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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.

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Hydraulic Principles Answer Sheet *Name*_____

Telephone# _____

Please circle only one answer per question or X, Underline, Bold or Circle it

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

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Please fax or e-mail this with your final exam

Hydraulic Principles CEU Training Course

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Hydraulic Principles CEU Course Assignment

You will have 90 days to complete this assignment and submit it to TLC. Please include the Registration Page, Answer Key and Customer Survey.

Multiple Choice Exam ***Please utilize the Answer key in the front of this section.***
Select one answer only and the answer will come exactly from the text.

Pump Section
Here are the important points to consider about suction piping when the liquid being pumped is below the level of the pump:

1. First, suction lift is when the level of water to be pumped is below the centerline of the pump. Sometimes suction lift is also referred to as '_____".
A. Partial vacuum
B. Hydrostatic or positive
C. Quasi-static
D. Negative suction head
E. None of the Above

2. The ability of the pump to lift water is the result of a _____ created at the center of the pump.
A. Partial vacuum
B. Hydrostatic or positive
C. Quasi-static
D. Negative suction head
E. None of the Above

3. The foot valve is located at the end of the suction pipe of a pump. It opens to allow water to enter the _____side, but closes to prevent water from passing back out of the bottom end.
A. Partial vacuum
B. Suction
C. Quasi-static
D. Negative suction head
E. None of the Above

4. The _____ side of pipe should be one diameter larger than the pump inlet. The required eccentric reducer should be turned so that the top is flat and the bottom tapered.
A. Partial vacuum
B. Hydrostatic or positive
C. Suction
D. Negative suction head
E. None of the Above

Points to Note are:
5. If an elbow and bell are used, they should be at least one pipe diameter from the tank bottom and side. This type of suction piping must have a gate valve which can be used to prevent the reverse flow when the pump has to be removed. The _____ is the difference between the two liquid levels.
A. Partial vacuum
B. Hydrostatic or positive
C. Total head
D. Negative suction head
E. None of the Above

Pumps
6. Pumps are used to move or raise fluids. They are not only very useful, but are excellent examples of _____.
A. Partial vacuum
B. Hydrostatics
C. Quasi-static
D. Negative suction head
E. None of the Above

7. Pumps are of two general types, hydrostatic or positive displacement pumps, and pumps depending on _____, such as centrifugal pumps.
A. Dynamic forces
B. Hydrostatic or positive
C. Total head
D. Negative suction head
E. None of the Above

8. Positive displacement pumps, which can be understood purely by _____ considerations. They have a piston (or equivalent) moving in a closely-fitting cylinder and forces are exerted on the fluid by motion of the piston.
A. Partial vacuum
B. Hydrostatic
C. Total head
D. Negative suction head
E. None of the Above

9. We have already seen an important example of this in the hydraulic lever or hydraulic press, which we have called _____. The simplest pump is the syringe, filled by withdrawing the piston and emptied by pressing it back in, as its port is immersed in the fluid or removed from it.
A. Quasi-static
B. Hydrostatic or positive
C. Total head
D. Negative suction head
E. None of the Above

10. More complicated pumps have valves allowing them to work repetitively. These are usually check valves that open to allow passage in one direction, and close automatically to prevent _____.
A. Partial vacuum
B. Trouble-prone
C. Reverse flow
D. None of the Above

11. There are many kinds of valves, and they are usually the most _____ and complicated part of a pump.
A. Partial vacuum
B. Trouble-prone
C. Reverse flow
D. Negative suction head
E. None of the Above

12. The _____pump has two check valves in the cylinder, one for supply and the other for delivery.
A. Quasi-static
B. Trouble-prone
C. Force
D. Negative suction head
E. None of the Above

13. The supply valve opens when the cylinder volume _____, the delivery valve when the cylinder volume decreases.
A. Partial vacuum
B. Hydrostatic
C. Increases
D. Negative suction head
E. None of the Above

14. _____ has a supply valve and a valve in the piston that allows the liquid to pass around it when the volume of the cylinder is reduced. The delivery in this case is from the upper part of the cylinder, which the piston does not enter.
A. Partial vacuum
B. Reduced
C. The lift pump
D. Negative suction head
E. None of the Above

15. Diaphragm pumps are force pumps in which the oscillating diaphragm takes the place of the piston. _____may be moved mechanically, or by the pressure of the fluid on one side of the diaphragm.
A. The discharged fluid
B. The diaphragm
C. The Roots blower
D. The Bicycle pump
E. None of the Above

16. Some positive displacement pumps are shown below. The force and lift pumps are typically used for water. _____has two valves in the cylinder, while the lift pump has one valve in the cylinder and one in the piston.
A. The discharged fluid
B. The force pump
C. The Roots blower
D. The Bicycle pump
E. None of the Above

17. _____, or "suction," is determined by the atmospheric pressure, and either cylinder must be within this height of the free surface.
A. The discharged fluid
B. The maximum lift
C. The Roots blower
D. The Bicycle pump
E. None of the Above

18. _____, can give an arbitrarily large pressure to the discharged fluid, as in the case of a diesel engine injector. A nozzle can be used to convert the pressure to velocity, to produce a jet, as for firefighting.
A. The discharged fluid
B. The maximum lift
C. The Roots blower
D. The Force pump
E. None of the Above

19. Fire fighting force pumps usually have two cylinders feeding one receiver alternately. _____in the receiver helps to make the water pressure uniform.
A. The discharged fluid
B. The maximum lift
C. The Roots blower
D. The air space
E. None of the Above

20. _____ has no valves, their place taken by the sliding contact between the rotors and the housing. The Roots blower can either exhaust a receiver or provide air under moderate pressure, in large volumes.
A. The discharged fluid
B. The maximum lift
C. The Roots blower
D. The Bicycle pump
E. None of the Above

21. _____ is a very old device, requiring no accurate machining. The single valve is in one or both sides of the expandable chamber. Another valve can be placed at the nozzle if required. The valve can be a piece of soft leather held close to holes in the chamber.
A. The discharged fluid
B. The maximum lift
C. The Bellows
D. The Bicycle pump
E. None of the Above

22. _____ uses the valve on the valve stem of the tire or inner tube to hold pressure in the tire. The piston, which is attached to the discharge tube, has a flexible seal that seals when the cylinder is moved to compress the air, but allows air to pass when the movement is reversed.
A. The discharged fluid
B. The maximum lift
C. The Roots blower
D. The Bicycle pump
E. None of the Above

Types of Pumps
The family of pumps comprises a large number of types based on application and capabilities. The two major groups of pumps are dynamic and positive displacement.

