

Registration form

PUMPS 303 \$200.00

48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00

Start and Finish Dates: _____

You will have 90 days from this date in order to complete this course

Name _____ **Signature** _____

I have read and understood the disclaimer notice on page 2. Digitally sign XXX

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Class/Grade _____

Your certificate will be e-mailed to you in about two weeks.

Please circle/check which certification you are applying the course CEU's.

Water Treatment ___ Water Distribution ___ Other _____

Collections ___ Wastewater Treatment ___ Onsite Installer _____

Oregon CCB (\$50 additional fee) _____

Technical Learning College TLC PO Box 3060, Chino Valley, AZ 86323

Toll Free (866) 557-1746 Fax (928) 272-0747 info@tlch2o.com

If you've paid on the Internet, please write your Customer# _____

Please invoice me, my PO# _____

We'll stop mailing the certificate of completion we need your e-mail address. We will e-mail the certificate to you, if no e-mail address; we will mail it to you.

DISCLAIMER NOTICE

I understand that it is my responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. I understand State laws and rules change on a frequent basis and I believe this course is currently accepted in my State for CEU or contact hour credit, if it is not, I will not hold Technical Learning College responsible. I fully understand that this type of study program deals with dangerous, changing conditions and various laws and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable in any fashion for any errors, omissions, advice, suggestions or neglect contained in this CEU education training course or for any violation or injury, death, neglect, damage or loss of your license or certification caused in any fashion by this CEU education training or course material suggestion or error or my lack of submitting paperwork. It is my responsibility to call or contact TLC if I need help or assistance and double-check to ensure my registration page and assignment has been received and graded. It is my responsibility to ensure all information is correct and to abide with all rules and regulations.

State Approval Listing Link, check to see if your State accepts or has pre-approved this course. Not all States are listed. Not all courses are listed.

Professional Engineers: Most states will accept our courses for credit but we do not officially list the States or Agencies. Please check your State for approval.

State Approval Listing URL...

<http://www.tlch2o.com/PDF/CEU%20State%20Approvals.pdf>

AFFIDAVIT OF EXAM COMPLETION

I affirm that I personally completed the entire text of the course. I also affirm that I completed the exam without assistance from any outside source. I understand that it is my responsibility to file or maintain my certificate of completion as required by the state or by the designation organization.

Grading Information

In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity.

Do not solely depend on TLC's Approval list for it may be outdated.

A second certificate of completion for a second State Agency \$50 processing fee.

All downloads are electronically tracked and monitored for security purposes.

Some States and many employers require the final exam to be proctored.

<http://www.abctlc.com/downloads/PDF/PROCTORFORM.pdf>

Pumps 303 Answer Key Name _____

Phone _____

You are solely responsible to ensure this course is accepted for credit by your State. Did you check with your State agency to ensure this course is accepted for credit?

Method of Course acceptance confirmation. Please fill this section

Website ___ Telephone Call ___ Email ___ Spoke to _____

Did you receive the approval number, if applicable? _____

What is the course approval number, if applicable? _____

You are responsible to ensure that TLC receives the Assignment and Registration Key. Please call us to ensure that we received it. No refunds.

Please Circle, Bold, Underline or X, one answer per question.

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Additional certificate for another Agency – additional fee \$50

Please e-mail or fax this survey along with your final exam

**PUMPS 303 CEU COURSE
CUSTOMER SERVICE RESPONSE CARD**

NAME: _____

E-MAIL _____ PHONE _____

PLEASE COMPLETE THIS FORM BY CIRCLING THE NUMBER OF THE APPROPRIATE ANSWER IN THE AREA BELOW.

1. Please rate the difficulty of your course.

Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.

Very Easy 0 1 2 3 4 5 Very Difficult

3. Please rate the subject matter on the exam to your actual field or work.

Very Similar 0 1 2 3 4 5 Very Different

4. How did you hear about this Course? _____

5. What would you do to improve the Course?

How about the price of the course?

Poor _____ Fair _____ Average _____ Good _____ Great _____

How was your customer service?

Poor _____ Fair _____ Average _____ Good _____ Great _____

Any other concerns or comments.

Please fax the answer key to
TLC Western Campus
Fax (928) 272-0747

You are responsible to ensure that TLC receives the Assignment and Registration Key.

Always call us after faxing the paperwork to ensure that we've received it.

Rush Grading Service

If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of \$50.00.

Pumps 303 CEU Training Course Assignment

The Assignment (Exam) is also available in Word on the Internet for your Convenience, please visit www.ABCTLC.com and download the assignment and e-mail it back to TLC.

You will have 90 days from the start of this course to complete in order to receive your Professional Development Hours (**PDHs**) or Continuing Education Unit (**CEU**). A score of 70 % is necessary to pass this course. We prefer if this exam is proctored. No intentional trick questions. If you should need any assistance, please email all concerns and the completed manual to info@tlch2o.com.

We would prefer that you utilize the enclosed answer sheet in the front, but if you are unable to do so, type out your own answer key. Please include your name and address on your Answer Key and make copy for yourself. You can e-mail or fax your Answer Key along with the Registration Form to TLC. **(S) Means answer may be plural or singular. Multiple Choice Section, One answer per question and please use the answer key.**

Pump Definitions

- Which of the following definitions is a mechanical device that seals the pump stuffing box?
A. Packing D. Mechanical seal
B. Bearing E. Lantern ring
C. Seal F. None of the Above
- Which of the following definitions is a pump that uses both axial-flow and radial-flow components in one impeller?
A. Bellows D. Dynamic
B. Mixed flow pump E. Diaphragm pump
C. Kinetic energy F. None of the Above
- Which of the following definitions is a flat material that is compressed between two flanges to form a seal?
A. Gasket D. Seal
B. Keyway E. Bond
C. Packing F. None of the Above
- Which of the following definitions is a line that directs sealing fluid to the stuffing box?
A. Leak-off D. Lantern ring
B. Gland sealing line E. Gland follower
C. Horizontal line F. None of the Above
- Which of the following definitions is the part of the pump that increases the speed of the fluid being handled?
A. Packing D. Seal
B. Impeller E. Outboard
C. Inboard F. None of the Above
- Which of the following definitions is the area on the shaft that accepts the key?
A. Gasket D. Inter-stage diaphragm
B. Keyway E. Kinetic energy
C. Energy F. None of the Above

7. Which of the following definitions is any substance that can be pumped such as oil, water, refrigerant, or even air?
- A. Fluid D. Substance
 B. Mixed flow pump E. Flow
 C. Energy F. None of the Above
8. Which of the following definitions is the end of the pump closest to the motor?
- A. Packing D. Bowl
 B. Impeller E. Outboard
 C. Inboard F. None of the Above
9. Which of the following definitions is the energy associated with motion?
- A. Soft start D. Flow
 B. Phase E. Kinetic energy
 C. Energy F. None of the Above
10. Which of the following definitions is bushing at the bottom of the stuffing box that prevents packing from being pushed out of the stuffing box into the suction eye of the impeller?
- A. Strainer D. Stuffing box
 B. Suction E. Throat bushing
 C. Suction eye F. None of the Above
11. Which of the following definitions is force, usually along the center line of the pump?
- A. Thrust D. Vertical power
 B. Pressure E. Energy
 C. Suction F. None of the Above
12. Which of the following definitions is a metal ring located between rings of packing that distributes gland sealing fluid?
- A. Leak-off D. Lantern ring
 B. Gland sealing line E. Gland follower
 C. Horizontal packing F. None of the Above
13. Which of the following definitions is the fluid that leaks from the stuffing box?
- A. Leak-off D. Lantern ring
 B. Gland sealing leakage E. Gland follower
 C. Horizontal leakage F. None of the Above
14. Which of the following definitions is a bushing used to compress the packing in the stuffing box and to control leakoff?
- A. Leak-off packing D. Lantern ring
 B. Gland sealing line E. Gland follower
 C. Horizontal packing F. None of the Above
15. Which of the following definitions are pumps in which the centerline of the shaft runs vertically?
- A. Thrusters D. Vertical pumps
 B. Vanes E. Double pumps
 C. Suction pumps F. None of the Above

16. Which of the following definitions are pumps with more than one impeller?
- A. Turbine
 - B. Mixed flow
 - C. Inboard
 - D. Multi-stage pumps
 - E. Outboard
 - F. None of the Above
17. Which of the following definitions is the end of the pump farthest from the motor?
- A. Outlet
 - B. Impeller
 - C. Inboard
 - D. Exit
 - E. Outboard
 - F. None of the Above
18. Which of the following definitions is the soft, pliable material that seals the stuffing box?
- A. Packing
 - B. Rubbers
 - C. Gaskets
 - D. Glands
 - E. Mechanical seal
 - F. None of the Above
19. Which of the following definitions are replaceable tubular coverings on the shaft?
- A. Protectors
 - B. Shrouds
 - C. Covers
 - D. Shaft sleeve
 - E. Stages
 - F. None of the Above
20. Which of the following definitions is the metal covering over the vanes of an impeller?
- A. Slop drain
 - B. Shroud
 - C. Slurry
 - D. Shaft sleeve
 - E. Stages
 - F. None of the Above
21. Which of the following definitions is the drain from the area that collects leak-off from the stuffing box?
- A. Slop drain
 - B. Shroud
 - C. Slurry drain
 - D. Shaft sleeve
 - E. Stages
 - F. None of the Above
22. Which of the following definitions is the part of the pump that changes the speed of the fluid into pressure?
- A. Thrust
 - B. Vanes
 - C. Suction eye
 - D. Vertical pumps
 - E. Volute
 - F. None of the Above
23. Which of the following definitions are the replaceable rings on the impeller or the casing that wear as the pump operates?
- A. Seals
 - B. Vanes
 - C. Packing glands
 - D. Glands
 - E. Wearing rings
 - F. None of the Above
24. Which of the following definitions is a nut that keeps the parts in place?
- A. Lock nut
 - B. Keyway
 - C. Cotter
 - D. Radial bearings
 - E. Retaining nut
 - F. None of the Above

25. Which of the following definitions are the rotating parts, usually including the impeller, shaft, bearing housings, and all other parts included between the bearing housing and the impeller?
- A. Inboard
 - B. Rotor
 - C. Mechanical
 - D. Flow parts
 - E. Retaining parts
 - F. None of the Above

Hydraulic Terms

26. Which of the following definitions is the engineering science pertaining to liquid pressure and flow?
- A. Pressure, Absolute
 - B. Pressure
 - C. Hydraulics
 - D. Hydrokinetics
 - E. Pascal's Law
 - F. None of the Above
27. Which of the following definitions is the engineering science pertaining to the energy of liquid flow and pressure?
- A. Pressure, Absolute
 - B. Pressure
 - C. Hydraulics
 - D. Hydrokinetics
 - E. Pascal's Law
 - F. None of the Above
28. Which of the following definitions is the pressure applied to a confined fluid at rest is transmitted with equal intensity throughout the fluid?
- A. Pressure, Absolute
 - B. Pressure
 - C. Hydraulics
 - D. Hydrokinetics
 - E. Pascal's Law
 - F. None of the Above
29. Which of the following definitions is the application of continuous force by one body upon another that it is touching; compression?
- A. Pressure, Absolute
 - B. Pressure
 - C. Hydraulics
 - D. Hydrokinetics
 - E. Pascal's Law
 - F. None of the Above
30. Which of the following definitions is used to indicate gauge pressure?
- A. Head, Friction
 - B. Head, static
 - C. Head
 - D. Hydraulics
 - E. Hydrokinetics
 - F. None of the Above
31. Which of the following definitions is when the pressure is equal to the height times the density of the liquid?
- A. Head, Friction
 - B. Head, static
 - C. Head
 - D. Hydraulics
 - E. Hydrokinetics
 - F. None of the Above
32. Which of the following definitions is required to overcome the friction at the interior surface of a conductor and between fluid particles in motion?
- A. Head, Friction
 - B. Head, static
 - C. Head
 - D. Hydraulics
 - E. Hydrokinetics
 - F. None of the Above

33. Which of the following definitions varies with flow, size, type, and conditions of conductors and fittings, and the fluid characteristics?
- A. Head, Friction D. Hydraulics
 B. Head, static E. Hydrokinetics
 C. Head F. None of the Above
34. Which of the following definitions is the pressure in a fluid at rest?
- A. Pressure, Atmospheric D. Pressure, Gauge
 B. Pressure, Static E. Pascal's Law
 C. Hydraulics F. None of the Above
35. Which of the following definitions is the height of a column or body of fluid above a given point?
- A. Head, Friction D. Hydraulics
 B. Head, static E. Hydrokinetics
 C. Head F. None of the Above
36. Which of the following definitions is the pressure exerted by the atmosphere at any specific location?
- A. Pressure, Atmospheric D. Pressure, Gauge
 B. Pressure, Static E. Pascal's Law
 C. Hydraulics F. None of the Above
37. Which of the following definitions is pressure above zone absolute, i.e. the sum of atmospheric and gauge pressure?
- A. Pressure, Absolute D. Hydrokinetics
 B. Pressure E. Pascal's Law
 C. Hydraulics F. None of the Above
38. Sea level pressure is approximately 2.31 pounds per square inch absolute, 1 bar = .433 psi.
- A. True B. False

