

Registration form

PUMP PRIMER 1

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

Address _____

City _____ **State** _____ **Zip** _____

Email _____ **Fax (_____)** _____

Phone:
Home (_____) _____ **Work (_____)** _____

Operator ID # _____ **Exp. Date** _____

Class/Grade _____

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

Water Treatment ___ Water Distribution ___ Other _____

Collections ___ Wastewater Treatment ___ Onsite Installer _____

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. If the course is not accepted for CEU credit, we will give you the course free if you ask your State to accept it for credit.

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.ABCTLC.com/downloads/PDF/CEU%20State%20Approvals.pdf>

You can obtain a printed version of the course manual from TLC for an additional \$169.95 plus shipping charges.

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.

CERTIFICATION OF COURSE PROCTOR

Technical Learning College requires that our students who takes a correspondence or home study program course must pass a proctored course reading, quiz and final examination. The proctor must complete and provide to the school a certification form approved by the commission for each examination administered by the proctor.

Instructions. When a student completes the course work, fill out the blanks in this section and provide the form to the proctor with the examination.

Name of Course: _____

Name of Licensee: _____

Instructions to Proctor. After an examination is administered, complete and return this certification and examination to the school in a sealed exam packet or in pdf format.

I certify that:

1. I am a disinterested third party in the administration of this examination. I am not related by blood, marriage or any other relationship to the licensee which would influence me from properly administering the examination.
2. The licensee showed me positive photo identification prior to completing the examination.
3. The enclosed examination was administered under my supervision on _____. The licensee received no assistance and had no access to books, notes or reference material.
4. I have not permitted the examination to be compromised, copied, or recorded in any way or by any method.
5. Provide an estimate of the amount of time the student took to complete the assignment.

Time to complete the entire course and final exam. _____

Notation of any problem or concerns:

Name and Telephone of Proctor (please print):

Signature of Proctor

Pump Primer 1 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
No refunds.**

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.

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

**PUMP PRIMER 1 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.

When Finished with Your Assignment...

REQUIRED DOCUMENTS

Please scan the **Registration Page, Answer Key, Proctoring report, Survey and Driver's License** and email these documents to info@TLCH2O.com.

IPhone Scanning Instructions

If you are unable to scan, take a photo of these documents with your **iPhone** and send these photos to TLC, info@TLCH2O.com.

FAX

If you are unable to scan and email, please fax these documents to TLC, if you fax, call to confirm that we received your paperwork. **(928) 468-0675**

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.

Pump Primer 1 CEU Training Course Assignment

The Pump Primer 1 CEU course assignment is available in Word on the Internet for your convenience, please visit www.ABCTLTC.com and download the assignment and e-mail it back to TLC.

You will have 90 days from receipt of this manual to complete it in order to receive your Professional Development Hours (PDHs) or Continuing Education Unit (CEU). A score of 70 % or better is necessary to pass this course. If you should need any assistance, please email all concerns and the completed ANSWER KEY to info@tlch2o.com.

Select one answer per question. Please utilize the answer key. If you see (s) in the answer, this means the answer could be singular or plural.

If you find any error or problem with the question or the answer, please write that concern down and notify us of this issue.

Please write down any questions you were not able to find the answers or that have errors.

Physical Science and Laws Section

- Which of the following is both a property of a physical body and a measure of its resistance to acceleration when a net force is applied?
A. Gravity C. Inertia
B. Mass D. None of the above
- Which of the following is any interaction that, when unopposed, will change the motion of an object?
A. Force C. Push
B. Drag D. None of the above
- Which of the following is the assumption that a fluid is composed of a continuous material so that properties such as density, pressure, temperature, and velocity are well-defined?
A. Force C. Continuum Assumption
B. Inertia D. None of the above
- Which of the following are three physical laws that directly relate the forces acting on a body to the motion of the body?
A. Laws of Thermodynamics C. Newton's laws of motion
B. Physical Laws D. None of the above
- Which of the following states that every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it?
A. First law C. Law of Thermodynamics
B. Physical Law D. None of the above
- Which of the following can also be described intuitively as a push or a pull?
A. Force C. Drag
B. Pull D. None of the above