Centrifugal pumps are classified into three general categories:
23. _____—a centrifugal pump in which the pressure is developed wholly by centrifugal force.
A. Axial flow
B. Progressing cavity
C. Radial flow
D. Forced out of the discharge
E. None of the Above

24. _____—a centrifugal pump in which the pressure is developed partly by centrifugal force and partly by the lift of the vanes of the impeller on the liquid.
A. Axial flow
B. Progressing cavity
C. Mixed flow
D. Forced out of the discharge
E. None of the Above

25. _____—a centrifugal pump in which the pressure is developed by the propelling or lifting action of the vanes of the impeller on the liquid.
A. Axial flow
B. Progressing cavity
C. Radial flow
D. Forced out of the discharge
E. None of the Above

Positive Displacement Pumps
26. A Positive Displacement Pump has an expanding cavity on the suction side of the pump and a _____on the discharge side.
A. Axial flow
B. Progressing cavity
C. Decreasing cavity
D. Forced out of the discharge
E. None of the Above

27. Liquid is allowed to flow into the pump as the cavity on the suction side expands and the liquid is forced out of the discharge as the _____.
A. Axial flow
B. Cavity collapses
C. Radial flow
D. Forced out of the discharge
E. None of the Above

28. This principle applies to all types of Positive Displacement Pumps whether the pump is a rotary lobe, gear within a gear, piston, diaphragm, screw, _____, etc.
A. Axial flow
B. Progressing cavity
C. Radial flow
D. None of the Above

29. A_____, unlike a Centrifugal Pump, will produce the same flow at a given RPM no matter what the discharge pressure is.
A. Axial flow
B. Progressing cavity
C. Radial flow
D. Positive Displacement Pump
E. None of the Above

30. A _____ cannot be operated against a closed valve on the discharge side of the pump, i.e. it does not have a shut-off head like a Centrifugal Pump does.
A. Axial flow
B. Progressing cavity
C. Plunger pump
D. Positive Displacement Pump
E. None of the Above

31. If a _____is allowed to operate against a closed discharge valve it will continue to produce flow which will increase the pressure in the discharge line until either the line bursts or the pump is severely damaged or both.
A. Axial flow
B. Progressing cavity
C. Plunger pump
D. Positive Displacement Pump
E. None of the Above

32. The vane(s) may be blades, buckets, rollers, or slippers that cooperate with a dam to draw fluid into and out of the_____.
A. Pump chamber
B. Progressing cavity
C. Plunger pump
D. Positive Displacement Pump
E. None of the Above

33. Fluid is drawn in and out of the _____ by a piston(s) reciprocating within a cylinder(s) and operating port valves.
A. Axial flow
B. Progressing cavity
C. Pump chamber
D. Positive Displacement Pump
E. None of the Above

34. _____ and sealing depends on the elasticity of a flexible member(s) that may be a tube, vane, or a liner.
A. Pumping
B. Progressing cavity
C. Plunger pump
D. Positive Displacement Pump
E. None of the Above

35. Fluid is carried between rotor screw threads as they mesh with internal threads on the _____.
A. Axial flow
B. Progressing cavity
C. Plunger pump
D. Stator
E. None of the Above

36. Fluid is carried between gear teeth and is expelled by the meshing of the gears that cooperate to provide continuous sealing between the_____.
A. Pump inlet and outlet
B. Progressing cavity
C. Plunger pump
D. Positive Displacement Pump
E. None of the Above

37. The _____ and the screw are two other types of mechanical action that can be used to provide movement of the liquid through the pump.
A. Axial flow
B. Progressing cavity
C. Plunger pump
D. Positive Displacement Pump
E. None of the Above

Plunger Pump
38. The plunger pump is a positive displacement pump that uses a plunger or piston to force liquid from _____to the discharge side of the pump. It is used for heavy sludge.
A. Axial flow
B. Progressing cavity
C. The suction side
D. Positive Displacement Pump
E. None of the Above

39. The movement of the plunger or piston inside the _____inside the pump, so you have to be careful that this kind of pump is never operated against any closed discharge valve.
A. Axial flow
B. Progressing cavity
C. Plunger pump
D. Pump creates pressure
E. None of the Above

40. All discharge valves must be open before the pump is started, to prevent any fast build-up of pressure that could damage the _____.
A. Axial flow
B. Progressing cavity
C. Pump
D. Positive Displacement Pump
E. None of the Above

Diaphragm Pumps

41. In this type of pump, a diaphragm provides the mechanical action used to force liquid from the suction to the discharge side of the pump. The advantage the diaphragm has over the plunger is that the _____does not come in contact with moving metal. This can be important when pumping abrasive or corrosive materials.

A. Diaphragm pump
B. Progressing cavity
C. Plunger pump
D. Positive Displacement Pump
E. None of the Above

Pump Categories

42. Let's cover the essentials first. The key to the whole operation is, of course, the pump. And regardless of what type it is (_____, centrifugal, turbine or jet-ejector, for either shallow or deep well applications), its purpose is to move water and generate the delivery force we call pressure.

A. Cylindrical pump housing
B. Reciprocating piston
C. Centrifugal pump(s)
D. Displacement
E. None of the Above

43. Sometimes — with _____ in particular — pressure is not referred to in pounds per square inch but rather as the equivalent in elevation, called head. No matter; head in feet divided by 2.31 equals pressure, so it's simple enough to establish a common figure.

A. Cylindrical pump housing
B. Bernoulli's equation
C. Centrifugal pump(s)
D. Displacement
E. None of the Above

44. Pumps may be classified on the basis of the application they serve. All pumps may be divided into two major categories: (1) dynamic, in which energy is continuously added to increase the fluid velocities within the machine, and (2) _____, in which the energy is periodically added by application of force.

A. Cylindrical pump housing
B. Bernoulli's equation
C. Centrifugal pump(s)
D. Displacement
E. None of the Above

Basic Water Pump

45. The water pump commonly found in our systems is centrifugal pumps. These pumps work by spinning water around in a circle inside a _____. The pump makes the water spin by pushing it with an impeller.