Pump Introduction

39. The key to understanding a pumps operation is that a pump is to move water and generate the _____ we call pressure.
- A. Centrifugal pump(s) D. Diaphragm pump(s)
 B. Impeller blade(s) E. Cylindrical pump housing
 C. Delivery force F. None of the Above
40. Pump operation like with a centrifugal pump — pressure is not referred to in pounds per square inch but rather as the equivalent in elevation, called?
- A. Inward force D. Center of the impeller
 B. Head E. Incompressible fluid
 C. Viscous drag pump F. None of the Above
41. According to the text, pumps may be classified on the basis of the application they serve.
- A. True B. False

42. According to the text, all pumps may be divided into two major categories: (1) dynamic and (2)?
- A. Centrifugal
 - B. Impeller
 - C. Displacement
 - D. Diaphragm
 - E. Rotary
 - F. None of the Above

Understanding the Basic Water Pump

43. According to the text, the centrifugal pumps work by spinning water around in a circle inside a?
- A. Vortex
 - B. Cylinder
 - C. Viscous drag pump
 - D. Center of the impeller
 - E. Cylindrical pump housing
 - F. None of the Above
44. The pump makes the water spin by pulling it with an impeller.
- A. True
 - B. False
45. The blades of this impeller project inward from an axle like the arms of a turnstile and, as the impeller spins, the water moves through it.
- A. True
 - B. False
46. In a centrifugal pump, the water pressure at the edge of the turning impeller rises until it is able to keep water circling with the?
- A. Centrifugal pump(s)
 - B. Impeller blade(s)
 - C. Bernoulli's equation
 - D. Diaphragm pump(s)
 - E. Cylindrical pump housing
 - F. None of the Above
47. In a centrifugal pump, as water drifts outward between the _____ of the pump, it must move faster and faster because its circular path is getting larger and larger.
- A. Centrifugal pump(s)
 - B. Impeller blade(s)
 - C. Bernoulli's equation
 - D. Diaphragm pump(s)
 - E. Cylindrical pump housing
 - F. None of the Above
48. As the water slows down and its kinetic energy decreases, that water's pressure potential energy increases.
- A. True
 - B. False
49. As the water spins, the pressure near the outer edge of the pump housing becomes much lower than near the center of the impeller.
- A. True
 - B. False
50. The impeller blades cause the water to move faster and faster.
- A. True
 - B. False
51. The impellers may be of either a semi-open or closed type.
- A. True
 - B. False
52. According to the text, without an inward force, an object will travel in a straight line and will not complete the?
- A. Circle
 - B. Pump pushes
 - C. Viscous drag pump
 - D. Center of the impeller
 - E. Incompressible fluid
 - F. None of the Above

53. In a centrifugal pump, the inward force is provided by high-pressure water near the outer edge of the?

- A. Centrifugal pump(s)
- B. Impeller blade(s)
- C. Pump housing
- D. Diaphragm pump(s)
- E. Cylindrical pump housing
- F. None of the Above

54. In the operation of the pump, the water at the edge of the _____ inward on the water between the impeller blades and makes it possible for that water to travel in a circle.

- A. Inward force
- B. Pump pushes
- C. Viscous drag pump
- D. Center of the impeller
- E. Incompressible fluid
- F. None of the Above

55. In the operation of the pump, when water is actively flowing through the pump, arriving through a hole near the center of the impeller and leaving through a _____ near the outer edge of the pump housing, the pressure rise between center and edge of the pump is not as large.

- A. Centrifugal pump(s)
- B. Impeller blade(s)
- C. Hole
- D. Diaphragm pump(s)
- E. Cylindrical pump housing
- F. None of the Above

Venturi (Bernoulli's law):

56. A venturi is a pipe that has a gradual restriction that opens up into a gradual enlargement.

- A. True
- B. False

57. Which of the following terms best describes a pump whose impeller has no vanes but relies on fluid contact with a flat rotating plate turning at high speed to move the liquid.

- A. Submersible
- B. Blower
- C. Viscous drag pump
- D. Rotary pump
- E. Bicycle pump
- F. None of the Above

Types of Water Pumps

58. The water production well industry almost exclusively uses Turbine pumps, which are a type of centrifugal pump.

- A. True
- B. False

59. The most common type of water pumps used for municipal and domestic water supplies are?

- A. Axial flow
- B. Submersible
- C. Rotary pump
- D. Turbine pump(s)
- E. Variable displacement pumps
- F. None of the Above

60. Which of the following terms will produce at different rates relative to the amount of pressure or lift the pump is working against?

- A. Variable displacement pump
- B. Drive shaft
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

61. Which of the following terms are variable displacement pumps that are by far used the most?

- A. Axial flow
- B. Submersible
- C. Rotary pump
- D. Turbine pump(s)
- E. Centrifugal pumps
- F. None of the Above

62. According to the text, the turbine pump utilizes impellers enclosed in single or multiple bowls or stages to?

- A. Lift water
- B. Drive shaft
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

63. Vertical turbine pumps are commonly used in groundwater wells.

- A. True
- B. False

64. The shaft turns the impellers within the pump housing while the?

- A. Spider bearing(s)
- B. Horsepower turns the shaft
- C. Impeller(s)
- D. Water moves up the column
- E. Desired pumping rate is obtained
- F. None of the Above

65. Impellers are rotated by the pump motor, which provides the _____ needed to overcome the pumping head.

- A. Spider bearing(s)
- B. Horsepower
- C. Impeller(s)
- D. Turbine pump(s)
- E. Desired pumping rate
- F. None of the Above

66. The size and number of stages, horsepower of the motor and _____ are the key components relating to the pump's lifting capacity.

- A. Pumping head
- B. Drive shaft
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

67. The rotating shaft in a line shaft turbine is housed within the column pipe that delivers the water to the surface.

- A. True
- B. False

68. The size of the _____ are selected based on the desired pumping rate and lift requirements.

- A. Spider bearing(s)
- B. Horsepower
- C. Impeller(s)
- D. Column, impeller, and bowls
- E. Desired pumping rate
- F. None of the Above

69. According to the text, column pipe sections can be threaded or coupled together while the drive shaft is coupled and suspended within the column by?

- A. Oil tube
- B. Spider bearings
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

70. The water passing through the column pipe serves as the lubricant for the bearings.

- A. True
- B. False

71. Which of the following terms, provide both a seal at the column pipe joints and keep the shaft aligned within the column?

- A. Spider bearing(s)
- B. Keyway
- C. Impeller(s)
- D. Roller bearings
- E. Lantern rings
- F. None of the Above

72. Some vertical turbines are lubricated by oil rather than water. These pumps are essentially the same as _____; only the drive shaft is enclosed within an oil tube.
- A. Oil tube D. Single or multiple bowls
 B. Water lubricated units E. Pump's lifting capacity
 C. Column pipe F. None of the Above
73. The oil tube is suspended within the column by _____, while the line shaft is supported within the oil tube by brass or redwood bearings.
- A. Oil tube D. Single or multiple bowls
 B. Spider flanges E. Pump's lifting capacity
 C. Column pipe F. None of the Above
74. A continuous supply of _____ the drive shaft as it proceeds downward through the oil tube.
- A. Spider bearing(s) D. Turbine pump(s)
 B. Oil lubricates E. Desired pumping rate
 C. Impeller(s) F. None of the Above
75. A small hole located at the top of the _____ allows excess oil to enter the well. This results in the formation of an oil film on the water surface within oil-lubricated wells.
- A. Pump bow unit D. Single or multiple bowls
 B. Drive shaft E. Pump's lifting capacity
 C. Column pipe F. None of the Above
76. Careful operation of oil lubricated turbines is needed to ensure that the pumping levels do not drop enough to allow oil to enter the pump.
- A. True B. False
77. According to the text, water and oil lubricated turbine pump units can be driven by?
- A. Gears D. Electric or fuel powered motors
 B. Drive shaft E. Pump's lifting capacity
 C. Column pipe F. None of the Above
78. Often an electric motor that is connected to the _____ by a keyway and nut.
- A. Drive shaft D. Sprocket
 B. Rotor E. Time delay or ratchet assembly
 C. Inboard F. None of the Above
79. Where electricity is not readily available, fuel powered engines may be connected to the drive shaft by a?
- A. Gear D. Volumetric positive displacement
 B. Lantern ring E. Right angle drive gear
 C. Drive shaft F. None of the Above
80. Oil and water lubricated systems will have a strainer attached to the _____ to prevent sediment from entering the pump.
- A. Intake D. Lantern ring
 B. Diaphragm E. Sump
 C. Inboard F. None of the Above

81. Which of the following terms: water flowing back down the column, turning the impellers in a reverse direction?

- A. Vapor bubbles are created
- B. Chamber pressure
- C. Drive shaft is off
- D. Volumetric positive displacement is turned off
- E. Line shaft turbine is turned off
- F. None of the Above

82. Time delays or ratchet assemblies are often installed on these motors to either prevent the motor from turning on before _____ stops or simply not allow it to reverse at all.

- A. Reverse rotation
- B. Diaphragm
- C. Inertial cavitation
- D. Keyway and nut
- E. Time delay or ratchet assembly
- F. None of the Above

Types of Pumps

83. The family of pumps comprises a large number of types based on application and capabilities. The two major groups of pumps are?

- A. Plunger and bicycle pump
- B. Mixed flow and single
- C. Dynamic and radical
- D. Discharge and radical displacement
- E. Dynamic and positive displacement
- F. None of the Above

Positive Displacement Pumps

84. A positive displacement pump has an expanding cavity on the _____ of the pump and a decreasing cavity on the discharge side.

- A. Plunger pump
- B. Suction side
- C. Dynamic
- D. Discharge tube
- E. Roots blower
- F. None of the Above

85. According to the text, liquid is allowed to flow into the pump as the cavity on the suction side expands and the liquid is forced out of the?

- A. Cylinder
- B. Chamber
- C. Radial flow
- D. Cavity
- E. Discharge
- F. None of the Above

86. This principle applies to all types of Positive Displacement Pumps whether the pump is a rotary lobe, gear within a gear, piston, diaphragm, screw, and?

- A. Plunger pump
- B. Mixed flow
- C. Dynamic
- D. Progressing cavity
- E. Roots blower
- F. None of the Above

87. A Positive Displacement Pump, unlike a Centrifugal Pump, will produce the same flow at a given RPM no matter what the discharge pressure is.

- A. True
- B. False

88. Which of the following terms cannot be operated against a closed valve on the discharge side of the pump?

- A. Bicycle
- B. Bellows
- C. Radial flow
- D. Centrifugal
- E. Positive Displacement Pump(s)
- F. None of the Above

89. If a Positive Displacement Pump is allowed to operate against a closed discharge valve it will continue to produce flow that will increase the pressure in the discharge line until either the line bursts or the pump is severely damaged or both.
A. True B. False

Plunger Pump

90. The plunger pump cannot be used for heavy sludge.
A. True B. False
91. The plunger pump is a positive displacement pump that uses a _____ to force liquid from the suction side to the discharge side of the pump.
A. Plunger pump D. Discharge tube
B. Mixed flow E. Plunger or piston
C. Dynamic F. None of the Above
92. According to the text, the movement of the plunger or piston inside the pump creates pressure inside the pump, never operated against any?
A. Inward force D. Closed discharge valve
B. Pump pushes E. Incompressible fluid
C. Viscous drag pump F. None of the Above
93. Which of the following terms must be open before the pump is started, to prevent any fast build-up of pressure that could damage the pump?
A. Inward force D. Center of the impeller
B. Discharge valves E. Incompressible fluid
C. Viscous drag pump F. None of the Above

Diaphragm Pumps

94. Which of the following terms provides the mechanical action used to force liquid from the suction to the discharge side of the pump?
A. Centrifugal pump(s) D. Diaphragm
B. Impeller blade(s) E. Cylindrical pump housing
C. Bernoulli's equation F. None of the Above
95. Which of the following terms has an advantage that this pump does not come in contact with moving metal?
A. Plunger pump D. Diaphragm
B. Mixed flow E. Plunger or piston
C. Dynamic F. None of the Above

There are three main types of diaphragm pumps:

96. In the first type, the _____ with one side in the fluid to be pumped, and the other in air or hydraulic fluid.
A. Vapor bubbles D. Volumetric positive displacement
B. Chamber pressure E. Diaphragm is sealed
C. Drive shaft F. None of the Above
97. The diaphragm is flexed, causing the volume of the pump chamber to increase and decrease.
A. True B. False

98. A pair of _____ prevents reverse flow of the fluid.
- | | |
|---------------|----------------------------|
| A. Strainers | D. Non-return check valves |
| B. Diaphragms | E. Check valves |
| C. Springs | F. None of the Above |
99. The second type of diaphragm pump works with volumetric positive displacement, but differs in that the prime mover of the diaphragm is neither oil nor air; but is?
- | | |
|-----------------------|-------------------------------------|
| A. Vapor bubbles | D. Volumetric positive displacement |
| B. Chamber pressure | E. Reverse direction |
| C. Electro-mechanical | F. None of the Above |
100. The third type of diaphragm pump has one or more springs with the fluid to be pumped on both sides.
- A. True B. False
101. According to the text, when the volume of a chamber of either type of pump is increased (the diaphragm moving up), the pressure decreases, and fluid is drawn into the?
- | | |
|------------------------|-----------------------------------|
| A. Chamber | D. Keyway and nut |
| B. Diaphragm | E. Time delay or ratchet assembly |
| C. Inertial cavitation | F. None of the Above |
102. Which of the following terms expresses pressure later increases from decreased volume (the diaphragm moving down), the fluid previously drawn in is forced out?
- | | |
|------------------|-------------------------------------|
| A. Vapor bubbles | D. Volumetric positive displacement |
| B. Chamber | E. Diaphragm |
| C. Drive shaft | F. None of the Above |
103. Which of the following terms expresses moving up once again draws fluid into the Chamber, completing the cycle?
- | | |
|------------------------|-----------------------------------|
| A. Spring | D. Keyway and nut |
| B. Diaphragm | E. Time delay or ratchet assembly |
| C. Inertial cavitation | F. None of the Above |

Cavitation

104. According to the text, cavitation is defined as the phenomenon of formation of vapor bubbles of a flowing liquid in a region where the pressure of the liquid falls below its?
- | | |
|---------------------|-------------------------------------|
| A. Vapor bubbles | D. Volumetric positive displacement |
| B. Chamber pressure | E. Vapor pressure |
| C. Drive shaft | F. None of the Above |
105. Cavitation is usually divided into two classes of behavior: inertial (or transient) cavitation and?
- | | |
|---------------------|-------------------------------------|
| A. Vapor bubbles | D. Volumetric positive displacement |
| B. Chamber pressure | E. Non-inertial cavitation |
| C. Drive shaft | F. None of the Above |
106. Which of the following terms is the process where a void or bubble in a liquid rapidly collapses, producing a shock wave?
- | | |
|------------------------|-------------------------------------|
| A. Vapor bubbles | D. Volumetric positive displacement |
| B. Chamber pressure | E. Reverse direction |
| C. Inertial cavitation | F. None of the Above |

107. Which of the following terms often occurs in pumps, propellers, impellers, and in the vascular tissues of plants?

- A. Vapor bubbles
- B. Chamber pressure
- C. Cavitation
- D. Volumetric positive displacement
- E. Reverse direction
- F. None of the Above

108. The cavitation pits increase the turbulence of the fluid flow and create crevasses that act as nucleation sites for?

