
 B. 17'.
 C. 19'.
 D. 17.5'.
 E. 12'.
27. If a 550-lb. load has to be raised with a force of 25 lbs. and the distance between the fulcrum and the load has to be 4', how long must the *total* lever arm be?
 A. 5.5'.
 B. 22'.
 C. 64'.
 D. 92'.
 E. 88'.
28. What is air leakage through cracks in walls?
 A. Heating units.
 B. Btu.
 C. **Infiltration.**
 D. The solar index.
 E. Conduction.
29. What is the most important reason the automobile is so predominant in our society?
 A. Easy to drive.
 B. Comfortable.
 C. **Convenience to the passenger.**
 D. Easy to steer.
 E. Does not delete natural resources.
30. What is the crankshaft in a four-stroke engine responsible for?
 A. Converting reciprocating mechanical power to rotary mechanical power.
 B. Transmitting power to the camshaft.
 C. Providing power to the load.
 D. **All of the above.**
 E. None of the above.
31. Which of the following statements is/are true about the need for transportation?
 A. Transportation is really *not* necessary in a society.
 B. Transportation meets specific human needs.
 C. Transportation generally improves the quality of life.
 D. **Both B and C.**
 E. All of the above.

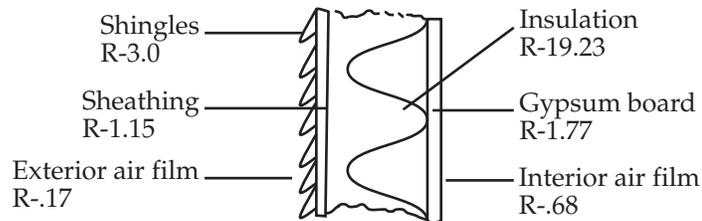
32. A shaft in mechanical power, a wire in electrical power, and a hose in fluid power are similar in what way?
- They all control effort.
 - They all carry power.**
 - They all store power.
 - They all allow power in one direction.
 - They all protect power circuitry.

The following three questions pertain to the figure below:



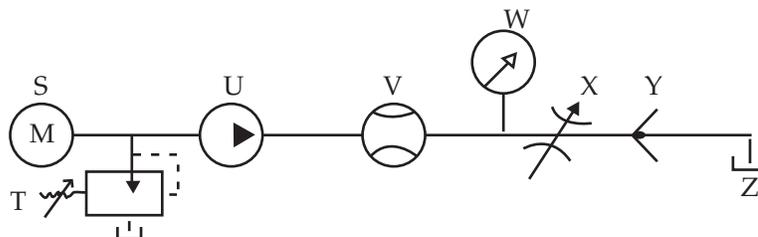
33. With component Q in its current position, a desired _____ circuit has been created.
- closed
 - short
 - open**
 - parallel
 - F.I.S.
34. If asked to determine the effort across resistor V, use _____.
- meter Y
 - meter Z
 - meter W**
 - meter U
 - your fingers
35. Resistor R in this circuit is placed in _____, with regard to resistor Y.
- parallel
 - series**
 - positive
 - neutral
36. What should you do when using a volt-ohmmeter (VOM) to read direct current (DC) voltage?
- Always start on the lowest DC range.
 - Always start on the highest alternating current (AC) range.
 - Always start on the highest DC range.**
 - Be sure the circuit is off.
37. Where is the largest source of heat loss likely to occur in a typical 40-year-old, nonweatherized structure?
- Through the floors.
 - Conduction through walls.
 - Convection through ceilings.
 - Infiltration through cracks.**
 - Radiation from aluminum siding.

38. When reattaching the flywheel to a small gas engine, which of the following will you need to use?
- A torque wrench and feeler gauge.
 - A strap wrench and feeler gauge.
 - A strap wrench and torque wrench.**
 - A torque wrench and vise grips.
 - A feeler gauge and vise grips.
39. Which of the following does *not* belong?
- Crank pin.**
 - Cam lobes.
 - Camshaft.
 - Tappets.
 - Valves.
40. Determine the total R-value of the following assembled structure:



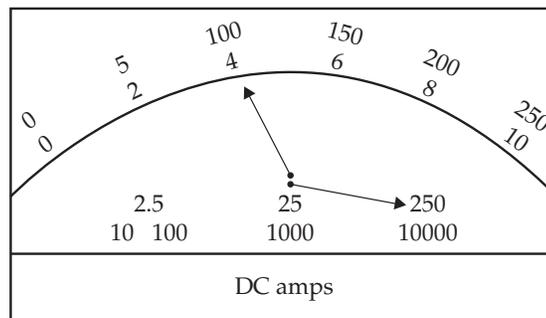
- 14.
 - 26.**
 - 19.
 - 11.
 - 30.
41. Determine the efficiency of an electric motor, given the following characteristics:
- | | |
|--------------------|---------------------------------------|
| input effort—110 V | output effort—2400 oz. |
| input rate—13.7 A | output shaft radius—6" |
| | output rate—7200 revolutions per hour |
- 84%.**
 - 93%.
 - 77%.
 - 87%.
 - 67%.

The following three questions refer to this diagram:



42. If asked to determine the rate in the above figure, use the meter represented by letter ____.
- A. U
 - B. V**
 - C. W
 - D. X
 - E. Y
43. If asked to vary the pressure in the above circuit, use device ____.
- A. S
 - B. T**
 - C. X
 - D. Y
 - E. Z
44. If asked to vary the flow in the above circuit, use device ____.
- A. Z
 - B. V
 - C. W
 - D. X**
 - E. Y
45. Historically, the United States has changed its primary energy source every 50 years. The year 2015 will more than likely bring about which of the following?
- A. Total dependency on nuclear fusion.
 - B. Total dependency on advanced solar energy systems.
 - C. A multitude of energy sources, along with increased conservation.**
 - D. The resurgence of propane as a primary energy source.
46. Which of the following would affect the drag coefficient of a transportation device?
- A. Skin friction.
 - B. Shape of vehicle.
 - C. Weight of vehicle.
 - D. Both A and B.**
 - E. Both B and C.
47. Where should the vapor barrier be placed?
- A. Facing the heated surface in a northern climate.**
 - B. Facing the cold surface in a northern climate.
 - C. Facing the cold surface in a southern climate.
 - D. Facing the cold surface in April.
 - E. It does not matter where it is put.
48. If you want to check an interior bearing for wear, you will need to use which of the following, along with a micrometer?
- A. A telescoping snap gauge.**
 - B. A strap wrench.
 - C. A feeler gauge.
 - D. A torque wrench.
 - E. A spring compressor.

49. Heat will flow only from a body at a higher temperature to a body at a lower temperature.
A. True.
 B. False.
 C. Only in some instances.
50. The flywheel on many small gas engines does which of the following?
 A. Provides power to the load.
 B. Smooths out reciprocation between power strokes.
 C. Contains the magnets that produce the magnetic field, eventually resulting in the electricity to fire the spark plug.
D. Both B and C.
 E. All of the above.
51. The camshaft on a conventional "straight six" cylinder engine contains how many lobes?
 A. 6.
 B. 9.
C. 12.
 D. 20.
 E. 32.
52. Which of the following is true about two-stroke engines?
 A. They have no crankshafts.
 B. They have no camshafts.
 C. They burn a mixture of gasoline and oil.
 D. Both A and B.
E. Both B and C.
53. What does this meter read?



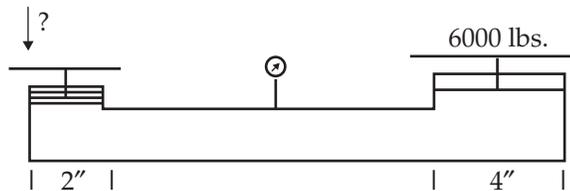
- A. 100 DC A.**
 B. 10 DC A.
 C. 1 DC A.
 D. 2.5 DC A.
 E. 250 DC A.
54. Which of the following does *not* belong?
 A. Resistance.
B. Turbulence.
 C. Inertia.
 D. Friction.
 E. Pressure.