A. Cylindrical pump housing
B. Bernoulli's equation
C. Centrifugal pump(s)
D. Displacement
E. None of the Above

46. The blades of this impeller project outward from an axle like the arms of a turnstile and, as the impeller spins, the water spins with it. As the water spins, the pressure near the outer edge of the pump housing becomes much higher than near the_____.
A. Cylindrical pump housing
B. Center of the impeller
C. Centrifugal pump(s)
D. Displacement
E. None of the Above

47. You can view the water as an incompressible fluid, one that obeys _____ in the appropriate contexts. As water drifts outward between the impeller blades of the pump, it must move faster and faster because its circular path is getting larger and larger. The impeller blades cause the water to move faster and faster.
A. Cylindrical pump housing
B. Bernoulli's equation
C. Centrifugal pump(s)
D. Displacement
E. None of the Above

48. By the time the water has reached the outer edge of the impeller, it is moving quite fast. However, when the water leaves the impeller and arrives at the outer edge of the _____, it slows down.
A. Cylindrical pump housing
B. Bernoulli's equation
C. Centrifugal pump(s)
D. Displacement
E. None of the Above

49. Here is where _____ figures in. As the water slows down and its kinetic energy decreases, that water's pressure potential energy increases (to conserve energy). Thus, the slowing is accompanied by a pressure rise.
A. Cylindrical pump housing
B. Bernoulli's equation
C. Centrifugal pump(s)
D. Displacement
E. None of the Above

50. That is why the water pressure at the outer edge of the pump housing is higher than the water pressure near the center of the impeller. When water is actively flowing through the pump, arriving through a hole near the _____and leaving through a hole near the outer edge of the pump housing, the pressure rise between center and edge of the pump is not as large.
A. Cylindrical pump housing
B. Center of the impeller
C. Centrifugal pump(s)
D. Displacement
E. None of the Above

Self-priming pump:
51. A pump that does not require priming or initial filling with liquid. The pump casing carries a reserve of water that helps create a vacuum that will lift_____.
A. The pressure is high and velocity is low
B. Stuffing box with gland packing
C. The fluid from a low source
D. The velocity changes
E. None of the Above

Stuffing box:
52. The joint that seals the fluid in the pump stopping it from coming out between_____. The following image shows a typical stuffing box with gland packing. The function of packing is to control leakage and not to eliminate it completely.
A. The pressure is high and velocity is low
B. The casing and the pump shaft
C. Low pressure occurs
D. The velocity changes
E. None of the Above

53. _____, and a flow from 40 to 60 drops per minute out of the stuffing box must be maintained for proper lubrication. This makes this type of seal unfit for situations where leakage is unacceptable but they are very common in large primary sector industries such a mining and pulp and paper.
A. The pressure is high and velocity is low
B. Stuffing box with gland packing
C. The packing must be lubricated
D. The velocity changes
E. None of the Above

54. It is not easy to understand why _____ in the small diameter area of the venturi.
A. The pressure is high and velocity is low
B. Stuffing box with gland packing
C. Low pressure occurs
D. The velocity changes
E. None of the Above

55. It is clear that all the flow must pass from the larger section to the smaller section. Or in other words, the flow rate will remain the same in_____. The flow rate is the same, but the velocity changes.
A. The pressure is high and velocity is low
B. Stuffing box with gland packing
C. The large and small portions of the tube
D. The velocity changes
E. None of the Above

56. The velocity is greater in the small portion of the tube. There is a relationship between the pressure energy and the velocity energy; if velocity increases_____.
A. The pressure is high and velocity is low
B. The pressure energy must decrease
C. Low pressure occurs
D. The velocity changes
E. None of the Above

57. This is the principle of conservation of energy at work which is also Bernoulli's law. In the large part of the pipe the pressure is high and velocity is low, in_____.
A. The pressure is high and velocity is low
B. Stuffing box with gland packing
C. The small part, pressure is low and velocity high
D. The velocity changes
E. None of the Above

Venturi (Bernoulli's law):
58. A venturi is a _____ that has a gradual restriction that opens up into a gradual enlargement. The area of the restriction will have a lower pressure than the enlarged area ahead of it. If the difference in diameters is large you can even produce a very high vacuum (-28 feet of water).
A. High speed
B. Pump and shaft
C. Pipe
D. Shaft
E. None of the Above

59. Viscous drag pump: A pump whose impeller has no _____ but relies on fluid contact with a flat rotating plate turning at high speed to move the liquid.
A. Vanes
B. Pump and shaft
C. Column pipe
D. Drive shaft
E. None of the Above

Types of Water Pumps
60. The most common type of water pumps used for municipal and domestic water supplies are variable _____.
A. High speed
B. Pump and shaft
C. Column pipe
D. Displacement pumps
E. None of the Above

61. A variable _____ will produce at different rates relative to the amount of pressure or lift the pump is working against.
A. Displacement pump
B. Pump and shaft
C. Column pipe
D. Drive shaft
E. None of the Above

62. Centrifugal pumps are variable _____ that are by far used the most. The water production well industry almost exclusively uses Turbine pumps, which are a type of centrifugal pump.
A. High speed
B. Pump and shaft
C. Displacement pumps
D. Drive shaft
E. None of the Above

63. The turbine pump utilizes impellers enclosed in _____ to lift water by centrifugal force. The impellers may be of either a semi-open or closed type.
A. Single or multiple bowls or stages
B. Pump and shaft
C. Column pipe
D. Drive shaft
E. None of the Above

64. Impellers are rotated by the pump motor, which provides the horsepower needed to overcome the _____.
A. High speed
B. Pump and shaft
C. Column pipe
D. Pumping head
E. None of the Above

65. The size and number of_____, horsepower of the motor and pumping head are the key components relating to the pump's lifting capacity.
A. High speed
B. Stages
C. Column pipe
D. Drive shaft
E. None of the Above

66. Vertical turbine pumps are commonly used in groundwater wells. These pumps are driven by a shaft rotated by a motor on the surface. The shaft turns the impellers within the pump housing while the water moves up the _____.
A. High speed
B. Pump and shaft
C. Column
D. Drive shaft
E. None of the Above

67. This type of pumping system is also called a line-shaft turbine. The rotating shaft in a line shaft turbine is actually housed within the _____ that delivers the water to the surface.
A. High speed
B. Pump and shaft
C. Column pipe
D. Drive shaft
E. None of the Above

68. The size of the _____, impeller, and bowls are selected based on the desired pumping rate and lift requirements.
A. High speed
B. Pump and shaft
C. Column
D. Drive shaft
E. None of the Above

69. Column pipe sections can be threaded or coupled together while the drive shaft is coupled and suspended within the _____ by spider bearings.
A. High speed
B. Pump and shaft
C. Column
D. Drive shaft
E. None of the Above

70. The spider bearings provide both a seal at the _____ joints and keep the shaft aligned within the column. The water passing through the column pipe serves as the lubricant for the bearings. Some vertical turbines are lubricated by oil rather than water.
A. High speed
B. Pump and shaft
C. Column pipe
D. Drive shaft
E. None of the Above