- A. Cause water hammer
- B. Cause residual stresses
- C. Cause shock waves
- D. Additional cavitation bubbles
- E. Collapse of cavities
- F. None of the Above

109. The pits also increase the component's surface area and leave behind residual stresses making the surface more prone to?

- A. Cause water hammer
- B. Cause residual stresses
- C. Cause shock waves
- D. Stress corrosion
- E. Collapse of cavities
- F. None of the Above

110. Which of the following terms is the process in which a bubble in a fluid is forced to oscillate in size or shape due to some form of energy input, such as an acoustic field?

- A. Strainer
- B. Diaphragm
- C. Cavitation
- D. Non-inertial cavitation
- E. Time delay or ratchet assembly
- F. None of the Above

111. According to the text, cavitation is, in many cases, an undesirable occurrence. In devices such as propellers and pumps, cavitation causes a great deal of _____, vibrations, and a loss of efficiency.

- A. Cavitation
- B. Turbulence
- C. Driveshaft
- D. Propellers and pumps
- E. Noise, damage to components
- F. None of the Above

112. Which of the following terms forces liquid energy into very small volumes, thereby creating spots of high temperature and emitting shock waves, the latter of which are a source of noise?

- A. Suction side
- B. Residual stresses
- C. Shock waves
- D. Cavitation bubbles collapse
- E. Collapse of cavities
- F. None of the Above

113. According to the text, although the collapse of a cavity is a relatively low-energy event, highly localized collapses can?

- A. Cause water hammer
- B. Cause residual stresses
- C. Cause shock waves
- D. Erode metals
- E. Collapse of cavities
- F. None of the Above

114. The pitting caused by the collapse of cavities produces great wear on components and can dramatically shorten a propeller's or pump's lifetime.

- A. True
- B. False

Impeller

115. Which of the following terms is a rotating component of a centrifugal pump, which transfers energy from the motor that drives the pump to the fluid being pumped by accelerating the fluid outwards from the center of rotation?

- A. Volute
- B. Driver
- C. Driveshaft
- D. Propellers and pumps
- E. Impeller
- F. None of the Above

116. The velocity achieved by the impeller transfers into pressure when the outward movement of the fluid is confined by the pump casing.

- A. True
- B. False

117. Impellers are usually short cylinders, vanes to push the fluid radially, and a splined center to accept a?

- A. Cavitation
- B. Turbulence
- C. Driveshaft
- D. Propellers and pumps
- E. Center of rotation
- F. None of the Above

General Pumping Fundamentals

118. Here are the important points to consider about suction piping when the liquid being pumped is below the level of the pump: Sometimes suction lift is also referred to as 'positive suction head'.

- A. True
- B. False

119. According to the text, suction lift is when the level of water to be pumped is below the?

- A. Impeller
- B. Suction
- C. Lift water
- D. Centerline of the pump
- E. Bellows
- F. None of the Above

120. According to the text, the ability of the pump to lift water is the result of a partial vacuum created at the?

- A. Partial vacuum
- B. Suction lift
- C. Center of the pump
- D. Pressure differential
- E. Negative suction head
- F. None of the Above

121. The suction side of pipe should be one diameter smaller than the pump inlet.

- A. True
- B. False

122. The required eccentric reducer should be turned so that the top is flat and the bottom tapered.

- A. True
- B. False

Screw or Auger Pump

123. The machine consists of a screw inside a hollow pipe. Some attribute its invention to Archimedes while others attribute it to Nebuchadnezzar II, the screw can be thought of as?

- A. Casing
- B. Screw
- C. Stair case
- D. An inclined plane
- E. Spiral tube
- F. None of the Above

124. Which of the following is turned as the bottom end of the tube turns, it scoops up a volume of water?

- A. Casing
- B. Screw
- C. Suction side
- D. Equilibrium
- E. Spiral tube
- F. None of the Above

125. According to the text, an amount of water will slide up in the spiral tube as the _____ is turned, until it finally pours out from the top of the tube and feeds the irrigation system.

- A. Casing
- B. Screw
- C. Suction side
- D. Shaft
- E. Spiral tube
- F. None of the Above

126. The contact surface between the screw and the pipe does not need to be perfectly water-tight because of the relatively large amount of water being scooped at each turn with respect to the?

- A. Casing
- B. Screw
- C. Suction side
- D. Equilibrium
- E. Angular speed of the screw
- F. None of the Above

127. Water leaking from the top section of the _____ will leak into the previous one and so on.

- A. Casing
- B. Screw
- C. Suction side
- D. Equilibrium
- E. Spiral tube
- F. None of the Above

128. Which of the following terms is related to how does it turn inside the casing, but can be allowed to turn with it in one piece?

- A. Casing
- B. Screw
- C. Suction side
- D. Equilibrium
- E. Spiral tube
- F. None of the Above

129. A large screw provides the mechanical action to move the liquid from the suction side to the?

- A. Casing
- B. Screw
- C. Suction side
- D. Discharge side of the pump
- E. Spiral tube
- F. None of the Above

130. Which of the following terms can rotate in the 30 to 60 rpm range, although some pumps are faster?

- A. Casing
- B. Screw pumps
- C. Suction side
- D. Equilibrium
- E. Spiral tube
- F. None of the Above

131. The slope of the _____ is normally either 30° or 38°.

- A. Casing
- B. Screw
- C. Suction side
- D. Equilibrium
- E. Spiral tube
- F. None of the Above

132. The maximum lift for the larger diameter pumps is about 300 feet.

- A. True
- B. False

Progressing Cavity Pump Section

133. In the progressing cavity pump, components referred to as a rotor and an elastic stator provide the collapse of cavities used to force liquid from the suction side to the discharge side of the pump.

- A. True B. False

134. The progressive cavity pump can be run dry, because there is no friction between the rotor and stator will quickly damage the pump.

- A. True B. False

135. According to the text, as the rotor turns within the stator, cavities are formed which progress from the suction to the _____, conveying the pumped material.

- A. Cavitation D. Discharge end of the pump
B. Turbulence E. Center of rotation
C. Driveshaft F. None of the Above

136. Which of the following terms between the rotor and the stator helices keeps the fluid moving steadily at a fixed flow rate proportional to the pump's rotational speed?

- A. Suction side D. Pump casing
B. Residual stresses E. Continuous seal
C. Shock waves F. None of the Above

137. Which of the following terms are used to pump material very high in solids content?

- A. Suction side D. Pump casing
B. Residual stresses E. Collapse of cavities
C. Progressing cavity pumps F. None of the Above

More on the Progressive Cavity Pump

138. A progressive cavity pump is also known as a progressing cavity pump, eccentric screw pump, or even just?

- A. Drag, or friction pump D. High pressure pump
B. Helical shaft pump E. Eccentric screw pump
C. Cavity pump F. None of the Above

139. This type of pump transfers fluid by means of the progress, through the pump, of a sequence of small, fixed shape, discrete cavities, as its?

- A. Flow rate D. Rotor is turned
B. Hypocycloids E. Peristaltic pump(s)
C. Piston pump F. None of the Above

140. Which of the following terms being proportional to the rotation rate and to low levels of shearing being applied to the pumped fluid?

- A. Drag, or friction D. High pressure
B. Volumetric flow rate E. Eccentric screw pump
C. Cavities F. None of the Above

141. Progressive Cavity Pumps have application in fluid metering and pumping of viscous or shear sensitive materials.

- A. True B. False

142. With the Progressive Cavity Pump, there no flow pulsing is caused by the arrival of _____, other than that caused by compression of the fluid or pump components.

- A. Flow rate
- B. Hypocycloids
- C. Piston pump
- D. Pump size
- E. Cavities at the outlet
- F. None of the Above

143. With the Progressive Cavity Pump, the principle of this _____ is due to a dynamic effect caused by drag, or friction against the moving teeth of the screw rotor.

- A. Drag, or friction
- B. Helical shaft
- C. Cavities
- D. High pressure
- E. Pumping technique
- F. None of the Above

144. In reality it is due to sealed cavities, being able to pump at extremely low rates, even to high pressure, revealing the effect to be purely?

- A. Flow rate
- B. Hypocycloids
- C. Piston pump
- D. Pump size
- E. Positive displacement
- F. None of the Above

145. The mechanical layout that causes the cavities to, uniquely, be of fixed dimensions as they move through the pump, the shape of the gap formed between a helical shaft and a two start, twice the wavelength and double the diameter, helical hole, as the shaft is " _____ " around the inside surface of the hole.

- A. Dragged
- B. Helical rolled
- C. Rolled
- D. Turned
- E. Eccentrically screwed
- F. None of the Above

146. The motion of the rotor being the same as the smaller gears of a planetary gears system. This form of motion gives rise to the curves called?

- A. Flow rate
- B. Hypocycloids
- C. Piston pump
- D. Pump curves
- E. Peristaltic curves
- F. None of the Above

147. With the Progressive Cavity Pump, in order to produce a seal between cavities, the rotor so takes a form similar to a corkscrew, and this, combined with the off-center rotary motion

- A. True
- B. False

148. Which of the following terms and various Rotor/stator pitch ratios exist, but are specialized in that they don't generally allow complete sealing?

- A. Flow rate
- B. Speeds
- C. Drivers
- D. Pump size
- E. Different rotor shapes
- F. None of the Above

149. At a high enough pressure the sliding seals between _____ will leak some fluid rather than pumping it?

- A. Drag, or friction
- B. Helical shaft
- C. Cavities
- D. High pressure
- E. Eccentric screw pump
- F. None of the Above

150. In operation, progressive cavity pumps are fundamentally fixed flow rate pumps, like piston pumps and?

- A. Flow rate
- B. Hypocycloids
- C. Piston pump
- D. Pump size
- E. Peristaltic pump(s)
- F. None of the Above

151. With the Progressive Cavity Pump, needs a fundamentally different understanding to the types of pumps to which people are more commonly first introduced, namely ones that can be thought of as generating a?

- A. Drag, or friction
- B. Helical shaft
- C. Motor
- D. Pressure
- E. Force
- F. None of the Above

152. According to the text, pumps are often fitted with cut-off pressure switches, burst disks or a bypass pipe that allows a variable amount of a fluid to return to the inlet.

- A. True
- B. False

153. Which of the following terms is there a fixed flow rate pump is effectively converted to a fixed pressure one?

- A. Drag, or friction
- B. Centrifugal
- C. Bypass fitted
- D. Double pump
- E. Dynamic pump
- F. None of the Above

154. Which of the following terms refers to where the rotor touches the stator, the surfaces are generally traveling transversely, small areas of sliding contact occur, these areas need to be lubricated by the fluid being pumped?

- A. Torque
- B. Lubrication layer
- C. Elastomer core
- D. Hydrodynamic lubrication
- E. Liquid's resistance to flow
- F. None of the Above

155. Which of the following terms offer long life and reliable service transporting thick or lumpy fluids, abrasive fluids will significantly shorten the life of the stator?

- A. Elastomer
- B. Rotor
- C. Axial
- D. Elastomer compatibility
- E. Progressive cavity pumps
- F. None of the Above

156. Slurries can be pumped reliably, as long as the _____ enough to maintain a lubrication layer around the particles and so provide protection to the stator.

- A. Torque
- B. Lubrication layer
- C. Elastomer core
- D. Medium is viscous
- E. Liquid's resistance to flow
- F. None of the Above

157. According to the text, specific designs involve the rotor of the pump being made of a steel, coated in a smooth hard surface, normally chromium, with the body made of a molded elastomer inside a?