55. Which of the following does *not* belong?
- A. Voltage.
 - B. Amperage.
 - C. Pressure.**
 - D. Wattage.
 - E. Kilowatts (kW).
56. The basic process of fission involves which of the following?
- A. Combining light atoms.
 - B. Transforming deuterium into uranium 235 (U235).
 - C. Splitting heavy atoms.**
 - D. Transforming uranium into plutonium 235.
 - E. Splitting light brain cells.
57. If a bolt must be tightened to a specification in inch-pounds (in.-lbs.) or foot-pounds (ft.-lbs.), what should you use?
- A. A strap wrench.
 - B. A feeler gauge.
 - C. A micrometer.
 - D. A snap gauge.
 - E. A torque wrench.**
58. When should attic insulation be placed between the roof rafters?
- A. In a ventilated attic.
 - B. In a heated attic.**
 - C. In a tightly sealed attic.
 - D. It makes no difference.
 - E. Under no condition should insulation be placed there.
59. What is the vertical distance from the waterline to the keel referred to as?
- A. Dock.
 - B. Draft.**
 - C. Hull.
 - D. Fore.
 - E. Gunwale.
60. Theoretically, to stop a fusion reaction, what must technicians do?
- A. Stop the flow of fuels used in the reaction.**
 - B. Use control rods to absorb the free neutrons.
 - C. Force the reactor into a meltdown sequence by injecting liquid sodium.
 - D. Stop the magnetic containment fields.
 - E. Panic.
61. What automatic control device is responsible for keeping small gas engines running at a relatively constant rate of speed under various load conditions?
- A. Carburetor.
 - B. Governor.**
 - C. Flywheel.
 - D. Breaker points.
 - E. Crankshaft.

62. Which of the following is true about advantage-gaining devices?
- A. They produce more power than they consume.
 - B. They produce more effort than they consume.
 - C. They modify input to output power characteristics to achieve a goal.**
 - D. They modify one form of power into another form of power.
 - E. They are perpetual motion machines.
63. Houses are always wired in ____.
- A. series
 - B. parallel**
 - C. series-parallel
 - D. parallel-series
 - E. None of the above.
64. An air conditioner provides a resistance of 8.5 ohms at 110 VAC. What gauge wire should feed this air conditioner? (See Formula Sheet for table.)
- A. 16.
 - B. 14.
 - C. 12.**
 - D. 10.
 - E. 9.
65. Which of the following is true about timing gears on an engine?
- A. They must be aligned properly for ideal engine performance.
 - B. They connect the camshaft to the crankshaft.
 - C. They provide a 2:1 crankshaft to camshaft ratio.
 - D. All of the above.**
 - E. None of the above.
66. Which of these units allows for the comparison of different forms of power (electrical, fluid, or mechanical)?
- A. Watts.
 - B. Amperes.
 - C. Volts.
 - D. Ohms.
 - E. hp.**
67. What is a major difference between gasoline and diesel engines?
- A. The firing order.
 - B. The number of cylinders.
 - C. The charging systems.
 - D. The time at which the fuel is delivered to the combustion chamber.**
 - E. There are no differences.
68. A solid-state magneto ignition system eliminates the need for which of the following?
- A. Breaker points and condenser.**
 - B. A glow plug.
 - C. A battery.
 - D. A rotor.
 - E. A spark plug.

69. How is nuclear fission reactor output controlled?
- A. By speeding up the circulation of the reactor coolant.
 - B. By inserting or retracting control rods, which absorb neutrons.**
 - C. By an extremely large rheostat.
 - D. By regulating the flow of fuel into the reactor.
 - E. None of the above.
70. A step-up transformer has the following characteristics: primary voltage = 220, primary amperage = 2000, number of turns in the primary windings = 100, and number of turns in the secondary windings = 1000. What will the secondary (output) wattage be? (Assume 100% efficiency.)
- A. 44 W.
 - B. 440 W.
 - C. 4,400 W.
 - D. 44,000 W.**
 - E. 440,000 W.
71. What units do feeler gauges measure in?
- A. Hundredths of an inch.
 - B. Tenths of an inch.
 - C. Eighths of an inch.
 - D. Thousandths of an inch.**
 - E. Inches.
72. What is the left side of any ship called, when you are standing at the stern and facing forward?
- A. Port.**
 - B. Starboard.
 - C. Aft.
 - D. Fore.
 - E. Yaw.
73. Which of the following is *not* considered one of the four forces that act on an airplane?
- A. Lift.
 - B. Speed.**
 - C. Thrust.
 - D. Drag.
 - E. Gravity.
74. Which of the following is true about a rotary engine?
- A. It has fewer moving parts than a piston engine.**
 - B. It has greater longevity than a piston engine.
 - C. It is environmentally superior to a piston engine.
 - D. All of the above.
75. Arguments against nuclear fission power include all of the following, *except* which?
- A. The cost of the fuel and facility is too great.
 - B. A properly functioning plant emits excessive radiation.**
 - C. The potential consequences from a "meltdown" are too great.
 - D. Long-term storage of radioactive waste is unavailable at this time.