7. Which of the following is the force that attracts a body toward the center of the earth, or toward any other physical body having mass?
- A. Gravity C. Inertia
B. Mass D. None of the above
8. Which of the following is the resistance of any physical object to any change in its state of motion?
- A. Gravity C. Inertia
B. Mass D. None of the above
9. Which of the following represents an increase in the speed of a fluid occurs simultaneously with a decrease in pressure or a decrease in the fluid's potential energy?
- A. Pascal's Law C. Bernoulli's Principle
B. Physical Law D. None of the above
10. Which of the following is a theoretical statement inferred from particular facts, applicable to a defined group or class of phenomena, and expressible by the statement that a particular phenomenon always occurs if certain conditions be present?
- A. Newton's Laws C. Law of Thermodynamic
B. Physical Law D. None of the above
11. Which of the following is the tendency of objects to keep moving in a straight line at constant velocity?
- A. Force C. Friction
B. Inertia D. None of the above
12. Which of the following can cause an object with mass to change its velocity to accelerate?
- A. Force C. Push
B. Pull D. None of the above
13. Which of the following determines the strength of its mutual gravitational attraction to other bodies?
- A. Force C. Weight
B. Mass D. None of the above
14. Which of the following are three physical laws that, together, laid the foundation for classical mechanics?
- A. Newton's Laws of motion C. Laws of Thermodynamics
B. Physical Laws D. None of the above
15. Which of the following describe the relationship between a body and the forces acting upon it, and its motion in response to those forces?
- A. Newton's Laws of motion C. Laws of Thermodynamics
B. Bernoulli's Principle D. None of the above
16. Which of the following define fundamental physical quantities that characterize thermodynamic systems?
- A. Newton's Laws C. Laws of Thermodynamics
B. Physical Laws D. None of the above

17. Which of the following laws describe how these quantities behave under various circumstances, and forbid certain phenomena?

- A. Bernoulli's Principles
- B. Physical Law
- C. Laws of Thermodynamics
- D. None of the above

18. Which of the following represent the principle of transmission of fluid-pressure is a principle in fluid mechanics that states that pressure exerted anywhere in a confined incompressible fluid is transmitted equally in all directions throughout the fluid such that the pressure variations remain the same?

- A. Pascal's Law
- B. Physical Law
- C. Bernoulli's Principle
- D. None of the above

19. Physical Law Description Physical laws are:

True, at least within their regime of validity. By definition, there have never been repeatable contradicting?

- A. Time
- B. Space and time
- C. Observations
- D. None of the above

20. Which of the following represents unchanged since first discovered although they may have been shown to be approximations of more accurate laws?

- A. Stable
- B. Absolute
- C. Space and time
- D. None of the above

21. Which of the following represents everything in the universe apparently must comply with them according to observations?

- A. Stable
- B. Universal
- C. Omnipotent
- D. None of the above

22. Which of the following represents that this appears to apply everywhere in the universe?

- A. Stable
- B. Universal
- C. Space and time
- D. None of the above

23. Which of the following terms represents in terms of a single mathematical equation?

- A. Easy
- B. Absolute
- C. Simple
- D. None of the above

24. Which of the following terms represents that nothing in the universe appears to affect them?

- A. Time
- B. Stable
- C. Universe
- D. None of the above

25. Theoretically reversible in _____, although time itself is irreversible.

- A. Universe
- B. Force
- C. Time
- D. None of the above

Newton's Laws

26. Newton's first law states that every object will remain at rest or in uniform motion in a straight line unless compelled to change its state by the action of an external force. This is normally taken as the definition of force.