- A. Elastomer
- B. Rotor
- C. Metal tube body
- D. Elastomer/pumped fluid compatibility
- E. Progressive cavity pumps
- F. None of the Above

158. Which of the following terms of the stator forms the required complex cavities?

- A. Torque
- B. Lubrication layer
- C. Elastomer core
- D. Force
- E. Liquid's resistance
- F. None of the Above

159. Which of the following terms is used for the stator to simplify the creation of the complex internal shape?

- A. Elastomer
- B. Rotor
- C. Helicase
- D. Elastomer/pumped fluid compatibility
- E. Progressive cavity pumps
- F. None of the Above

160. Two common designs of stator are the "Equal-walled" and the?

- A. Unequal walled
- B. Lubrication layer
- C. Elastomer core
- D. Distort under pressure
- E. Liquid's resistance to flow
- F. None of the Above

Key Pump Words

161. Which of the following key terms is a measure of a liquid's resistance to flow. i.e.: how thick it is?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. S.G.: Specific gravity
- E. Vapor Pressure
- F. None of the Above

162. Which of the following key terms is the weight of liquid in comparison to water at approx. 20 degrees C?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. S.G.: Specific gravity
- E. Vapor Pressure
- F. None of the Above

163. Which of the following key terms is a number that is the function of pump flow, head, efficiency?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. S.G.: Specific gravity
- E. Vapor Pressure
- F. None of the Above

164. Which of the following key terms determines the type of pump used, the speed it can run at, and with gear pumps, the internal clearances required?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. S.G.: Specific gravity
- E. Vapor Pressure
- F. None of the Above

165. Which of the following key terms is the amount of pressure / head required to 'force' liquid through pipe and fittings?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. Friction Loss
- E. Vapor Pressure
- F. None of the Above

166. Which of the following key terms is related to how much suction lift a pump can achieve by creating a partial vacuum?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. S.G.: Specific gravity
- E. Vapor Pressure
- F. None of the Above

167. Which of the following key terms is related to how a liquid is greater than the surrounding air pressure, the liquid will boil?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. S.G.: Specific gravity
- E. Vapor Pressure
- F. None of the Above

More on Centrifugal Pump

168. A Centrifugal pump is a machine that imparts energy to a fluid. This energy infusion can cause a liquid to flow, rise to a higher level, or both.

- A. True
- B. False

169. The centrifugal pump is an extremely simple machine. It is a member of a family known as rotary machines and consists of two basic parts: 1) the rotary element or impeller and 2) the stationary element or?

- A. Staging
- B. Eye
- C. Pressure
- D. Lantern ring spacer
- E. Casing (volute)
- F. None of the Above

170. In operation, a centrifugal pump “_____” liquid out of the impeller via centrifugal force. One fact that must always be remembered:

- A. Web of the ring
- B. Slings
- C. Pump shaft
- D. Vapor bound
- E. Single-stage pump
- F. None of the Above

171. A pump does not create pressure; it only provides flow. Pressure is just an indication of the amount of?

- A. Staging
- B. Eye
- C. Pressure
- D. Resistance to flow
- E. Recirculation lines
- F. None of the Above

172. Centrifugal pumps are also classified as HORIZONTAL or VERTICAL, depending upon the position of the pump shaft.

- A. True
- B. False

173. Centrifugal pumps may be classified as either SINGLE STAGE or MULTI-STAGE.

- A. True
- B. False

174. A multi-stage pump has one impellers housed together in two casings.

- A. True
- B. False

175. Which of the following terms has only one impeller?

- A. Axial
- B. Closed pumps
- C. Double suction
- D. Multi-stage
- E. Single-stage pump
- F. None of the Above

176. The impellers used on centrifugal pumps may be classified as?

- A. By the volute
- B. Open or Closed
- C. The type of driver
- D. Single or double suction
- E. Single-stage pump
- F. None of the Above

177. The single-suction impeller allows liquid to enter the eye from one side only. The double-suction impeller allows liquid to enter the _____ from two directions.

- A. Staging
- B. Eye
- C. Pressure
- D. Volute
- E. Recirculation line
- F. None of the Above

178. Which of the following terms are classified as Closed or Open?

- A. Webs
- B. Volute
- C. Dynamic pumps
- D. Impellers
- E. Single-stage pumps
- F. None of the Above

179. Which of the following terms have sidewalls that extend from the eye to the outer edge of the vane tips?

- A. Staging
- B. Eyes
- C. Pressure vanes
- D. Closed impellers
- E. Recirculation lines
- F. None of the Above

180. Some small pumps with single-suction impellers have only a casing wearing ring and no?

- A. Staging
- B. Eye
- C. Impeller ring
- D. Lantern ring spacer
- E. Recirculation lines
- F. None of the Above

181. Which of the following terms are installed on some centrifugal pumps to prevent the pumps from overheating and becoming vapor bound?

- A. Air relief
- B. Foot valve
- C. Pump shaft
- D. Recirculation lines
- E. Single-stage pump
- F. None of the Above

182. Which of the following terms is installed to cool the shaft and the packing, to lubricate the packing, and to seal the rotating joint between the shaft and the packing against air leakage?

- A. Staging
- B. Eye
- C. Seal piping
- D. Lantern ring spacer
- E. Water jet
- F. None of the Above

183. Which of the following terms is inserted between the rings of the packing in the stuffing box?

- A. Web of the ring
- B. Lantern ring spacer
- C. Pump shaft
- D. Mechanical seal
- E. Bearings
- F. None of the Above

184. According to the text, seal piping leads the liquid from the discharge side of the pump to the annular space formed by the?

- A. Staging
- B. Eye
- C. Lantern ring
- D. Lantern ring spacer
- E. Volute
- F. None of the Above

Submersible Pump Section

185. Submersible pumps are in essence very similar to?

- A. Cased wells
- B. Turbine pumps
- C. Pump's intake
- D. Pump bowl assembly
- E. VHS or VSS motors
- F. None of the Above

186. The pump shaft has a keyway in which the splined motor end shaft inserts, the motor is often bolted to the?

- A. Motor
- B. Pump shrouds
- C. Canned configurations
- D. Pump housing
- E. Number of stages
- F. None of the Above

187. The pump's intake is located between the motor and the pump and is normally screened to prevent sediment from entering the pump and damaging the?

- A. Impellers
- B. Shroud
- C. Pump's intake
- D. Pump bowl assembly
- E. VHS or VSS motors
- F. None of the Above

188. These types of pumps are installed such that flow through the _____ can occur upwards past the motor and into the intake.

- A. Well screen
- B. Pump shrouds
- C. Volute
- D. Pump housing
- E. Number of stages
- F. None of the Above

189. Which of the following terms if inserted below the screened interval or below all productive portions of the aquifer, it will not be cooled, resulting in premature motor failure?

- A. Cased wells
- B. Shroud
- C. Pump's intake
- D. Pump bowl assembly
- E. Motor end
- F. None of the Above

190. Some pumps may have _____ installed on them to force all the water to move past the motor to prevent overheating.

- A. Motor
- B. Pump shrouds
- C. Canned configurations
- D. Pump housing
- E. Number of stages
- F. None of the Above

191. Which of the following terms is a piece of pipe that attaches to the pump housing with an open end below the motor?

- A. Cased wells
- B. Shroud
- C. Pump's intake
- D. Pump bowl assembly
- E. VHS or VSS motors
- F. None of the Above

192. With the turbine pump, the size of the bowls and impellers, number of stages, and horsepower of the motor are adjusted to achieve the desired production rate within the limitations of the?

- A. Motor
- B. Pump shrouds
- C. Canned configurations
- D. Pump housing
- E. Pumping head
- F. None of the Above

Understanding the Operation of a Vertical Turbine Pump

193. Turbine pump efficiencies are comparable to or greater than most centrifugal pumps, these are usually more expensive than centrifugal pumps and more difficult to inspect and repair.

- A. True
- B. False

194. According to the text, the intake for the turbine pump is continuously under water, priming is not a concern.

- A. True
- B. False

195. Which of the following terms are available in deep well, shallow well, or canned configurations?

- A. Cased wells
- B. Shroud
- C. Pump's intake
- D. Pump bowl assembly
- E. Vertical turbine pumps
- F. None of the Above

196. Which of the following terms are also available, these pumps are also suitable industrial, municipal, commercial and agricultural applications?

- A. Motor
- B. Pump shrouds
- C. Canned configurations
- D. Submersible motors
- E. Number of stages
- F. None of the Above

197. Deep well turbine pumps are adapted for use in cased wells or where the water surface is below the practical limits of a?

- A. Cased wells
- B. Shroud
- C. Pump's intake
- D. Pump bowl assembly
- E. Centrifugal pump
- F. None of the Above

198. Which of the following terms are also used in surface water systems?

- A. Turbine pumps
- B. Pump shrouds
- C. Canned configurations
- D. Pump housing
- E. Number of stages
- F. None of the Above

199. According to the text, the turbine pump has three main parts: (1) the _____, (2) the shaft and column assembly and (3) the pump bowl assembly.

- A. Head assembly
- B. Shroud
- C. Pump's intake
- D. Pump bowl assembly
- E. VHS or VSS motors
- F. None of the Above

200. The head is normally cast iron and designed to be installed on a foundation. It supports the column, shaft, and bowl assemblies, and provides a discharge for the water.

- A. True
- B. False

201. The head will support either an electric motor, a _____ or a belt drive.

- A. Right angle gear drive
- B. Pump shrouds
- C. Canned configurations
- D. Pump housing
- E. Number of stages
- F. None of the Above

Bowl Assembly

202. The clutch assembly is the heart of the vertical turbine pump.

- A. True
- B. False

203. The impeller and diffuser type casing is designed to deliver the energy that the system requires as efficiently as possible.

- A. True
- B. False

204. Maximum flexibility both in the initial pump selection and in the event that future system modifications require a change in the pump rating, therefore Vertical turbine pumps can be?

- A. Clutch driven
- B. Driver mounted
- C. Solid shaft drivers
- D. Progressive
- E. Multi-staged
- F. None of the Above

205. The submerged impellers allow the pump to be started with a foot valve.

- A. True B. False

206. Which of the following terms changes the direction of flow from vertical to horizontal, and couples the pump to the system piping, in addition to supporting and aligning the driver?

- A. Clutch assembly D. Discharge head
B. Driver mounting base E. Priming Capacity
C. Solid shaft drivers F. None of the Above

207. Which of the following terms is where the pump shaft extends through a tube in the center of the rotor and is connected to the driver by a clutch assembly at the top of the driver?

- A. Clutch assembly D. Aligning the driver
B. Driver mounting base E. Hollow shaft drivers
C. Solid shaft drivers F. None of the Above

208. With the solid shaft driver, the _____ is solid and projects below the driver mounting base.

- A. Clutch assembly D. Aligning the driver
B. Rotor shaft E. Priming Capacity
C. Solid shaft drivers F. None of the Above

Discharge Head Assembly

209. The discharge head supports the driver and bowl assembly as well as supplying a discharge connection also called?

- A. NUF D. An open shaft
B. Head and pump bowls E. Several bowls are stacked in series
C. Discharge head F. None of the Above

210. According to the text, a shaft sealing arrangement is located in the discharge head to seal the shaft where it leaves the?

- A. Single-stage pump D. Semi-open or enclosed
B. Line shaft E. Mechanical seal assembly
C. Liquid chamber F. None of the Above

211. The shaft seal is usually a lantern ring type device.

- A. True B. False

Column Assembly

212. Due to its limited diameter, each impeller develops a relatively low head.

- A. True B. False

213. In most deep well turbine installations, several bowls are stacked in series one above the other, this is called staging.

- A. True B. False

214. The oil-lubricated pump has an enclosed shaft into which oil drips, lubricating the bearings.

- A. True B. False

215. The shaft and _____ provides a connection between the head and pump bowls.

- A. Column assembly
- B. Head and pump bowls
- C. Discharge head
- D. An open shaft
- E. Several bowls are stacked in series
- F. None of the Above

216. The line shaft transfers the power from the motor to the impellers and the column carries the water to the surface.

- A. True
- B. False

217. Which of the following terms on a turbine pump may be either water lubricated or oil lubricated?

- A. Single-stage pump
- B. Line shaft
- C. Oil drips
- D. Semi-open or enclosed
- E. Mechanical seal assembly
- F. None of the Above

218. According to the text, the water-lubricated pump has?

- A. 10-foot centers
- B. Head and pump bowls
- C. Discharge head
- D. An open shaft
- E. Bowls are stacked in series
- F. None of the Above

219. According to the text, if there is a possibility of fine sand being pumped, select the oil lubricated pump because it will keep the _____ of the bearings.

- A. Single-stage pump
- B. Line shaft
- C. Sand out
- D. Semi-open or enclosed
- E. Mechanical seal assembly
- F. None of the Above

220. Line shaft bearings are commonly placed on _____ for water-lubricated pumps operating at speeds under 2,200 RPM and at 5-foot centers for pumps operating at higher speeds.

- A. 10-foot centers
- B. Head and pump bowls
- C. Discharge head
- D. An open shaft
- E. Several bowls are stacked in series
- F. None of the Above

221. According to the text, oil-lubricated bearings are commonly placed on?

- A. 10-foot centers
- B. Head and pump bowls
- C. Discharge head
- D. An open shaft
- E. 5-foot centers
- F. None of the Above

222. Which of the following terms encloses the impeller?

- A. Pump bowl
- B. Head and pump bowls
- C. Discharge head
- D. An open shaft
- E. Several bowls are stacked in series
- F. None of the Above

223. Which of the following terms contains four impellers; all attached to a common shaft and will operate at four times the discharge head of a single-stage pump?