76. External combustion engines are presently used to do which of the following?
- Drive generators to produce electricity.
 - Power large ocean-going vessels.
 - Power some automobiles.
 - Pump water from mines.
 - Both A and B.**
77. Which gear is known for its ability to produce high torque when used in combination with a spur gear?
- Rack gear.
 - Crown gear.
 - Bevel gear.
 - Worm gear.**
 - Idler gear.
78. In the hydraulic circuit below, the drive cylinder must be inserted how many feet in order to achieve a 3' lift in the driven cylinder?



- 4'.
 - 6'.
 - 12'.**
 - 16'.
 - 24'.
79. The greenhouse effect is said to do which of the following?
- Produce smog and soot.
 - Produce harmful toxins.
 - Produce skin cancer in laboratory mice.
 - Produce a worldwide reduction in energy consumption.
 - Produce a worldwide climatic warming effect.**
80. Which form of control logic requires input from all input devices, such as switches or sensors, in order to provide output?
- IF.
 - AND.**
 - OR.
 - NOT.
 - WAITUNTIL.
81. Which two segments of the U.S. economy consume the most energy?
- Residential and transportation.
 - Commercial and industrial.
 - Industrial and transportation.
 - Commercial and transportation.**
 - Residential and industrial.

82. An experimental internal combustion engine consumes .09 gallons of gasoline per minute. The engine rotates at an average speed of 1100 revolutions per minute (rpm) and provides power to a flywheel with a diameter of 20". This flywheel spins with 500 lbs. of force. How efficient is the engine? (1 gallon of gasoline = 100,000 Btu)
- A. 82%.
 - B. 74%.
 - C. 37%.
 - D. 41%.**
 - E. 47%.
83. Which of the following causes the lift to occur on an airfoil?
- A. Thrust of engine.
 - B. Differences between camber on wing.**
 - C. Weight of engine.
 - D. Drag.
 - E. Chord line.
84. How is kinetic or radiant energy defined?
- A. Electricity.
 - B. Potential energy.
 - C. Energy which is stored.
 - D. Combustion.
 - E. Energy in motion.**
85. What does Newton's third law of motion state?
- A. To every action, there is an equal and opposite reaction.**
 - B. Force is equal to pressure multiplied by area.
 - C. Thrust equals force multiplied by degrees of freedom.
 - D. Power equals force multiplied by displacement.
 - E. Energy can neither be created nor destroyed.
86. Which is the largest fossil fuel reserve in the United States?
- A. Oil.
 - B. Coal.**
 - C. Natural gas.
 - D. Uranium.
 - E. Hydro.
87. Your small gas engine turns over well, but it fails to start. You know it has plenty of gasoline. What should your first step toward diagnosing the problem be?
- A. Check for spark at the plug.**
 - B. Check the flywheel.
 - C. Check the key to see if it has sheared.
 - D. Check the fuel pump.
 - E. Replace the crankshaft.

88. Which of the following can increase the lift of an airplane?
- A. Increasing the speed of the plane.
 - B. Increasing the angle of attack.
 - C. Decreasing the speed.
 - D. Increasing the weight of the plane.
 - E. **Both A and B.**
89. Which form of control logic allows switches or sensors to be wired in parallel with each other, so input to any one of them will produce output?
- A. IF.
 - B. AND.
 - C. **OR.**
 - D. NOT.
 - E. WAITUNTIL.
90. Which of the following is/are used to control the pitch of an aircraft?
- A. The stabilizer.
 - B. **The elevators.**
 - C. The ailerons.
 - D. The fuselage.
 - E. The rudder.
91. If you are asked to measure the effort in a fluid circuit, which of the following should you use?
- A. A flowmeter.
 - B. An ammeter.
 - C. **A pressure gauge.**
 - D. A wind speed indicator.
 - E. None of the above.
92. Advantages of fusion reactors include which of the following?
- A. Fusion reactors are theoretically safer than fission reactors.
 - B. Fusion reactors consume no fossil fuels.
 - C. Fusion reactors produce no weapons-grade by-products.
 - D. The fuel for fusion is readily abundant.
 - E. **All of the above.**
93. When _____ forces are equal to centrifugal forces, a body is said to be in weightlessness.
- A. thrust
 - B. side
 - C. reaction
 - D. **gravitational**
 - E. All of the above.
94. Which testing device will allow you to check for continuous flow of electricity through an unenergized electrical circuit or device?
- A. A polarity tester.
 - B. A voltage tester.
 - C. An amperage tester.
 - D. A receptacle tester.
 - E. **A continuity tester.**