71. These pumps are essentially the same as water lubricated units; only the _____ is enclosed within an oil tube.
A. High speed
B. Pump and shaft
C. Column pipe
D. Drive shaft
E. None of the Above

72. Food grade oil is supplied to the tube through a gravity feed system during operation. The oil tube is suspended within the column by spider flanges, while the _____is supported within the oil tube by brass or redwood bearings.
A. High speed
B. Line shaft
C. Column pipe
D. Drive shaft
E. None of the Above

73. A continuous supply of oil lubricates the _____ as it proceeds downward through the oil tube.
A. High speed
B. Pump and shaft
C. Column pipe
D. Drive shaft
E. None of the Above

74. A small hole located at the top of the _____unit 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 bowl
B. Pump and shaft
C. Column pipe
D. Drive shaft
E. None of the Above

75. Careful operation of _____is needed to ensure that the pumping levels do not drop enough to allow oil to enter the pump. Both water and oil lubricated turbine pump units can be driven by electric or fuel powered motors.
A. Oil lubricated turbines
B. Pump and shaft
C. Column pipe
D. Drive shaft
E. None of the Above

76. Most installations use an electric motor that is connected to the _____ by a keyway and nut.
A. High speed
B. Pump and shaft
C. Column pipe
D. Drive shaft
E. None of the Above

77. Where electricity is not readily available, fuel powered engines may be connected to the _____ by a right angle drive gear. Also, both oil and water lubricated systems will have a strainer attached to the intake to prevent sediment from entering the pump.
A. High speed
B. Pump and shaft
C. Column pipe
D. Drive shaft
E. None of the Above

78. When the line shaft turbine is turned off, water will flow back down the column, turning the impellers in a reverse direction. A pump and shaft can easily be broken if the motor were to turn on during this process. A _____or ratchet assembly is often installed on these motors to either prevent the motor from turning on before reverse rotation stops or simply not allow it to reverse at all.
A. Time delay
B. Pump and shaft
C. Column pipe
D. Drive shaft
E. None of the Above

There are three main types of diaphragm pumps:
79. In the first type, the diaphragm is _____ with one side in the fluid to be pumped, and the other in air or hydraulic fluid.
A. Sealed
B. Draws fluid
C. Flexed Or Flexes
D. Forced out
E. None of the Above

80. The diaphragm is _____, causing the volume of the pump chamber to increase and decrease. A pair of non-return check valves prevents reverse flow of the fluid.
A. Unsealed or Sealed
B. Draws fluid
C. Flexed Or Flexes
D. Forced out
E. None of the Above

81. The second type of diaphragm pump works with _____, but differs in that the prime mover of the diaphragm is neither oil nor air; but is electro-mechanical, working through a crank or geared motor drive.
A. Unsealed or Sealed
B. Draws fluid
C. Flexed Or Flexes
D. Volumetric positive displacement
E. None of the Above

82. This method _____the diaphragm through simple mechanical action, and one side of the diaphragm is open to air.
A. Unsealed or Sealed
B. Draws fluid
C. Flexes
D. Forced out
E. None of the Above

83. The third type of diaphragm pump has one or more unsealed diaphragms with the fluid to be pumped on both sides. The diaphragm(s) again are _____, causing the volume to change.
A. Unsealed or Sealed
B. Draws fluid
C. Flexed Or Flexes
D. Forced out
E. None of the Above

84. When the volume of a chamber of either type of pump is increased (the diaphragm moving up), the pressure decreases, and _____ into the chamber.
A. Unsealed or Sealed
B. Fluid is drawn
C. Flexed Or Flexes
D. Forced out
E. None of the Above

85. When the chamber pressure later increases from decreased volume (the diaphragm moving down), the fluid previously drawn in is _____.
A. Unsealed or Sealed
B. Draws fluid
C. Flexed Or Flexes
D. Forced out
E. None of the Above

86. The diaphragm moving up once again _____ into the chamber, completing the cycle. This action is similar to that of the cylinder in an internal combustion engine.
A. Unsealed or Sealed
B. Draws fluid
C. Flexed Or Flexes
D. Forced out
E. None of the Above

Cavitation

87. 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 pressure
B. Transfers energy
C. Oscillate in size
D. Bubbles collapse
E. None of the Above

88. Cavitation is usually divided into two classes of behavior: inertial (or transient) cavitation and non-inertial cavitation. Inertial cavitation is the process where a void or bubble in a liquid rapidly collapses, producing a _____.

A. Shock wave
B. Transfers energy
C. Oscillate in size
D. Bubbles collapse
E. None of the Above

89. Such cavitation often occurs in pumps, propellers, impellers, and in the vascular tissues of plants. Non-inertial cavitation is the process in which a bubble in a fluid is forced to oscillate in size or shape due to some form of _____, such as an acoustic field.

A. Passive sonar
B. Transfers energy
C. Oscillate in size
D. Energy input
E. None of the Above

90. Such _____is often employed in ultrasonic cleaning baths and can also be observed in pumps, propellers etc.

A. Cavitation
B. Transfers energy
C. Oscillate in size
D. Bubbles collapse
E. None of the Above

91. Cavitation is, in many cases, an undesirable occurrence. In devices such as propellers and pumps, _____ causes a great deal of noise, damage to components, vibrations, and a loss of efficiency.

A. Passive sonar
B. Transfers energy
C. Oscillate in size
D. Cavitation
E. None of the Above

92. When the cavitation _____, they force 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. Passive sonar
B. Transfers energy
C. Oscillate in size
D. Bubbles collapse
E. None of the Above

93. The noise created by cavitation is a particular problem for military submarines, as it increases the chances of being detected by passive sonar. Although the _____is a relatively low-energy event, highly localized collapses can erode metals, such as steel, over time.
A. Collapse of a cavity
B. Transfers energy
C. Oscillate in size
D. Bubbles collapse
E. None of the Above

94. The pitting caused by the _____produces great wear on components and can dramatically shorten a propeller's or pump's lifetime. After a surface is initially affected by cavitation, it tends to erode at an accelerating pace.
A. Passive sonar
B. Collapse of cavities
C. Oscillate in size
D. Bubbles collapse
E. None of the Above

95. The cavitation pits increase the turbulence of the fluid flow and create crevasses that act as nucleation sites for additional_____.
A. Cavitation bubbles
B. Transfers energy
C. Oscillate in size
D. Bubbles collapse
E. None of the Above

96. The pits also increase the component's surface area and leave behind residual stresses. This makes the surface more prone to_____.
A. Stress corrosion
B. Transfers energy
C. Oscillate in size
D. Bubbles collapse
E. None of the Above