- A. Single-stage pump
- B. Line shaft
- C. Fine sand
- D. Semi-open or enclosed
- E. Four-stage bowl assembly
- F. None of the Above

224. Which of the following terms used in turbine pumps may be either semi-open or enclosed?

- A. Single-stage pump
- B. Line shaft
- C. Impellers
- D. Semi-open or enclosed
- E. Mechanical seal assembly
- F. None of the Above

225. The vanes on semi-open impellers are open on the bottom and they rotate with a close tolerance to the bottom of the?

- A. Pump bowl
- B. Bowls
- C. Suction bell
- D. Lineshaft bearings
- E. Discharge head
- F. None of the Above

226. During the initial break-in period the line shaft couplings will tighten, therefore, after about 1000 hours of operation, the impeller adjustments should be checked.

- A. True
- B. False

227. According to the text, the column assembly is of two basic types, either of which may be used: Open _____ construction utilizes the fluid being pumped to lubricate the lineshaft bearings.

- A. Pumping level
- B. Lineshaft
- C. Discharge head
- D. Upward adjustment
- E. Utilizes the fluid
- F. None of the Above

228. Which of the following terms has an enclosing tube around the lineshaft and utilizes oil, grease, or injected liquid to lubricate the lineshaft bearings?

- A. Bowl shaft
- B. Bowls
- C. Suction bell
- D. Lineshaft
- E. Discharge head
- F. None of the Above

Column assembly will consist of:

229. According to the text, column pipe, which connects the _____ to the discharge head,

- A. Pumping level
- B. Bowl assembly
- C. Discharge head
- D. Upward adjustment
- E. Utilizes the fluid
- F. None of the Above

230. Shaft, connecting the bowl shaft to the?

- A. Bowl shaft
- B. Driver
- C. Suction bell
- D. Lineshaft bearings
- E. Discharge head
- F. None of the Above

231. Column pipe may be either threaded or flanged.

- A. True
- B. False

232. Some units will not require _____, having the bowl assembly connected directly to the discharge head instead.

- A. Bowl shaft
- B. Bowls
- C. Suction bell
- D. Column assembly
- E. Discharge head
- F. None of the Above

Bowl Assemblies

The bowl consists of:

233. Impellers rigidly mounted on the _____, which rotate and impart energy to the fluid,

- A. Line shaft
- B. Bowl shaft
- C. Column pipe
- D. Enclosed impellers
- E. Suction bell
- F. None of the Above

234. Which of the following terms to contain the increased pressure and direct the fluid?

- A. Bowl shaft
- B. Bowls
- C. Suction bell
- D. Lineshaft bearings
- E. Discharge head
- F. None of the Above

235. Which of the following terms or case that directs the fluid into the first impeller?

- A. Line shaft
- B. Bowl shaft
- C. Column pipe
- D. Enclosed impellers
- E. Suction bell
- F. None of the Above

236. Bearings located in the suction bell (or case) and in each?

- A. Bowl shaft
- B. Bowl
- C. Suction bell
- D. Lineshaft bearings
- E. Discharge head
- F. None of the Above

237. Which of the following terms may cause inefficient pump operation if they are not properly adjusted?

- A. Line shaft
- B. Bowl shaft
- C. Column pipe
- D. Enclosed impellers
- E. Impellers
- F. None of the Above

238. Mechanical damage will result if the semi-open impellers are set too low and the vanes rub against the bottom of the?

- A. Bowl shaft
- B. Bowls
- C. Suction bell
- D. Lineshaft bearings
- E. Discharge head
- F. None of the Above

239. These must still be checked and adjusted, the adjustment of _____ is not as critical.

- A. Line shaft
- B. Bowl shaft
- C. Column pipe
- D. Enclosed impellers
- E. Suction bell
- F. None of the Above

240. Impeller adjustments are made by tightening or loosening a nut on the top of the?

- A. Line shaft
- B. Bowl shaft
- C. Column pipe
- D. Head assembly
- E. Suction bell
- F. None of the Above

241. Which of the following terms are normally made by lowering the impellers to the bottom of the bowls and adjusting them upward?

- A. Bowl shaft
- B. Bowls
- C. Suction bell
- D. Lineshaft bearings
- E. Impeller adjustments
- F. None of the Above

242. The amount of _____ is determined by how much the line shaft will stretch during pumping.

- A. Pumping level
- B. Tolerance
- C. Discharge head
- D. Upward adjustment
- E. Leakage
- F. None of the Above

243. According to the text, the adjustment must be made based on the lowest possible pumping level in the well, the proper adjustment procedure is often provided by the?

- A. Pumping level
- B. Tolerance
- C. Discharge head
- D. Upward adjustment
- E. Pump manufacturer
- F. None of the Above

Stuffing Box Adjustment

244. On the initial starting it is very important that the packing gland not be tightened too much.

- A. True
- B. False

245. To prevent damage to the shaft and shortening of the packing life, new packing must be "_____ " properly

- A. Packing gland
- B. Run in
- C. Impending trouble
- D. Lineshaft bearings
- E. Variances
- F. None of the Above

246. The stuffing box must be allowed to leak for?

- A. Periodic inspection
- B. Proper operation
- C. Correct alignment
- D. Any deviation in performance
- E. Air to be released
- F. None of the Above

247. Bring both nuts down evenly and in small steps until the leakage is reduced as required, when adjusting the?

- A. Packing gland
- B. Oil reservoir
- C. Impending trouble
- D. Lineshaft bearings
- E. Lantern
- F. None of the Above

248. The nuts should only be tightened about ½ turn at a time at 20 to 30 minute intervals to allow the packing to?

- A. Run in
- B. Stuffing box
- C. Correct alignment
- D. Any deviation in performance
- E. Gravity flow system
- F. None of the Above

249. A new set of ring packing will need to be added to keep the?

- A. Packing gland
- B. Box full
- C. Impending trouble
- D. Lineshaft bearings
- E. Variances
- F. None of the Above

250. According to the text, after adding two or three rings of packing, or when proper adjustment cannot be achieved, the _____ should be cleaned completely of all old packing and re-packed.

- A. Periodic inspection
- B. Stuffing box
- C. Correct alignment
- D. Any deviation in performance
- E. Gravity flow system
- F. None of the Above

Lineshaft Lubrication

251. Which of the following terms are lubricated by the pumped fluid and on close-coupled units, will usually not require pre or post lubrication?

- A. Packing gland
- B. Oil reservoir
- C. Driver
- D. Open lineshaft bearings
- E. Enclosed lineshaft bearings
- F. None of the Above

252. Which of the following terms are lubricated by extraneous liquid, which is fed to the tension nut by either a gravity flow system or pressure injection system?

- A. Packing gland
- B. Oil reservoir
- C. Impending trouble
- D. Open lineshaft bearings
- E. Enclosed lineshaft bearings
- F. None of the Above

253. According to the text, the oil reservoir must be kept filled with a good quality _____ and adjusted to feed 10 to 12 drops per minute plus one (1) drop per 100' of setting.

- A. Packing gland
- B. Oil reservoir
- C. Impending trouble
- D. Lineshaft bearings
- E. Light turbine oil
- F. None of the Above

254. Injection systems are designed for each installation — injection pressure and quantity of lubricating liquid will vary.

- A. True
- B. False

Pump Requirements/Operation Section

NPSH - Net Positive Suction Head

255. NPSH (a) must exceed NPSH(r) to allow pump operation without cavitation.

- A. True
- B. False

256. The vapor pressure of water at 95 degrees C is 84.53 kPa, there was enough suction to contain the vapor, but once the atmospheric pressure dropped at the higher elevation, the vapor was able to escape.

- A. True
- B. False

257. NPSH(r) is the Net Positive Suction Head Required by the pump, which is read from the?

- A. Pump suction
- B. Speed
- C. Suction conditions
- D. Pump performance curve
- E. Hydraulic efficiency
- F. None of the Above

Affinity Laws

258. The Centrifugal Pump is a very capable and?

- A. Centrifugal Pump
- B. Transmit tension
- C. Most economical
- D. Atmospheric pressure
- E. Flexible machine
- F. None of the Above

259. The performance of a centrifugal pump can be varied by changing the _____ or its rotational speed.

- A. Pump suction
- B. Speed
- C. Suction conditions
- D. Rotational speed
- E. Impeller diameter
- F. None of the Above

260. Reducing impeller diameter is probably the most common change and is usually the?
 A. Most economical D. Atmospheric pressure
 B. Transmit tension E. Laws of Affinity
 C. Most economical F. None of the Above
261. The speed can be altered by changing _____ or by changing the speed of the driver.
 A. Pump suction D. Rotational speed
 B. Pulley diameters E. Hydraulic efficiency
 C. Suction conditions F. None of the Above
262. Which of the following terms or change in impeller diameter, the Laws of Affinity give results that are approximate?
 A. Centrifugal Pump D. Speed change
 B. Transmit tension E. Laws of Affinity
 C. Most economical F. None of the Above
263. According to the text, the discrepancy between the _____ and the actual values obtained in test are due to hydraulic efficiency changes that result from the modification.
 A. Calculated values D. Rotational speed
 B. Speed E. Hydraulic efficiency
 C. Suction conditions F. None of the Above
264. Which of the following terms give reasonably close results when the changes are not more than 50% of the original speed or 15% of the original diameter?
 A. Centrifugal Pump D. Atmospheric pressure
 B. Transmit tension E. Laws of Affinity
 C. Most economical F. None of the Above
265. Which of the following terms are some of the most important factors affecting centrifugal pump operation?
 A. Pump suction D. Rotational speed
 B. Speed E. Hydraulic efficiency
 C. Suction conditions F. None of the Above

Suction Lift

266. According to the text, atmospheric pressure at sea level is called absolute pressure because it is a measurement using absolute zero as a base.
 A. True B. False
267. A pump cannot push or "force" a liquid up its suction pipe because liquids do not exhibit tensile strength.
 A. True B. False
268. The vapor pressure of a liquid is the pressure necessary to keep the liquid from vaporizing at a given temperature.
 A. True B. False
269. When a pump creates a suction, it is simply reducing local pressure by creating a partial vacuum.
 A. True B. False

270. Atmospheric or some other external pressure acting on the surface of the liquid pushes the liquid up the suction pipe into the pump.

- A. True B. False

271. According to the text, no pump can attain a suction lift of 34 ft; however, well-designed ones can reach 25 ft quite easily.

- A. True B. False

272. In addition to pump design and _____, there are two physical properties of the liquid being pumped that affect suction lift.

- A. Pump suction D. Suction piping
B. Speed E. Hydraulic efficiency
C. Suction conditions F. None of the Above

273. Maximum suction lift is dependent upon the pressure applied to the surface of the liquid at the suction source. _____ decreases as pressure decreases.

- A. Centrifugal Pump D. Atmospheric pressure
B. Transmit tension E. Laws of Affinity
C. Maximum suction lift F. None of the Above

274. Which of the following terms is dependent upon the vapor pressure of the liquid being pumped?

- A. Pump suction D. Maximum suction lift
B. Speed E. Hydraulic efficiency
C. Suction conditions F. None of the Above

275. Vapor pressure increases as liquid temperature increases. _____ decreases as vapor pressure rises.

- A. Vapor pressure D. Rotational speed
B. Speed E. Maximum suction lift
C. Suction conditions F. None of the Above

276. Maximum suction lift will increase as the external pressure on its source increases.

- A. True B. False

Cavitation - Two Main Causes:

277. Due to low pressure the _____ and higher pressure implodes into the vapor bubbles as they pass through the pump, causing reduced performance and potentially major damage.

- A. Pump suction D. Water vaporizes (boils)
B. Speed E. Hydraulic efficiency
C. Suction conditions F. None of the Above

278. Suction or discharge recirculation. The pump is designed for a certain flow range, if there is not enough or too much flow going through the pump, the resulting _____ can reduce performance and damage the pump.

- A. Pump suction D. Turbulence and vortexes
B. Speed E. Hydraulic efficiency
C. Suction conditions F. None of the Above

Affinity laws

279. The flow changes proportionally to speed.

- A. i.e.: double the speed / multiply the pressure by 4
- B. i.e.: double the speed / double the flow
- C. i.e.: double the speed / multiply the power by 8
- D. None of the Above

280. The pressure changes by the square of the difference.

- A. i.e.: double the speed / multiply the pressure by 4
- B. i.e.: double the speed / double the flow
- C. i.e.: double the speed / multiply the power by 8
- D. None of the Above

281. The power changes by the cube of the difference.

- A. i.e.: double the speed / multiply the pressure by 4
- B. i.e.: double the speed / double the flow
- C. i.e.: double the speed / multiply the power by 8
- D. None of the Above

Pump Casing

282. The most common type of centrifugal pump is an end suction pump.

- A. True
- B. False

283. Another type of centrifugal pump used is the split case.

- A. True
- B. False

284. The line shaft turbine is really a single stage centrifugal pump.

- A. True
- B. False

285. There are many variations of split case, such as; two-stage, single suction, and?

- A. Radial flow impellers
- B. Double suction
- C. Parallel
- D. Mixed media
- E. Multi media
- F. None of the Above

Impeller

286. In most centrifugal pumps, the impeller looks like a number of cupped vanes on blades mounted on?

- A. Radial flow impellers
- B. Axial flow impellers
- C. Parallel to the shaft
- D. Cupped vanes on blades
- E. Disc or shaft
- F. None of the Above

287. As the water is being thrown out of the pump, this means you can run centrifugal pumps with the discharged valve closed for a long period of time.

- A. True
- B. False

288. The impellers all cause a flow from the eye of the impeller to the outside of the impeller.

- A. True
- B. False

289. According to the text, some impellers cause what is called _____, and they can be referred to as radial flow impellers.