95. When gapping critical areas, such as spark plug electrodes or valve clearances, which of the following should you use?
- A. A ruler.
 - B. A hole gauge.
 - C. A ring compressor.
 - D. A torque wrench.
 - E. **A feeler gauge.**
96. A transportation system uses which of the following to move people and goods from one location to another?
- A. Inputs.
 - B. Processes.
 - C. Feedback.
 - D. **All of the above.**
 - E. None of the above.
97. Which of the following is *not* a category for transportation system inputs?
- A. People.
 - B. Knowledge.
 - C. **Management.**
 - D. Finances.
98. Receiving, holding, loading, and moving are components of which of the following?
- A. **The production process of transportation.**
 - B. The management process of transportation.
 - C. Transportation system inputs.
 - D. Transportation system outputs.
99. A speedometer is an example of which portion of a transportation system?
- A. Input.
 - B. Process.
 - C. Output.
 - D. **Feedback.**
 - E. Control.
100. What is the main transportation regulatory agency in the United States known as?
- A. The National Aeronautics and Space Administration (NASA).
 - B. **The U.S. Department of Transportation.**
 - C. The Transportation Regulation Society.
 - D. The National Vehicular Agency.
101. An engine is a common component of which vehicular system?
- A. **Propulsion.**
 - B. Guidance.
 - C. Control.
 - D. Support.
102. A map is a common example of which vehicular system?
- A. Propulsion.
 - B. **Guidance.**
 - C. Control.
 - D. Support.

103. Highway rest stops are an example of which vehicular system?
- A. Propulsion.
 - B. Guidance.
 - C. Structural.
 - D. Support.**
104. Which of the following is a system that uses satellites to determine its location on earth?
- A. A global positioning system (GPS).**
 - B. The National Location System (NLS).
 - C. Very-high-frequency omnidirectional radio range (VOR) navigation.
 - D. Loran-C.
105. A railroad is an example of which of the following?
- A. Nonfixed pathway.
 - B. Fixed pathway.**
 - C. Stationary pathway.
 - D. Moving pathway.
106. Automobiles, trucks, motorcycles, and heavy equipment are found in which mode of land transportation?
- A. Highway.**
 - B. Railway.
 - C. Pipeline.
 - D. On-site.
 - E. Recreational.
107. What is a train car with high or low sides and an open top, used for transporting materials such as scrap metal, iron, and stone, called?
- A. A boxcar.
 - B. A gondola.**
 - C. A flatcar.
 - D. A hopper car.
108. Which is *not* an example of a mass transit rail system?
- A. A subway.
 - B. A light-rail train.
 - C. A unit train.**
 - D. An elevated train.
109. Conveyors, forklifts, and escalators are found in which mode of land transportation?
- A. Highway.
 - B. Railway.
 - C. Pipeline.
 - D. On-site.**
 - E. Recreational.
110. Gasoline and diesel engines are different in which of the following ways?
- A. Gasoline engines use a spark plug, and diesel engines do not.**
 - B. Gasoline engines have a higher compression ratio than diesel engines.
 - C. Gasoline engines are typically built heavier and stronger than diesel engines.
 - D. All of the above.
 - E. None of the above.