Impeller
97. An impeller is a rotating component of a centrifugal pump, usually made of iron, steel, aluminum or plastic, which transfers energy from the motor that drives the pump to the fluid being pumped by accelerating the _____from the center of rotation.
A. Passive sonar
B. Transfers energy
C. Oscillate in size
D. Fluid outwards
E. None of the Above

98. The velocity achieved by the _____into pressure when the outward movement of the fluid is confined by the pump casing.
A. Passive sonar
B. Transfers energy
C. Impeller transfers
D. Bubbles collapse
E. None of the Above

99. Impellers are usually short cylinders with an open inlet (called an eye) to accept incoming fluid, vanes to push the_____, and a splined center to accept a driveshaft.
A. Passive sonar
B. Fluid radically
C. Oscillate in size
D. Bubbles collapse
E. None of the Above

Move the Hydraulic section
100. _____ is a branch of engineering concerned mainly with moving liquids.
A. Hydrokinetics
B. Hydrostatics
C. Hydraulics
D. Engineering
E. None of the Above

101. Hydraulics is applied commonly to the study of the mechanical properties of water, other _____, and even gases when the effects of compressibility are small.
A. Hydrokinetics
B. Hydrostatics
C. Hydraulics
D. Liquids
E. None of the Above

102. Hydraulics can be divided into two areas, _____ and hydrokinetics.
A. Hydrokinetics
B. Hydrostatics
C. Hydraulics
D. Engineering
E. None of the Above

103. The word _____ is based on the Greek word for water, and originally covered the study of the physical behavior of water at rest and in motion.
A. Hydrokinetics
B. Hydrostatics
C. Hydraulics
D. Engineering
E. None of the Above

104. Hydraulics includes the manner in which _____ act in tanks and pipes, deals with their properties, and explores ways to take advantage of these properties.
A. Hydrokinetics
B. Hydrostatics
C. Hydraulics
D. Liquids
E. None of the Above

105. _____, the consideration of liquids at rest, involves problems of buoyancy and flotation, pressure on dams and submerged devices, and hydraulic presses.
A. Hydrokinetics
B. Hydrostatics
C. Hydraulics
D. Engineering
E. None of the Above

106. The relative incompressibility of _____ is one of its basic principles.
A. Hydrokinetics
B. Fuilds
C. Hydraulics
D. Liquids
E. None of the Above

107. _____, the study of liquids in motion, is concerned with such matters as friction and turbulence generated in pipes by flowing liquids, the flow of water over weirs and through nozzles, and the use of hydraulic pressure in machinery.
A. Hydrokinetics
B. Hydrodynamics
C. Hydraulics
D. Engineering
E. None of the Above

108. _____ is about the pressures exerted by a fluid at rest. Any fluid is meant, not just water.
A. Hydrokinetics
B. Hydrostatics
C. Hydraulics
D. Engineering
E. None of the Above

109. Hydrostatics is an excellent example of _____, one that can be understood easily and completely from a very few fundamentals, and in which the predictions agree closely with.
A. Experiment
B. Atmosphere
C. Geology
D. Column
E. None of the Above

110. The definition of a fluid deserves careful consideration. Although time is not a factor in hydrostatics, it enters in the approach to hydrostatic equilibrium. It is usually stated that a fluid is a substance that cannot resist a _____, so that pressures are normal to confining surfaces.
A. Experiment
B. Atmosphere
C. Geology
D. Shearing stress
E. None of the Above

111. The atmosphere is the entire mass of air that surrounds the earth. While it 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. This layer is called the _____.
A. Experiment
B. Atmosphere
C. Geology
D. Column
E. None of the Above

112. If a _____ of air 1-inch square extending all the way to the "**top**" of the atmosphere could be weighed, this column of air would weigh approximately 14.7 pounds at sea level.
A. Experiment
B. Atmosphere
C. Geology
D. Column
E. None of the Above

113. _____ pressure at sea level is approximately 14.7 psi.
A. Experiment
B. Atmospheric
C. Geology
D. Column
E. None of the Above

114. As one _____, the atmospheric pressure decreases by approximately 1.0 psi for every 2,343 feet.
A. Experiment
B. Atmosphere
C. Geology
D. Column
E. None of the Above

115. Below sea level, in excavations and depressions, atmospheric pressure _____.
A. Pressure
B. Weight
C. Increases
D. Mercury
E. None of the Above

116. _____ under water differ from those under air only because the weight of the water must be added to the pressure of the air.
A. Pressures
B. Weight
C. Increases
D. Mercury
E. None of the Above

117. Atmospheric pressure can be measured by any of several methods. The common laboratory method uses the mercury column barometer. The height of the _____column serves as an indicator of atmospheric pressure.
A. Pressure
B. Weight
C. Increases
D. Mercury
E. None of the Above

118. At sea level and at a temperature of 0° Celsius (**C**), the height of the mercury column is approximately 30 inches, or 76 centimeters. This represents a pressure of approximately 14.7 psi. The 30-inch column is used as a _____.
A. Pressure
B. Weight
C. Increases
D. Mercury
E. None of the Above

119. Another device used to measure atmospheric _____ is the aneroid barometer.
A. Pressure
B. Weight
C. Increases
D. Mercury
E. None of the Above

120. The aneroid barometer uses the change in shape of an evacuated metal cell to measure variations in atmospheric _____.
A. Pressure
B. Weight
C. Increases
D. Mercury
E. None of the Above

121. The atmospheric pressure does _____ with altitude. It changes very rapid.
A. Pressure
B. Weight
C. Increases
D. Mercury
E. None of the Above

122. The barometric loop consists of a continuous section of supply piping that abruptly rises to a height of approximately 35 feet and then returns back down to the originating level. It is a loop in the piping system that effectively protects against _____.
A. Absolute scale
B. Barometric loops
C. Back-pressure
D. Backsiphonage
E. None of the Above

123. The barometric loop may not be used to protect against _____.
A. Absolute scale
B. Barometric loops
C. Back-pressure
D. Backsiphonage
E. None of the Above

124. Its operation, in the protection against backsiphonage, is based upon the _____ that a water column, at sea level pressure, will not rise above 33.9 feet.
A. Absolute scale
B. Barometric loops
C. Back-pressure
D. Backsiphonage
E. None of the Above

125. In general, _____ are locally fabricated, and are 35 feet high.
A. Absolute scale
B. Barometric loops
C. Back-pressure
D. Backsiphonage
E. None of the Above

126. Pressure may be referred to using an _____, pounds per square inch absolute (**psia**), or gauge scale, (**psiag**).
A. Absolute scale
B. Barometric loops
C. Back-pressure
D. Backsiphonage
E. None of the Above