- A. Radial flow impellers
- B. Axial flow impellers
- C. Parallel to the shaft
- D. Radial flow
- E. Shape of the vanes
- F. None of the Above

290. Which of the following terms of the impeller and how it is installed in the casing will determine if it is high volume / low pressure or the type of liquid that could be pumped?

- A. Shape of the vanes
- B. Line shaft turbine
- C. Parallel to the shaft
- D. Critical distance
- E. Discharge piping outlet
- F. None of the Above

291. Which of the following terms looks like a propeller and create a flow that is parallel to the shaft?

- A. Radial flow impellers
- B. Axial flow impellers
- C. Parallel to the shaft
- D. Cupped vanes on blades
- E. Shape of the vanes
- F. None of the Above

Motor and Pump Calculations

292. Which of the following terms is the height we are pumping to, or the height to the discharge piping outlet that is filling the tank from the top?

- A. Static head
- B. Pump discharge head
- C. Friction Loss
- D. System or dynamic head
- E. Negative suction head
- F. None of the Above

293. Which of the following terms, pumping to a pressurized vessel we must convert the pressure units to head units?

- A. Positive suction head
- B. Pressure head
- C. Friction Loss
- D. Negative suction head
- E. Total Dynamic Head (TDH)
- F. None of the Above

294. Which of the following terms is caused by friction in the pipes, fittings, and system components?

- A. Static head
- B. Pump discharge head
- C. Friction Loss
- D. System or dynamic head
- E. Negative suction head
- F. None of the Above

Suction Head is Measured the Same Way.

295. If the liquid level is above the pump centerline, that level is a positive suction head.

- A. True
- B. False

296. If the pump is lifting a liquid level from below its centerline, it is a?

- A. Positive suction head
- B. Friction
- C. Friction Loss
- D. Negative suction head
- E. Total Dynamic Head (TDH)
- F. None of the Above

297. If the pump is pumping liquid from a pressurized vessel, you must convert this pressure to a positive suction head.

- A. True
- B. False

298. A vacuum in the tank would be converted to a?
- A. Static head
 - B. Pump discharge head
 - C. Friction Loss
 - D. System or dynamic head
 - E. Negative suction head
 - F. None of the Above

299. Friction loss is calculated via a formula or a chart, taking into account the pipe diameter and roughness and the fluid flow rate, density, and viscosity.
- A. True
 - B. False

300. According to the text, friction in the pipes, fittings, and associated hardware is a?
- A. Positive suction head
 - B. Friction
 - C. Friction Loss
 - D. Negative suction head
 - E. Total Dynamic Head (TDH)
 - F. None of the Above

Motor Section

301. The purpose of the bearing house is to hold the shaft firmly in place, yet allow it to rotate.
- A. True
 - B. False

302. The pump assembly can only be a vertical set-up.
- A. True
 - B. False

303. The power source of the pump is usually an electric motor. The motor is connected by a coupling to the?
- A. Static head
 - B. Bearings
 - C. Pump assembly
 - D. System or dynamic head
 - E. Pump shaft
 - F. None of the Above

304. Which of the following terms supports the bearings and provides a reservoir for the lubricant?
- A. Static head
 - B. Bearings
 - C. Pump assembly
 - D. System or dynamic head
 - E. Bearing house
 - F. None of the Above

305. An impeller is connected to the?
- A. Static head
 - B. Bearings
 - C. Pump assembly
 - D. System or dynamic head
 - E. Shaft
 - F. None of the Above

D-C Motors

306. The important characteristic of the D-C motor is that its speed will not vary with the amount of current used.
- A. True
 - B. False

307. There are many different kinds of D-C motors, depending on how they are wound and their totally enclosed motors.
- A. True
 - B. False

A-C Motors

308. The synchronous type of A-C motor is used in smaller horsepower sizes, usually above 100 HP.
- A. True
 - B. False

309. There are a number of different types of alternating current motors, such as Synchronous, Induction, wound rotor, and?

- A. Bubbler pipe
- B. Manual pump controls
- C. Wound rotor type
- D. Totally enclosed motors
- E. Squirrel cage
- F. None of the Above

310. Which of the following terms of A-C motor requires complex control equipment, since they use a combination of A-C and D-C.

- A. Heat generated
- B. Synchronous type
- C. Motor(s)
- D. Speed/torque characteristics
- E. Full voltage or reduced voltage
- F. None of the Above

311. The induction type motor uses only alternating current.

- A. True
- B. False

312. The squirrel cage motor provides a relatively constant speed.

- A. True
- B. False

313. The wound rotor type could be used as a?

- A. Bubbler pipe
- B. Manual pump controls
- C. Variable speed motor
- D. Totally enclosed motor
- E. Reduced voltage starter
- F. None of the Above

Motor Starters

314. All electric motors, except very large ones are equipped with starters, either full voltage or reduced voltage.

- A. True
- B. False

315. Motors draw a much higher current when they are?

- A. Heat generated
- B. Synchronous type
- C. Motor(s)
- D. Starting and gaining speed
- E. Full voltage or reduced voltage
- F. None of the Above

316. The purpose of the _____ is to prevent the load from coming on until the amperage is low enough.

- A. Bubbler pipe
- B. Manual pump controls
- C. Reduced voltage starter
- D. Totally enclosed motors
- E. Reduced voltage starter
- F. None of the Above

Motor Enclosures

317. Depending on the application, motors may need special protection.

- A. True
- B. False

318. Some motors are referred to as open motors.

- A. True
- B. False

319. Open motors allow air to pass through to remove heat generated when current passes through the windings.

- A. True
- B. False

320. Totally enclosed motors include dust-proof, waterproof and explosion-proof motors.

- A. True B. False

321. Other motors use _____ for special environments or safety protection.

- A. Heat generated D. Speed/torque characteristics
B. Synchronous type E. Full voltage or reduced voltage
C. Motor(s) F. None of the Above

322. Which of the following terms must be provided on any motor where dangerous gases might accumulate?

- A. Bubbler pipe D. Totally enclosed motors
B. Manual pump controls E. Reduced voltage starter
C. Explosion proof enclosure F. None of the Above

Motor Controls

323. Which of the following terms are provided with some method of control, typically a combination of manual and automatic?

- A. Heat generated D. Speed/torque characteristics
B. Synchronous type E. Full voltage or reduced voltage
C. Pump motors F. None of the Above

324. Which of the following terms can be located at the central control panel at the pump or at the suction or discharge points of the liquid being pumped?

- A. Bubbler pipe D. Totally enclosed motors
B. Manual pump controls E. Reduced voltage starter
C. Wound rotor type F. None of the Above

325. Two typical level sensors are the float sensor and the bubble regulator.

- A. True B. False

326. The float sensor is pear-shaped and hangs in the wet well.

- A. True B. False

327. As the height increases, the float tilts, and the mercury in the glass tube flows toward the end of the tube that has two wires attached to it. When the mercury covers the wires, it closes the circuit.

- A. True B. False

328. A low pressure air supply is allowed to escape from a _____ in the wet well.

- A. Bubbler pipe D. Totally enclosed motors
B. Manual pump controls E. Reduced voltage starter
C. Wound rotor type F. None of the Above

Motor Maintenance

329. Motors should be kept clean, free of moisture, and lubricated properly.

- A. True B. False

330. Dirt, dust, and grime will plug the _____ and can actually form an insulating layer over the metal surface of the motor.

- A. Heat generated
- B. Synchronous type
- C. Ventilating spaces
- D. Speed/torque characteristics
- E. Full voltage or reduced voltage
- F. None of the Above

The Wonder of Electricity

331. Electrically charged matter is influenced by, and produces, electromagnetic fields.

- A. True
- B. False

332. Electrical charges produce _____ which act on other charges.

- A. Electric charge
- B. Electricity
- C. Electrical current
- D. Electromagnetic fields
- E. Ampere(s)
- F. None of the Above

333. An electric field is an especially simple type of electromagnetic field produced by an electric charge even when it is not moving.

- A. True
- B. False

334. The _____ produces a force on other charges in its vicinity.

- A. Electric charge
- B. Electric field
- C. Electrical current
- D. Charge
- E. Ampere(s)
- F. None of the Above

335. Electric potential is the capacity of an electric field to do work on an electric charge, typically measured in?

- A. Electric power
- B. Electric charge
- C. Volts
- D. Amps
- E. Hertz
- F. None of the Above

336. Which of the following terms is a movement or flow of electrically charged particles, typically measured in amperes?

- A. Electric charge
- B. Electricity
- C. Electrical current
- D. Hertz
- E. Ampere(s)
- F. None of the Above

337. Electromagnets: Moving charges produce a magnetic field.

- A. True
- B. False

338. Electrical currents generate magnetic fields, and changing magnetic fields generate?

- A. Electric power
- B. Electric charge
- C. Charged matter
- D. Electrical current(s)
- E. Electromagnetic field(s)
- F. None of the Above

How Electricity Is Generated

339. A generator is a device that converts mechanical mass into electrical energy.

- A. True
- B. False

340. The generator has a series of insulated coils of wire that form a stationary cylinder. This cylinder surrounds a rotary electromagnetic shaft.

- A. True B. False

341. This current is the _____ that is transmitted from the power company to the consumer.

- A. Electric power D. Electrical current(s)
B. Electric charge E. Electromagnetic field(s)
C. Charged matter F. None of the Above

342. An electric utility power station uses either a turbine, engine, water wheel, or other similar machine to drive an electric generator — a device that converts mechanical or _____ to electricity.

- A. Electric charge D. Hertz
B. Chemical energy E. Ampere(s)
C. Electrical current F. None of the Above

Joules

343. Electrons move through insulators.

- A. True B. False

What is Electric Power?

344. Electric power is the rate at which electric energy is transferred by an electric circuit.

- A. True B. False

345. The SI unit of power is the watt, one joule per second.

- A. True B. False

Water and Electrical Principles are Very Similar

346. The electronic-hydraulic analogy is the most widely used analogy for "Hydraulic fluid" in a metal conductor.

- A. True B. False

347. Electricity was originally understood to be a kind of energy, and the names of certain electric quantities are derived from heating equivalents.

- A. True B. False

348. Since electric current is invisible and the processes at play in electronics are often difficult to demonstrate, the various electronic components are represented by?

- A. Volts D. Hydraulic equivalents
B. Electron fluid E. Hydraulic ohm analogy
C. Pressure F. None of the Above

Basic Ideas

349. Large tanks of water are held up high, or are filled to differing water levels, and the potential energy of the water head is the pressure source.

- A. True B. False

350. Flow and pressure variables can be calculated in fluid flow network with the use of the?
- A. Volts
 - B. Electron fluid
 - C. Pressure
 - D. Hydraulic equivalents
 - E. Hydraulic ohm analogy
 - F. None of the Above

Component Equivalents

351. If water is flowing horizontally, so that the force of gravity can be ignored, and then electric potential is equivalent to?
- A. Nothing to the circuit
 - B. Voltage in a capacitor
 - C. Force of gravity
 - D. Pressure
 - E. Section of pipe
 - F. None of the Above

352. Electric potential: In general, it is equivalent to kinetic energy.
- A. True
 - B. False

353. Connecting one end of a wire to a circuit is equivalent to forcibly un-capping one end of the pipe and attaching it to another pipe.
- A. True
 - B. False

354. When comparing to a piece of wire, a water pipe should be thought of as having semi-permanent caps on the ends.
- A. True
 - B. False

355. In hydraulic terms, a Capacitor is a water tank with one connection at each end and a rubber sheet dividing the tank in two lengthwise.
- A. True
 - B. False

356. A capacitor cannot "filter out" constant pressure differences frequency pressure differences.
- A. True
 - B. False

357. A wire with only one end attached to a circuit will do nothing; the pipe remains capped on the free end, and?
- A. Nothing to the circuit
 - B. Voltage in a capacitor
 - C. Force of gravity
 - D. A needle valve
 - E. Thus adds nothing to the circuit
 - F. None of the Above

358. Usually measured in amperes, current is equivalent to a _____; that is, the volumetric quantity of flowing water over time.
- A. Stretched rubber
 - B. Rubber diaphragm
 - C. Flow meter
 - D. Hydraulic volume flow rate
 - E. Flowing water
 - F. None of the Above

359. According to the text, a Transistor is a valve in which a diaphragm, controlled by a low-current signal moves _____ which affects the current through another section of pipe.
- A. A plunger
 - B. Voltage in a capacitor
 - C. Force of gravity
 - D. A needle valve
 - E. Section of pipe
 - F. None of the Above

Understanding Voltage

360. Voltage, electrical potential difference, electric tension or electric pressure and measured in units of electric potential.

- A. True B. False

361. Volts, or joules per coulomb is the electric potential difference between two points, or the difference in electric potential energy of a unit charge transported between two points.

- A. True B. False

362. Which of the following terms is equal to the work done per unit charge against a static electric field to move the charge between two points?

- A. Energy D. Voltage
B. Pressure E. Charge
C. Electric potential F. None of the Above

363. Which of the following terms may represent either a source of energy or lost, used, or stored energy?

- A. Electric current D. A static (unchanging) electric field
B. Voltage E. Electric potential difference
C. Electromotive force F. None of the Above

364. A voltmeter can be used to measure the _____ between two points in a system?

- A. Energy D. Voltage
B. Pressure E. Charge
C. Electric potential F. None of the Above

365. According to the text, voltage can be caused by this missing term or, by electric current through a magnetic field, by time-varying magnetic fields, or some combination of these three.