111. Subway trains that use a third rail for power use which type of electrical propulsion system?
- A. Hybrid.
 - B. Indirect electric.
 - C. Direct electric.**
 - D. Electromagnetic.
112. What does it mean if first gear in a transmission has a gear ratio of 3:1?
- A. The output shaft rotates once for every three revolutions of the input shaft.**
 - B. The output shaft rotates three times for every one revolution of the input shaft.
 - C. The output shaft rotates 1.5 times for every three revolutions of the input shaft.
 - D. The output shaft rotates 1.5 times for every one revolution of the input shaft.
113. What is the component that holds the suspension system on railroad cars known as?
- A. The stabilizer bar.
 - B. The bogie.**
 - C. The torsion bar.
 - D. The chassis.
114. A railroad grade of 1.5% means which of the following?
- A. The condition of the railroad is hazardous.
 - B. The height of the railway changes 1.5' every 10'.
 - C. The height of the railway changes 15' every 100'.
 - D. The height of the railway changes 1.5' every 100'.**
115. What was the first steamship named?
- A. The *Monitor*.
 - B. The *Pyroscaphe*.**
 - C. The *Turtle*.
 - D. USS *Indianapolis*.
116. The flotation of objects is dependent on which two forces?
- A. Buoyancy and floativity.
 - B. Displacement and water pressure.
 - C. Displacement and buoyancy.**
 - D. Floativity and displacement.
117. Barges, ferries, tugboats, and towboats are examples of which mode of water transportation?
- A. Inland.**
 - B. Transoceanic.
 - C. Seaward.
 - D. Arctic.
118. Generally, a water vessel over 100' in length is known as which of the following?
- A. A boat.
 - B. A ship.**
 - C. A cruiser.
 - D. A canoe.
119. Trawlers, liners, and seiners are three types of which kind of water vessel?
- A. Fishing boat.**
 - B. Yacht.
 - C. Ferry.
 - D. Submarine.

120. Which of the following was the first type of water vessel propulsion?
- A. Sail.
 - B. Propeller.
 - C. Water jet.
 - D. Paddle.**
121. Heading and bearing are _____.
- A. the same thing
 - B. different—heading is current direction, and bearing is the desired direction**
 - C. different—heading is desired direction, and bearing is the current direction
 - D. different—heading is the current direction, and bearing is the current speed of the vessel
122. What is the main suspension system of a water vessel known as?
- A. The keel.**
 - B. The hull.
 - C. The rudder.
 - D. Draft.
123. Figure the hull speed of boat that has a 32' waterline. Formula: hull speed = square root of the length at the waterline $\times 1.34$
- A. 7.58.**
 - B. 8.50.
 - C. 16.28.
 - D. 42.88.
124. The rear of a vessel is also known as which of the following?
- A. The bow.
 - B. Port.
 - C. Starboard.
 - D. The stern.**
125. What is an organization that sets and enforces shipbuilding standards known as?
- A. A marine construction agency.
 - B. A classification society.**
 - C. A shipping association.
 - D. The national institute for vessel construction.
126. Which one of the following inventors and scientists was *not* involved in the early history of flight?
- A. Otto Lilienthal.
 - B. Samuel Langley.
 - C. Wilber Wright.
 - D. Hermann Oberth.**
127. Balloons, airships, and gliders are examples of which mode of air transportation?
- A. Lighter-than-air.**
 - B. Heavier-than-air.
 - C. Powered.
 - D. Unpowered.

128. If you have a hot air balloon envelope that can hold 80,000 ft³ of hot air, how much weight can it lift? Formula: weight = volume × lift (or 0.015 lbs.)
- A. 600 lbs.
 - B. 1200 lbs.**
 - C. 6000 lbs.
 - D. 12,000 lbs.
129. Which type of aviation consists of privately owned planes?
- A. General.**
 - B. Commercial.
 - C. Military.
 - D. Regional.
130. Which type of engine was used on early aircraft and is designed so the pistons are connected to a central hub?
- A. Rotary.
 - B. Vee.
 - C. Straight.
 - D. Radial.**
131. The speed known as Mach 1 is roughly equal to which of the following?
- A. The speed of light.
 - B. The speed of sound.**
 - C. Five times the speed of light.
 - D. Five times the speed of sound.
132. Which of the following statements is true of afterburning turbojet engines?
- A. They have a port that injects fuel into the hot exhaust gases.
 - B. They provide additional thrust.
 - C. They are highly efficient.
 - D. Both A and B.**
 - E. Both B and C.
133. Aeronautical charts are similar to which of the following types of maps?
- A. Political.
 - B. Topographic.**
 - C. Road.
 - D. City.
134. Which cockpit instrument functions by measuring the difference between two pressures acting on an aircraft?
- A. Airspeed indicator.**
 - B. Artificial horizon.
 - C. Heading indicator.
 - D. Instrument landing system (ILS).
135. Which of following is *not* a motion that affects the stability of an aircraft?
- A. Yaw.
 - B. Pitch.
 - C. Roll.
 - D. Elevation.**