127. Absolute pressure and gage pressure are related. _____ pressure is equal to gauge pressure plus the atmospheric pressure.
A. Absolute
B. Barometric loops
C. Back-pressure
D. Backsiphonage
E. None of the Above

128. Informally, _____ is the quantity that describes a fluid's resistance to flow.
A. Viscosity
B. Velocity Head
C. Vorticity
D. Vapor Pressure
E. None of the Above

129. _____ is a condition in which the pressure in the distribution system is less than atmospheric pressure. In other words, something is “sucked” into the system because the main is under a vacuum.
A. Backsiphonage
B. Backpressure

130. Float mechanisms, diaphragm elements, bubbler tubes, and direct electronic sensors are?
A. Types of valves
B. Methods of telemetry
C. Common types of level sensors
D. Out dated methods of measuring flows
E. All of the above

131. Absolute pressure is the _____.
A. Absolute
B. Gauge
C. Volume
D. Incompressible
E. None of the Above

132. 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. Then the _____ pressure would be equal to 14.7 psi, which is the atmospheric pressure.
A. Absolute
B. Gauge
C. Volume
D. Incompressible
E. None of the Above

133. Water is _____, while air is very compressible, but both are fluids.
A. Absolute
B. Gauge
C. Volume
D. Incompressible
E. None of the Above

134. Water has a definite _____; air does not.
A. Absolute
B. Gauge
C. Volume
D. Incompressible
E. None of the Above

135. Water and air have low _____; that is, layers of them slide very easily on one another, and they quickly assume their permanent shapes when disturbed by rapid flows.
A. Absolute
B. Gauge
C. Volume
D. Incompressible
E. None of the Above

136. A fluid, therefore, is a substance that cannot exert any _____ tangential to a boundary.
A. Absolute
B. Gauge
C. Volume
D. Incompressible
E. None of the Above

137. Any force that it exerts on a boundary must be normal to the boundary. Such a force is proportional to the area on which it is exerted, and is called a _____.
A. Aneroid barometer
B. Specific weight
C. Gravity
D. Pressure
E. None of the Above

138. On earth, fluids are also subject to the force of _____.
A. Aneroid barometer
B. Specific weight
C. Gravity
D. Atmospheric pressure
E. None of the Above

139. The density of water is about 1 g/cm3, or its _____ is 62.4 pcf.
A. Aneroid barometer
B. Specific weight
C. Gravity
D. Atmospheric pressure
E. None of the Above

140. 33.9 ft of water is the maximum height to which water can be raised by a suction pump, or, more correctly, can be supported by _____.
A. Aneroid barometer
B. Specific weight
C. Gravity
D. Atmospheric pressure
E. None of the Above

141. When _____ acts, the liquid assumes a free surface perpendicular to gravity, which can be proved by Thomson's method.
A. Aneroid barometer
B. Specific weight
C. Gravity
D. Atmospheric pressure

142. This definition of the standard _____was established by Regnault in the mid-19th century. In Britain, 30 in Hg (inches of mercury) had been used previously.
A. Aneroid barometer
B. Specific weight
C. Gravity
D. Atmospheric pressure
E. None of the Above

143. As a practical matter, it is convenient to measure pressure differences by measuring the height of liquid columns, a practice known as _____.
A. Aneroid barometer
B. Specific weight
C. Gravity
D. Atmospheric pressure
E. None of the Above

144. The barometer is a familiar example of this, and atmospheric pressures are traditionally given in terms of the length of a _____.
A. Aneroid barometer
B. Specific weight
C. Gravity
D. Atmospheric pressure
E. None of the Above

145. To make a barometer, the barometric tube, closed at one end, is filled with mercury and then _____ and placed in a mercury reservoir.
A. Barometer
B. Specific weight
C. Gravity
D. Atmospheric pressure
E. None of the Above

146. An _____ uses a partially evacuated chamber of thin metal that expands and contracts according to the external pressure. This movement is communicated to a needle that revolves in a dial.
A. Aneroid barometer
B. Specific weight
C. Gravity
D. Atmospheric pressure
E. None of the Above

147. The materials and construction in an aneroid barometer are arranged to give a low temperature _____.
A. Aneroid barometer
B. Specific weight
C. Gravity
D. Atmospheric pressure
E. None of the Above

148. The aneroid barometer instrument must be calibrated before use, and is usually arranged to read directly in _____.
A. Gauge
B. Vacuum
C. Pressure
D. Partial
E. None of the Above

149. An aneroid barometer is much easier to use in field observations, such as in _____ surveys.
A. Gauge
B. Vacuum
C. Pressure
D. Partial
E. None of the Above

150. An absolute pressure is referred to a _____, while a gauge pressure is referred to the atmospheric pressure at the moment.
A. Gauge
B. Vacuum
C. Pressure
D. Partial
E. None of the Above

151. Negative gauge pressure is a (_____) vacuum.
A. Gauge
B. Zero
C. Pressure
D. Partial
E. None of the Above

152. When a _____is stated to be so many inches, this means the pressure below the atmospheric pressure of about 30 in.
A. Gauge
B. Vacuum
C. Pressure device
D. Partial
E. None of the Above

153. A vacuum of 25 inches is the same thing as an _____ pressure of 5 inches (of mercury).
A. Gauge
B. Vacuum
C. Pressure
D. Partial
E. None of the Above

154. The term **vacuum** indicates that the absolute _____ is less than the atmospheric pressure and that the gauge pressure is negative.
A. Gauge
B. Vacuum
C. Pressure
D. Partial
E. None of the Above

155. A complete or total vacuum would mean a _____ of 0 psia or –14.7 psig.
A. Gauge
B. Vacuum
C. Pressure
D. Partial
E. None of the Above

156. Since it is impossible to produce a total vacuum, the term _____, will mean all degrees of partial vacuum.
A. Gauge
B. Vacuum
C. Pressure
D. Zero
E. None of the Above

157. In a _____ vacuum, the pressure would range from slightly less than 14.7 psia (0 psig) to slightly greater than 0 psia (-14.7 psig).
A. Gauge
B. Complete
C. Pressure
D. Partial
E. None of the Above

158. Backsiphonage results from atmospheric pressure exerted on a liquid forcing it toward a supply system that is under a _____.
A. Suction
B. Vacuum
C. Pressure break
D. Condition
E. None of the Above

159. The weight of a cubic foot of water is 62.4 pounds per square foot. The base can be subdivided into 144-square _____ with each subdivision being subjected to a pressure of 0.433 psig.
A. Is related to gauge pressure
B. Is related to vacuum
C. Is related to pressure
D. Feet
E. None of the Above

160. Pressures are very frequently stated in terms of the height of a fluid. If it is the same fluid whose pressure is being given, it is usually called "head," and the factor connecting the head and the pressure is the weight density ρg. In the English _____ system, weight density is in pounds per cubic inch or cubic foot.
A. Gauge
B. Vacuum
C. Pressure
D. Engineer's
E. None of the Above

A little math.