- A. Electric current D. A static (unchanging) electric field
B. Static electric fields E. Electric potential difference
C. Electromotive force F. None of the Above

366. Voltage is electric potential energy per unit charge, measured in amps per coulomb.

- A. True B. False

367. Which of the following terms must be distinguished from electric potential energy by noting that the "potential" is a "per-unit-charge" quantity?

- A. Energy D. Voltage
B. Pressure E. Charge
C. Electric potential F. None of the Above

368. Electric potential is mathematically expressed as the line integral of the electric field and the time rate of change of voltage.

- A. True B. False

369. Which of the following terms can flow from lower voltage to higher voltage, but only when a source of energy is present to "push" it?

- A. Energy D. Voltage
B. Pressure E. Charge
C. Current F. None of the Above

370. Which of the following terms is not the only factor determining charge flow?

- A. Electric field
- B. Voltage
- C. Electromotive force
- D. Resistance
- E. Electric potential difference
- F. None of the Above

371. The electric potential of a material is not even a well-defined quantity, since it varies on the subatomic scale.

- A. True
- B. False

Faraday's Law

372. According to the text, any change in the magnetic environment of a coil of wire will cause a _____ to be "induced" in the coil.

- A. Voltage
- B. Electrical energy
- C. Magnetic field strength
- D. Magnetic flux in the loop constant
- E. Lorentz force
- F. None of the Above

Lenz's Law

373. When an EMF is generated by a change in magnetic flux according to Faraday's Law, the polarity of the induced EMF is such that it produces a current whose magnetic field opposes the change which produces it.

- A. True
- B. False

374. The induced magnetic field inside any loop of wire always acts to keep the induced electromotive force in the loop constant.

- A. True
- B. False

The most widespread version of Faraday's law states:

375. Which of the following terms in any closed circuit is equal to the negative of the time rate of change of the magnetic flux through the circuit?

- A. An electromagnet
- B. An electromotive force
- C. Magnetic flux
- D. The induced electromotive force
- E. Faraday's Law
- F. None of the Above

Electrical Generator

376. Which of the following terms generated by Faraday's law of induction due to relative movement of a circuit and a magnetic field?

- A. EMF
- B. Electrical energy
- C. Magnetic field strength
- D. Magnetic flux in the loop constant
- E. Lorentz force
- F. None of the Above

377. An electromotive force is created when a permanent magnet is moved relative to?

- A. An electromagnet
- B. An electromotive force
- C. Magnetic flux
- D. Other inefficiencies
- E. A conductor
- F. None of the Above

378. According to the text, if a wire is connected through magnetic flux in the loop constant, current will flow, and thus electrical energy is generated, converting the mechanical energy of motion to electrical energy.

- A. True
- B. False

379. With Faraday's disc example, the disc is rotated in a uniform magnetic field perpendicular to the disc, causing a current to flow in the radial arm due to the?

- A. An electromagnet
- B. An electromotive force
- C. Magnetic flux
- D. Other inefficiencies
- E. Lorentz force
- F. None of the Above

380. When the generated current flows through the conducting rim, a magnetic field is generated by this current through?

- A. Ampère's circuital law
- B. Electrical energy
- C. Magnetic field strength
- D. Magnetic flux in the loop constant
- E. Lorentz force
- F. None of the Above

Understanding Resistance

381. No electrons move at all until the voltage or _____ is very high, typically thousands of volts.

- A. Ohms
- B. EMF
- C. Size of the charge
- D. Electrically conductive liquids and slurries
- E. Amperes
- F. None of the Above

382. In those materials with high _____ few electrons will move.

- A. Amps
- B. Current
- C. Potential difference
- D. Resistance
- E. Volts
- F. None of the Above

383. Resistance is measured in _____ and is designated by the symbol Ω (omega).

- A. Ohms
- B. EMF
- C. Size of the charge
- D. Potential difference
- E. Amperes
- F. None of the Above

Measuring Resistance

384. The symbol "V" is used to represent something called the?

- A. Electron(s)
- B. Current
- C. Potential difference
- D. Resistance
- E. Amperes
- F. None of the Above

385. Which of the following terms is the amount of work done in moving a charge between two points, divided by the size of the charge?

- A. Ohms
- B. EMF
- C. Size of the charge
- D. Potential difference
- E. Amperes
- F. None of the Above

386. According to the text, the potential difference is measured in volts, and potential is commonly referred to as voltage. "I" is the symbol for current and "R" is the symbol for the? of the system.

- A. Electron(s)
- B. Current
- C. Potential difference
- D. Resistance
- E. Volts
- F. None of the Above

387. Current is measured in amperes and resistance is measured in?

- A. Ohms
- B. EMF
- C. Size of the charge
- D. Electrically conductive liquids and slurries
- E. Amperes
- F. None of the Above

Ohm's Law tells us that:

388. Which of the following terms increases, current decreases; if resistance decreases, current increases?

- A. Ohms
- B. EMF
- C. Size of the charge
- D. Resistance
- E. Amperes
- F. None of the Above

389. Current is directly proportional to?

- A. Electron(s)
- B. Current
- C. Potential difference
- D. Voltage
- E. Volts
- F. None of the Above

What is Electrical Resistance?

390. The electrical resistance of an electrical conductor is the opposition to the passage of an electric current through that conductor; the inverse quantity is?

- A. The voltage difference
- B. Classical mechanics
- C. Its resistivity
- D. Proportional to the potential difference
- E. Electrical conductance
- F. None of the Above

391. Which of the following terms shares some conceptual parallels with the mechanical notion of friction?

- A. Conductance
- B. Electrical resistance
- C. Electric field vector
- D. Infinity
- E. Current
- F. None of the Above

392. All materials show some resistance, except for superconductors, which have a?

- A. The voltage difference
- B. Resistance of zero
- C. Its resistivity
- D. Proportional to the potential difference
- E. The charge is negative
- F. None of the Above

393. In other cases of a diode or battery, V and I are not directly proportional, or in other words the I - V curve is not a straight line through the origin, and Ohm's law does not hold, in this case, resistance and _____ are less useful concepts, and more difficult to define.

- A. Conductance
- B. Electrical resistance
- C. Electric field vector
- D. Infinity
- E. Current
- F. None of the Above

Potential Difference

394. The voltage difference between any two points in a circuit is known as the Potential Difference or?

- A. The voltage difference
- B. Voltage Drop
- C. Its resistivity
- D. Proportional to the potential difference
- E. The charge is negative
- F. None of the Above

395. Which of the following terms flows around a circuit in the form of electrical charge, potential difference does not move it is applied?

- A. Conductance
- B. Electrical resistance
- C. Electric field vector
- D. Infinity
- E. Current
- F. None of the Above

396. Which of the following terms is usually taken to be at zero volts (0V) and everything is referenced to that common point in a circuit?

- A. Conductance
- B. Electrical resistance
- C. Electric field vector
- D. Ground potential
- E. Current
- F. None of the Above

397. To complete the analysis, we work backwards to the original circuit, applying Kirchoff's laws: Kirchoff's Current Law: The sum of currents entering a junction must equal the sum of currents leaving that?

- A. Voltage difference
- B. Junction
- C. Resistivity
- D. Potential difference
- E. The charge is negative
- F. None of the Above

Direct Current (DC) or Alternating Current (AC)

398. In engineering or household applications, current is often described as being either direct current (DC) or alternating current (AC).

- A. True
- B. False

399. Which of the following terms as produced by example from a battery and required by most electronic devices, is a unidirectional flow from the positive part of a circuit to the negative?

- A. Alternating current
- B. Capacitance
- C. Negative
- D. An electric field
- E. Direct current
- F. None of the Above

400. Which of the following terms is any current that reverses direction repeatedly; almost always this takes the form of a sine wave?

- A. Lines of force
- B. Test charge
- C. Electric field
- D. Alternating current
- E. Energy in first one direction
- F. None of the Above

Electric Field

401. Which of the following terms is created by a charged body in the space that surrounds it, and results in a force exerted on any other charges placed within the field?

- A. Alternating current field
- B. Capacitance
- C. Negative field
- D. An electric field
- E. Gravity
- F. None of the Above

402. The electric field acts between two charges in a similar manner to the way that the _____ between two masses.

- A. Lines of force
- B. Test charge
- C. Electric field
- D. Gravitational field acts
- E. Energy in first one direction
- F. None of the Above

403. Which of the following terms always acts in attraction, drawing two masses together, while the electric field can result in either attraction or repulsion?

- A. Alternating current
- B. Capacitance
- C. Negative
- D. An electric field
- E. Gravity
- F. None of the Above

404. Which of the following terms at a distance is usually zero?
- A. Lines of force
 - B. Test charge
 - C. Electric field
 - D. Transients
 - E. Energy in first one direction
 - F. None of the Above
405. Which of the following terms varies in space, and its strength at any one point is defined as the force that would be felt by a stationary, negligible charge if placed at that point?
- A. Alternating current
 - B. Capacitance
 - C. Negative
 - D. An electric field
 - E. Gravity
 - F. None of the Above
406. Which of the following terms must be vanishingly small to prevent its own electric field disturbing the main field?
- A. Lines of force
 - B. Test charge
 - C. Electric field
 - D. Transients
 - E. Energy in first one direction
 - F. None of the Above
407. As the electric field is defined in terms of force, and force is a vector, so it follows that an electric field is also a vector, having both magnitude and direction, it is called?
- A. Alternating current
 - B. Capacitance
 - C. Negative
 - D. An electric field
 - E. A vector field
 - F. None of the Above
408. The study of electric fields created by stationary charges is called electrostatics. The field may be visualized by a set of imaginary lines whose direction at any point is the same as that of the field.
- A. True
 - B. False
409. Which of the following terms emanating from stationary charges have several key properties: first, that they originate at positive charges and terminate at negative charges?
- A. Lines of force
 - B. Test charge
 - C. Electric field
 - D. Field lines
 - E. Energy in first one direction
 - F. None of the Above
410. A hollow conducting body carries all its charge on its outer surface. The field is therefore zero at all places inside the body.
- A. True
 - B. False
411. This operating principal of the Faraday cage is a conducting metal shell which isolates its interior from?
- A. Outside electrical effects
 - B. Electric field strength
 - C. Electrical breakdown
 - D. This principle
 - E. The charge
 - F. None of the Above
412. Which of the following terms are important when designing items of high-voltage equipment?
- A. Outside electrical effects
 - B. Electric field strength
 - C. Electrical breakdown
 - D. This principle
 - E. The principles of electrostatics
 - F. None of the Above

413. The voltage of a large lightning cloud may be as high as 100 MV and have discharge energies as great as 250 kWh.

- A. True B. False

414. Which of the following terms is greatly affected by nearby conducting objects, and it is particularly intense when it is forced to curve around sharply pointed objects?

- A. The field strength D. Potential of the surface
B. Electric field strength E. Faraday cage
C. Electrical breakdown F. None of the Above

Electric Potential

415. Which of the following terms is closely linked to that of the electric field?

- A. Two specified points D. Electrically uncharged—and unchargeable
B. Force E. The concept of electric potential
C. Electric potential difference F. None of the Above

416. A small charge placed within an electric field experiences a pressure, and to have brought that charge to that point against the pressure requires a charge.

- A. True B. False

417. According to the text, the electric potential at any point is defined as the energy required to bring a unit test charge from _____ slowly to that point?

- A. Earth itself D. An infinite distance
B. An electric field E. Potential of the surface
C. Potential F. None of the Above

418. This definition of potential, while formal, has little practical application, and a more useful concept is that of electric potential difference, and is the energy required to move a unit charge between?

- A. Two specified points D. Electrically uncharged—and unchargeable
B. Force and voltage E. Two potentials of the surface
C. Electric potential difference F. None of the Above

419. Which of the following terms has the special property that it is conservative, which means that the path taken by the test charge is irrelevant?

- A. Earth itself D. Earth
B. Potential of the surface E. An electric field
C. Potential F. None of the Above

420. Which of the following terms is so strongly identified as the unit of choice for measurement and description of electric potential difference?

- A. Volt D. Electrically charged
B. Force E. Potential of the surface
C. Electric potential difference F. None of the Above

421. It is useful to define a common reference point to which potentials may be expressed and compared. While this could be at infinity, a much more useful reference is the?

- A. Earth itself D. Earth ground
B. An electric field E. Potential of the surface
C. Potential F. None of the Above

422. Earth is therefore electrically uncharged—and unchargeable and assumed to be an infinite source of equal amounts of?

- A. Electrons
- B. Positive and negative charge
- C. Electric potential difference
- D. Power
- E. Potential
- F. None of the Above

423. Electric potential is a scalar quantity, that is, it has only magnitude and not direction.

- A. True
- B. False

424. Which of the following terms was formally defined as the force exerted per unit charge?

- A. EMF
- B. The electric field
- C. Potential
- D. Negative charge
- E. Potential of the surface
- F. None of the Above

425. Where the equipotentials lie closest together and usually expressed in volts per meter, the _____ is the line of greatest slope of potential.

- A. Vector direction of the field
- B. Force
- C. Electric potential difference
- D. Electrically uncharged—and unchargeable
- E. Potential of the surface
- F. None of the Above

Understanding Single-Phase Power

426. Which of the following terms refers to the distribution of alternating current electric power using a system in which all the voltages of the supply vary in unison?

- A. Three-phase service
- B. High power systems
- C. Double phase
- D. The waveforms of the three supply conductors
- E. Single-phase electric power
- F. None of the Above

427. Which of the following terms is used when loads are mostly lighting and heating, with few large electric motors?

- A. Power frequency
- B. Three phase(s)
- C. Poly-phase distribution
- D. Double-phase power distribution
- E. Single-phase distribution
- F. None of the Above

428. Which of the following terms connected to an alternating current electric motor does not produce a revolving magnetic field?