136. Complete the following sentence: The theory of lift stating that air traveling over the airfoil must travel further, which creates an area of low pressure, ____.
- A. **was created by Bernoulli**
 - B. was created by Newton
 - C. is completely correct
 - D. is the only valid theory of lift
137. The first liquid-fuel rocket was built by which of the following people?
- A. Konstantin Tsiolkovsky.
 - B. **Robert Goddard.**
 - C. Hermann Oberth.
 - D. Warnher von Braun.
138. The world's first artificial satellite was which of the following?
- A. *Explorer 1.*
 - B. ***Sputnik 1.***
 - C. *Apollo 1.*
 - D. *Skylab.*
139. Which of the following is the atmospheric region closest to earth?
- A. The stratosphere.
 - B. The exosphere.
 - C. The thermosphere.
 - D. **The troposphere.**
140. Satellites are used for which of the following purposes?
- A. Communication.
 - B. Environmental research.
 - C. Navigation.
 - D. **All of the above.**
 - E. None of the above.
141. Solid rocket boosters (SRBs), an external fuel tank, and an orbiter make up which space vehicle?
- A. The International Space Station (ISS).
 - B. **The space transportation system (STS), or space shuttle.**
 - C. Project Mercury.
 - D. A space probe.
142. Model rockets typically use which type of rocket engine?
- A. **Solid-fuel.**
 - B. Liquid-fuel.
 - C. Ramjet.
 - D. Ion.
143. What is the technique that places several rocket propulsion systems on top of one another known as?
- A. Phasing.
 - B. Boostering.
 - C. **Staging.**
 - D. Combusting.

144. Which of the following is a process used to compute the location of a spacecraft?
- A. Vectoring.
 - B. Triangulation.**
 - C. Referencing.
 - D. Telemetry.
145. The pitch and roll of the space shuttle orbiter is controlled within the earth's atmosphere by which of the following control surfaces?
- A. The rudder.
 - B. The elevators.
 - C. The ailerons.
 - D. The elevons.**
146. The engines used to maneuver the space shuttle orbiter in space are known as which of the following?
- A. Reaction control system (RCS) engines.**
 - B. Orbital maneuvering system (OMS) engines.
 - C. Space Shuttle Main Engines (SSMEs).
 - D. Manned maneuvering units (MMUs).
147. The large wing on the space shuttle orbiter is an example of which of the following?
- A. A beta wing.
 - B. A gamma wing.
 - C. A delta wing.**
 - D. An alpha wing.
148. Which of the following is the largest space station ever constructed?
- A. *Skylab*.
 - B. *Mir*.
 - C. *Salyut*.
 - D. The International Space Station (ISS).**
149. Intermodal transportation involves which of the following, as compared to land, water, air, or space transportation alone?
- A. A greater amount of material handling.
 - B. Greater shipping times.
 - C. More energy consumption.
 - D. All of the above.
 - E. None of the above.**
150. The method of handling goods by packing many small packages in one large container is known as which of the following?
- A. Containerization.**
 - B. Trailers on Flat Car (TOFCs).
 - C. Bulk loading.
 - D. Hauling.
151. What is carrying truck trailers on the back of railroad cars known as?
- A. Hauling.
 - B. Containerization.
 - C. Piggybacking.**
 - D. Intermodal passenger transportation.

152. The design of products on a molecular level is known as which of the following?
- A. **Nanotechnology.**
 - B. Microtechnology.
 - C. Millitechnology.
 - D. Miniaturization.
153. Which of the following accounts for two-thirds of the electricity generated?
- A. Solar energy.
 - B. Fuel cells.
 - C. **Fossil fuels.**
 - D. Wind energy.
154. What is the conversion of organic materials to energy known as?
- A. Plant energy.
 - B. **Biomass energy.**
 - C. Conduction.
 - D. Ecoelectricity.
155. Future transportation technologies might include which of the following?
- A. Smart roads.
 - B. Solar sails.
 - C. Space planes.
 - D. Both A and C.
 - E. **All of the above.**