161. What would the static pressure be on a pressure gauge at the bottom of a 60 foot wide water tower that contained 180 feet of water?
A. 415
B. 78
C. 1501.2
D. 25.98
E. None of the Above

162. What would the static pressure be on a pressure gauge at the bottom of a 30 foot wide water tower that contained 180 feet of water?
A. 415
B. 78
C. 1501.2
D. 25.98
E. None of the Above

163. What would the static pressure be on a pressure gauge at the bottom of a 300 foot wide water tower that contained 10 feet of water?
A. 2.31
B. 23.10
C. 43
D. 4.33
E. None of the above

164. A fire hydrant has a static pressure of 86 PSI, how much Head is stores in the storage tank?
A. Not enough information.
B. 37.22
C. 198.66
D. 643.28
E. None of the Above

165. There is 35 feet of water in a storage tank. The tank was recently pressure cleaned and is located at the top of a hill. What should the natural pressure be on the bottom of this cleaned tank?
A. Not enough information.
B. Too much information but the answer is 15 PSI
C. Too much information but the answer is 283 PSI
D. None of the Above

166. In studying fluids _____, we are concerned with the transmission of force and the factors which affect the forces in liquids. Additionally, pressure in and on liquids and factors affecting pressure are of great importance.
A. Force
B. Pressure
C. Pull
D. Push
E. None of the Above

167. Pressure is the force that pushes water through pipes. Water pressure determines the flow of water from the tap. If _____ is not sufficient then the flow can reduce to a trickle and it will take a long time to fill a kettle or a cistern.
A. Force
B. Pressure
C. Pull
D. Push
E. None of the Above

168. The terms **force** and _____ are used extensively in the study of fluid power. It is essential that we distinguish between the terms.
A. Force
B. Pressure
C. Pull
D. Push
E. None of the Above

169. Force means a total push or _____. It is the push or pull exerted against the total area of a particular surface and is expressed in pounds or grams.
A. Force
B. Pressure
C. Pull
D. Push
E. None of the Above

170. Pressure means the amount of _____ or pull (force) applied to each unit area of the surface and is expressed in pounds per square inch (lb/in2) or grams per square centimeter (gm/cm2).
A. Force
B. Pressure
C. Pull
D. Push
E. None of the Above

171. Pressure maybe _____ in one direction, in several directions, or in all directions.
A. Force
B. Pressure
C. Pull
D. Push
E. None of the Above

172. A formula is used in computing force, pressure, and area in fluid power systems. In this formula, P refers to pressure, F indicates force, and A represents area. _____ equals pressure times area.
A. Force
B. Pressure
C. Pull
D. Push
E. None of the Above

Some History
173. Although the modern development of hydraulics is comparatively recent, the ancients were familiar with many _____and their applications.
A. Submerged bodies
B. Fundamental law
C. Hydraulic principles
D. Domestic purposes
E. None of the Above

174. The Egyptians and the ancient people of Persia, India, and China conveyed water along channels for irrigation and _____, using dams and sluice gates to control the flow.
A. Submerged bodies
B. Fundamental law
C. Hydraulic principles
D. Domestic purposes
E. None of the Above

175. The ancient Cretans had an elaborate plumbing system. Archimedes studied the laws of floating and _____. The Romans constructed aqueducts to carry water to their cities.
A. Submerged bodies
B. Fundamental law
C. Hydraulic principles
D. Domestic purposes
E. None of the Above

176. Beginning near the end of the seventeenth century, Italian physicist, Evangelista Torricelle, French physicist, Edme Mariotte, and later, Daniel Bernoulli conducted experiments to study the elements of force in the _____ through small openings in the sides of tanks and through short pipes.
A. Submerged bodies
B. Fundamental law
C. Hydraulic principles
D. Discharge of water
E. None of the Above

177. Blaise Pascal, a French scientist, discovered the _____for the science of hydraulics.
A. Submerged bodies
B. Fundamental law
C. Hydraulic principles
D. Domestic purposes
E. None of the Above

178. _____states that increase in pressure on the surface of a confined fluid is transmitted undiminished throughout the confining vessel or system.
A. Pascal's law
B. Evangelista Torricelli
C. Galileo
D. Experimentum cruces
E. None of the Above

179. For _____to be made effective for practical applications, it was necessary to have a piston that "**fit exactly**." It was not until the latter part of the eighteenth century that methods were found to make these snugly fitted parts required in hydraulic systems.
A. Pascal's law
B. Evangelista Torricelli
C. Galileo
D. Experimentum cruces
E. None of the Above

180. _____ was accomplished by the invention of machines that were used to cut and shape the necessary closely fitted parts and, particularly, by the development of gaskets and packings.
A. Pascal's law
B. Evangelista Torricelli
C. Galileo
D. Experimentum cruces
E. None of the Above

181. Since that time, _____ such as valves, pumps, actuating cylinders, and motors have been developed and refined to make hydraulics one of the leading methods of transmitting power.
A. Pascal's law
B. Evangelista Torricelli
C. Galileo
D. Experimentum cruces
E. None of the Above

182. Evangelista Torricelli (1608-1647), _____'s student and secretary,
A. Pascal's law
B. Evangelista Torricelli
C. Galileo
D. Experimentum cruces
E. None of the Above

183. _____a member of the Florentine Academy of Experiments, invented the mercury barometer in 1643, and brought the weight of the atmosphere to light.
A. Pascal's law
B. Evangelista Torricelli
C. Galileo
D. Experimentum cruces
E. None of the Above

184. The mercury column was held up by the pressure of the atmosphere, not by horror vacui as _____ had supposed.
A. Aristotle
B. Evangelista Torricelli
C. Galileo
D. Experimentum cruces
E. None of the Above

185. Torricelli's early death was a blow to science, but his ideas were furthered by _____ (1623-1662).
A. Pascal
B. Evangelista Torricelli
C. Galileo
D. Experimentum cruces
E. None of the Above

186. _____ had a barometer carried up the 1465 m high Puy de Dôme, an extinct volcano in the Auvergne just west of his home of Clermont-Ferrand in 1648 by Périer, his brother-in-law. Pascal's experimentum crucis is one of the triumphs of early modern science.
A. Pascal
B. Evangelista Torricelli
C. Galileo
D. Experimentum cruces
E. None of the Above