- A. Three-phase service
- B. High power systems
- C. A single-phase supply
- D. The waveforms of the three supply conductors
- E. Voltages of the supply vary in unison
- F. None of the Above

429. Which of the following terms, the currents in each conductor reach their peak instantaneous values sequentially?

- A. Power frequency
- B. Three phase(s)
- C. Poly-phase distribution
- D. Double-phase power distribution
- E. Single-phase distribution
- F. None of the Above

430. Which of the following terms, of the three supply conductors are offset from one another in time by one-third of their period.

- A. Three-phase service
- B. High power systems
- C. Single phase
- D. The waveforms
- E. Voltages of the supply vary in unison
- F. None of the Above

431. Which of the following terms, are connected to windings around the interior of a motor stator, they produce a revolving magnetic field; such motors are self-starting?
- A. Power frequency
 - B. Three phase(s)
 - C. Poly-phase distribution
 - D. Soft start
 - E. Squirrel cage
 - F. None of the Above

Understanding Three-Phase Power

432. The three-phase system was introduced and patented by George Westinghouse.
- A. True
 - B. False

433. Which of the following terms electric power is a common method of alternating-current electric power generation, transmission, and distribution?
- A. Power frequency
 - B. Three phase(s)
 - C. Poly-phase distribution
 - D. Single-phase power distribution
 - E. Balanced load
 - F. None of the Above

434. Which of the following terms more economical than others because it uses less conductor material to transmit electric power than equivalent single-phase or two-phase systems at the same voltage?
- A. Three-phase system
 - B. High power system
 - C. Single phase
 - D. Supply conductor
 - E. Balanced load
 - F. None of the Above

435. In a three-phase system, _____ carry three alternating currents (which reach their instantaneous peak values at different times).
- A. A balanced load
 - B. Single-phase
 - C. Three circuit conductors
 - D. Instantaneous peak values
 - E. This delay between phases
 - F. None of the Above

436. Taking one conductor as the reference, the other two currents are delayed in time by one-third and two-thirds of one cycle of the?
- A. Neutral wire
 - B. Electric current
 - C. Four-phase system
 - D. Linear balanced load
 - E. Lowest phase order
 - F. None of the Above

437. Which of the following terms has the effect of giving constant power transfer over each cycle of the current and makes it possible to produce a rotating magnetic field in an electric motor?
- A. This delay between phases
 - B. Three-phase circuits
 - C. Three-phase system
 - D. Linear balanced load
 - E. The lowest phase order
 - F. None of the Above

438. Three-phase systems may have a?
- A. Neutral wire
 - B. Three-phase circuits
 - C. One phase system
 - D. Linear balanced load
 - E. The lowest phase order
 - F. None of the Above

439. A hot wire allows the three-phase system to use a higher voltage while still supporting lower-voltage single-phase appliances.
- A. True
 - B. False

Hydraulic Principles Section

440. Hydraulics is a branch of engineering concerned mainly with moving liquids.

- A. True B. False

441. Hydraulics is applied commonly to the study of this missing term, other liquids, and even gases when the effects of compressibility are small.

- A. Fluids D. Mechanical properties of water
B. Hydrostatics E. Flow
C. Hydrokinetics F. None of the Above

442. Hydraulics can be divided into two areas, this term and hydrokinetics.

- A. Fluids D. Mechanical properties of water
B. Hydrostatics E. Flow
C. Hydrokinetics F. None of the Above

443. Which of the following terms is about the pressures exerted by a fluid at rest?

- A. Pressure D. Hydraulics
B. Hydrostatics E. Flow
C. Hydrokinetics F. None of the Above

Atmospheric Pressure

444. Which of the following terms is the layer that extends upward for about 500 miles, the section of primary interest is the portion that rests on the earth's surface and extends upward for about 7 1/2 miles?

- A. Column D. Mass
B. Troposphere E. Atmospheric pressure
C. Sea level F. None of the Above

445. According the text, if a column of air 1-inch square extending all the way to the "atmosphere", this column of air would weigh approximately 2.31 pounds at sea level.

- A. True B. False

446. Which of the following terms at sea level is approximately 14.7 psi?

- A. Static pressure D. Bottom
B. Pressure E. Atmospheric pressure
C. Gauge pressure F. None of the Above

447. If you were to ascend, the atmospheric pressure increases by approximately 1.0 psi for every 2,343 feet.

- A. True B. False

448. Which of the following terms if you could be below, an example is in excavations and depressions, atmospheric pressure increases?

- A. Static pressure D. Sea level
B. Pressure E. Atmospheric pressure
C. Gauge pressure F. None of the Above

Barometric Loop

449. According to the text, the barometric loop, will provide protection against backsiphonage, is based upon the principle that a water column, at sea level pressure, will not rise above 33.9 feet. In general, barometric loops are locally fabricated, and are 35 feet high.

- A. True B. False

450. Which of the following terms could be measured on an absolute scale, pounds per square inch absolute, or gauge scale?

- A. Static pressure D. Sea level
B. Pressure E. Atmospheric pressure
C. Gauge pressure F. None of the Above

451. Absolute pressure is equal to gauge pressure plus the atmospheric pressure.

- A. True B. False

452. The barometric loop consists of a continuous section of supply piping that abruptly rises to a height of approximately 233 feet and then returns back down to the originating level.

- A. True B. False

453. Which of the following terms is the total pressure?

- A. Static pressure D. Sea level
B. Absolute pressure E. Atmospheric pressure
C. Gauge pressure F. None of the Above

454. Gauge pressure is simply the pressure read on the gauge. If there is no pressure on the gauge other than atmospheric, the gauge will read zero.

- A. True B. False

455. Which of the following terms would be equal to 14.7 psi, which is the atmospheric pressure?

- A. Static pressure D. Sea level
B. Absolute pressure E. Atmospheric pressure
C. Gauge pressure F. None of the Above

Pressure

456. Water is incompressible, while air is very compressible.

- A. True B. False

457. Both air and water are considered to be?

- A. Absolute pressure D. Volume
B. Atmospheric pressure E. Shearing force
C. Fluid(s) F. None of the Above

458. Which of the following terms does water possess and air does not?

- A. Absolute pressure D. Volume
B. Atmospheric pressure E. Shearing force
C. Fluid(s) F. None of the Above

459. A fluid is a substance that cannot exert any permanent forces tangential to a boundary and any force that it exerts on a boundary must be normal to the boundary.

- A. True B. False

468. Which of the following terms uses a partially evacuated chamber of thin metal that expands and contracts according to the external pressure?
- A. Aneroid barometer
 - B. Total vacuum
 - C. Capillarity tube
 - D. Partial vacuum
 - E. Barometric loop
 - F. None of the Above

Vacuum

469. The term vacuum indicates that the absolute pressure is less than the atmospheric pressure and that the _____ is negative.

- A. Static pressure
- B. Pressure
- C. Gauge pressure
- D. Total vacuum
- E. Atmospheric pressure
- F. None of the Above

470. Which of the following terms would mean a pressure of 0 psia or -14.7 psig?

- A. Static pressure
- B. Pressure
- C. Gauge pressure
- D. Total vacuum
- E. Atmospheric pressure
- F. None of the Above

471. According to the text, it is impossible to produce a partial vacuum.

- A. True
- B. False

472. Which of the following terms the pressure would range from slightly less than 14.7 psia to slightly greater than 0 psia?

- A. Static pressure
- B. Pressure
- C. Gauge pressure
- D. Total vacuum
- E. Partial vacuum
- F. None of the Above

473. Backsiphonage results from _____ exerted on a liquid, forcing it toward a supply system that is under a vacuum.

- A. Static pressure
- B. Pressure
- C. Gauge pressure
- D. Atmospheric pressure
- E. Partial vacuum
- F. None of the Above

Water Pressure

474. The weight of a cubic foot of water is 62.4 pounds per square foot. The base can be subdivided into 144-square inches with each subdivision being subjected to a pressure of 0.433 psig. This is one of our key foundation for backflow prevention.

- A. True
- B. False

475. Which of the following terms are normally stated in terms of the height of a fluid.

- A. Friction
- B. Weight
- C. Pressure(s)
- D. Siphon
- E. Depth
- F. None of the Above

476. Water with a pressure head of 10 ft can provide the same _____ as an equal amount of water raised by 10 ft.

- A. Friction
- B. Weight
- C. Pressure(s)
- D. Siphon
- E. Energy
- F. None of the Above

477. Water flowing in a pipe is subject to head loss because of?
- A. Friction
 - B. Weight
 - C. Pressure(s)
 - D. Siphon
 - E. Energy
 - F. None of the Above

Pressure and Force

478. Which of the following terms is the force that pushes water through pipes?
- A. Absolute pressure
 - B. Pressure
 - C. Fluid(s)
 - D. Volume
 - E. Shearing force
 - F. None of the Above

479. Water pressure determines the flow of water from the tap.
- A. True
 - B. False

480. Which of the following terms and force are used extensively in the study of fluid power?
- A. Absolute pressure
 - B. Pressure
 - C. Fluid(s)
 - D. Volume
 - E. Shearing force
 - F. None of the Above

481. Which of the following terms means a total push or pull. It is the push or pull exerted against the total area of a particular surface?
- A. Absolute pressure
 - B. Pressure
 - C. Fluid(s)
 - D. Volume
 - E. Force
 - F. None of the Above

482. Which of the following terms means the amount of push or pull applied to each unit area of the surface?
- A. Absolute pressure
 - B. Pressure
 - C. Fluid(s)
 - D. Volume
 - E. Force
 - F. None of the Above

483. Which of the following terms maybe exerted in one direction, in several directions, or in all directions?
- A. Absolute pressure
 - B. Pressure
 - C. Fluid(s)
 - D. Volume
 - E. Force
 - F. None of the Above

Computing Force, Pressure, and Area

484. A formula is used in computing force, volume, and area in fluid power systems. In this formula, P refers to pressure, F indicates volume, and A represents area.
- A. True
 - B. False

Development of Hydraulics

485. Which of the following terms to be made effective for practical applications, it was necessary to have a piston that "fit exactly?"
- A. Pascal's law
 - B. Evangelista Torricelli
 - C. Blaise Pascal
 - D. Aristotle' law
 - E. Archimedes' law
 - F. None of the Above

Pumps

486. Pumps are excellent examples of?

- A. Hydrostatics
- B. Quasi-static
- C. Oscillating diaphragm
- D. Multi-stage pumps
- E. Complicated part
- F. None of the Above

487. Pumps are of two general types, _____ or positive displacement pumps, and pumps depending on dynamic forces, such as centrifugal pumps.

- A. Hydrostatic
- B. Quasi-static
- C. Oscillating diaphragm
- D. Hydrostatic considerations
- E. Complicated part
- F. None of the Above

488. Positive displacement pumps have a piston (or equivalent) moving in a closely fitting cylinder and forces are exerted on the fluid by motion of the piston.

- A. True
- B. False

489. More complicated pumps have valves check valves that open to allow _____, and close automatically to prevent reverse flow.

- A. Pistons
- B. Diaphragms
- C. Discharged fluid
- D. Passage in one direction
- E. Lift pumps
- F. None of the Above

490. There are many kinds of _____, and can be the most trouble-prone and complicated part of a pump.

- A. Rotors
- B. Force pumps
- C. Inlets
- D. Air space
- E. Valves
- F. None of the Above

491. According to the text, the force pump has _____ in the cylinder, one for supply and the other for delivery.

- A. Two check valves
- B. Diaphragms
- C. Rotors
- D. Cylinders
- E. Lift pumps
- F. None of the Above

492. The supply valve opens when the cylinder _____, the delivery valve when the cylinder volume decreases.

- A. Rotor
- B. Force pump
- C. Volume decreases
- D. Air space
- E. Volume increases
- F. None of the Above

493. According to the text, the lift pump has a _____ and a valve in the piston that allows the liquid to pass around it when the volume of the cylinder is reduced.

- A. Supply valve
- B. Diaphragm
- C. Discharged fluid
- D. Cylinder
- E. Lift pumps
- F. None of the Above

494. The delivery in this case is from the upper part of the _____, which the piston does not enter.

- A. Rotor
- B. Force pump
- C. Volume decreases
- D. Air space
- E. Cylinder
- F. None of the Above

495. Diaphragm pumps are force pumps in which the oscillating diaphragm takes the place of the piston.

- A. True
- B. False

496. Which of the following terms may be moved mechanically, or by the pressure of the fluid on one side of the diaphragm?

- A. Piston
- B. Diaphragm
- C. Discharged fluid
- D. Cylinder
- E. Lift pumps
- F. None of the Above

497. Which of the following terms are typically used for water?

- A. Bellows
- B. Force pumps
- C. Volume pumps
- D. Force and lift pumps
- E. Delivery pumps
- F. None of the Above

498. The force pump has two valves in the cylinder, while the lift pump has one valve in the cylinder and one in the piston.

- A. True
- B. False

499. Which of the following terms is determined by the atmospheric pressure, and either cylinder must be within this height of the free surface?

- A. Suction
- B. Diaphragm
- C. Discharged fluid
- D. Discharge
- E. Force
- F. None of the Above

500. The force pump can give an arbitrarily large pressure to the _____, as in the case of a diesel engine injector.

- A. Rotor
- B. Discharged fluid
- C. Volume decreases
- D. Air space
- E. Delivery
- F. None of the Above