187. The Puy de Dôme is not the highest peak in the Massif Central--the Puy de Sancy, at 1866 m is, but it was the closest. _____is now the centre of the French pneumatics industry.
A. Pascal
B. Evangelista Torricelli
C. Galileo
D. Experimentum cruces
E. None of the Above

188. The remarkable _____ (1602-1686), Burgomeister of Magdeburg, Saxony, took up the cause, making the first vacuum pump, which he used in vivid demonstrations of the pressure of the atmosphere to the Imperial Diet at Regensburg in 1654.
A. Pascal
B. Otto von Guericke
C. Robert Boyle
D. Torricelli's
E. None of the Above Famous Scientists

189. Famously, he evacuated a sphere consisting of two well-fitting hemispheres about a foot in diameter, and showed that 16 horses, 8 on each side, could not pull them apart. An original vacuum pump and hemispheres from 1663.
A. Pascal
B. Otto von Guericke
C. Robert Boyle
D. Torricelli's
E. None of the Above Famous Scientists

190. He also showed that air had weight, and how much force it did require to separate evacuated hemispheres.
A. Pascal
B. Otto von Guericke
C. Robert Boyle
D. Torricelli's
E. None of the Above Famous Scientists

191. In England, Robert Hooke (1635-1703) made a vacuum pump for _____ (1627-1691). Christian Huygens (1629-1695) became interested in a visit to London in 1661 and had a vacuum pump built for him.
A. Pascal
B. Otto von Guericke
C. Robert Boyle
D. Torricelli's
E. None of the Above Famous Scientists

192. By this time, _____ doctrine had triumphed over the Church's support for horror vacui. This was one of the first victories for rational physics over the illusions of experience, and is well worth consideration.
A. Pascal
B. Otto von Guericke
C. Robert Boyle
D. Torricelli's
E. None of the Above Famous Scientists

193. _____ demonstrated that the siphon worked by atmospheric pressure, not by horror vacui.
A. Pascal
B. Otto von Guericke
C. Robert Boyle
D. Torricelli's
E. None of the Above Famous Scientists

194. The mm of mercury is sometimes called a torr after Torricelli, and _____also has been honored by a unit of pressure, a newton per square meter or 10 dyne/cm2
A. Pascal
B. Otto von Guericke
C. Robert Boyle
D. Torricelli's
E. None of the Above

These questions will come from the Glossary

195. _____ The Law of Conservation of Mass states that mass can be neither created nor destroyed. Using the Mass Conservation Law on a **steady flow** process - flow where the flow rate don't change over time - through a control volume where the stored mass in the control volume don't change - implements that inflow equals outflow.
A. Conservation laws
B. Euler Equations
C. Equation of Mechanical Energy
D. Equation of Continuity
E. None of the Above

196. _____ is a statement of the first law of thermodynamics. The energy equation involves energy, heat transfer and work.
A. Conservation laws
B. Euler Equations
C. Equation of Mechanical Energy
D. Equation of Continuity
E. None of the Above

197. With certain limitations the mechanical energy equation can be compared to the Bernoulli Equation and transferred to the Mechanical Energy Equation in Terms of Energy per Unit Mass.
A. Conservation laws
B. Euler Equations
C. Equation of Mechanical Energy
D. Equation of Continuity
E. None of the Above

198. The _____describes the behavior of gravitational, electric, and fluid potentials.
A. Conservation laws
B. Euler Equations
C. Darcy-Weisbach Equation
D. Laplace Equation(s)
E. None of the Above

199. The _____- For a perfect or ideal gas the change in density is directly related to the change in temperature and pressure as expressed in the Ideal Gas Law.
A. Mechanical Energy Equation
B. Pressure
C. Navier-Stokes Equations
D. Ideal Gas Law
E. None of the Above

200. The motion of a non-turbulent, Newtonian fluid is governed by the _____. The equation can be used to model turbulent flow, where the fluid parameters are interpreted as time-averaged values.
A. Mechanical Energy Equation
B. Pressure
C. Navier-Stokes Equations
D. Euler Equations
E. None of the Above

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Special Notice to Help the Less Fortunate

Kavi and the believers in his church prayed fervently and lifted up praise to God before digging the well. We here in the U.S. have it very good. Here is a story of and drilling a well just to have drinking water in India.

Kavi Viresh was accustomed to rejection. A Gospel for Asia missionary, Kavi knew he was laboring in hard soil in his village in Andhra Pradesh, India and the spiritual drought experienced by its people was worse than the physical drought they suffered in the summers. The people of this village lived hard lives focused on daily survival, and most did not have faith in any god.

By God's grace, Kavi has seen a church planted there—and believers who are eager to help him with outreach. Still, the hearts of many in the village have remained hard. Kavi has suffered beatings several times for sharing the Good News of Jesus. One time, a group of 30 people came to his house to attack him. The Gospel tracts he handed out were torn into pieces on many occasions.
"People told me, 'Your God is a great God.'"

But Kavi knew the people weren't really rejecting *him*—they were rejecting *Jesus* who sent him. And he knew there just had to be some way to get through to these people whom Jesus loved so much. That way turned out to be a Jesus Well. Before the Jesus Well was dug in this village, the people's only source of water was one government-built water tank that was not nearly

enough to meet their basic needs. Kavi knew the Jesus Well would be a tangible way to show the villagers that Jesus loved them.

Sudhir Rao, a new Christian in the village, gladly provided his services as a mason to help with construction. The digging of the Jesus Well was in itself a miracle. Others had attempted to dig a well in the village but not seen water even at depths of 300 feet. So when Kavi saw water at around 100 feet, villagers were amazed.

"People told me, 'Your God is a great God,'" Kavi recalls. Even the village leader expressed heartfelt appreciation to Kavi for providing his people with water—and that he desired to see another well dug in a nearby area. Although the well was just dug in recent months, Kavi has already seen God wash away barriers in the villagers' hearts through its refreshing waters. Hearts have been brought that much closer to being able to receive the message of hope in Christ. And he has a vision of faith for how God will continue to work. "Through this Jesus Well, surely those who have beaten me and are against me will come to know the Lord Jesus," Kavi shared.

For more information, we welcome you to visit…

Gospel for Asia

Phone:
Toll Free: 800-946-2742
972-300-7777

Address:
Gospel for Asia
1800 Golden Trail Ct.
Carrollton, TX 75010
USA

Information:
info@gfa.org

Web Related questions:
webservant@gfa.org
Gospel for Asia Web Site