- A. True
- B. False

27. If there is no net force acting on an object (if all the external forces cancel each other out) then the object will maintain a constant velocity. If that velocity is zero, then the object remains at rest.
A. True B. False
28. If an external force is applied, the velocity will change because of the mass.
A. True B. False
29. Concepts related to force include: thrust, which increases the velocity of an object; drag, which decreases the velocity of an object; and torque, which produces changes in rotational speed of?
A. An object C. Torque
B. Mass D. None of the above
30. Which of the following represents cause no acceleration of that body as the forces balance one another?
A. Gravity C. Internal mechanical stresses
B. Fundamental interactions D. None of the above
31. Which of the following represents the distribution of many small forces applied over an area of a body, is a simple type of stress that if unbalanced can cause the body to accelerate?
A. Pressure C. Torque
B. Mass D. None of the above
32. Which of the following represents usually causes deformation of solid materials, or flow in fluids?
A. Acceleration C. Stress
B. Internal mechanical stresses D. None of the above
33. Gravity is one of the four forces of nature. The strength of the gravitational force between two objects depends on their?
A. Masses C. Gravity
B. Mass D. None of the above
34. Which of the following represents, applied forces, and atmospheric pressure are static factors that apply equally to fluids at rest or in motion?
A. Gravity C. Internal mechanical stresses
B. Fundamental interactions D. None of the above
35. Which of the following also known as fundamental forces, are the interactions in physical systems that do not appear to be reducible to more basic interactions?
A. Fundamental interactions C. Gravity
B. Mass D. None of the above
36. Which of the following terms is the resistance of any physical object to any change in its state of motion?
A. Pressure C. Torque
B. Inertia D. None of the above
37. Which of the following is both a property of a physical body and a measure of its resistance to acceleration when a net force is applied?
A. Gravity C. Mass
B. Fundamental interactions D. None of the above

38. There are four conventionally accepted fundamental interactions—gravitational, electromagnetic, strong nuclear, and weak nuclear.

- A. True B. False

39. In physics, mass is not the same as weight, even though mass is often determined by measuring the object's weight using a spring scale, rather than balance scale comparing it directly with known masses.

- A. True B. False

Pascal's Law

40. Pascal discovered that pressure in a fluid acts equally in some directions.

- A. True B. False

41. According to the text, pressure acts at right angles to the containing surfaces.

- A. True B. False

42. If a pressure gauge, with an exposed face, is placed beneath the surface of a liquid at a specific depth and pointed in different directions, the pressure will read the same.

- A. True B. False

43. Pressure in a _____ of direction.

- A. Liquid at a specific depth C. Height of a liquid
B. Liquid is independent D. None of the above

44. Pressure due to the _____, at any level, depends on the depth of the fluid from the surface.

- A. Weight of a liquid C. Height of a liquid
B. Liquid at a specific depth D. None of the above

45. If the exposed face of the pressure gauges are moved closer to the surface of the liquid, the indicated?

- A. Pressure will be less C. Is equal
B. Pressure of a liquid D. None of the above

46. The indicated pressure is doubled, when the?

- A. Depth is doubled C. Column is tripled
B. Pressure of a liquid D. None of the above

47. The pressure at any depth in this term of the column of liquid at that depth divided by the cross-sectional area of the column at that depth.

- A. Depth is doubled C. Liquid is equal to the weight
B. Pressure of a liquid D. None of the above

48. Which of the following produces the pressure is referred to as the fluid head of the liquid?

- A. Depth is doubled C. Volume of a liquid
B. Pressure of a liquid D. None of the above

49. Which of the following is due to its fluid head is also dependent on the density of the liquid?

- A. Pressure will be less C. Is equal
B. Pressure of a liquid D. None of the above

Static Pressure

50. Static pressure exists in addition to Gravity that may also be present at the same time.
A. True B. False
51. Pascal's law states that a pressure set up in a fluid acts equally in all directions and at right angles to the containing surfaces.
A. True B. False
52. Which of the following flow terms is an important consideration in sizing the hydraulic lines?
A. Velocity of flow C. Volume of flow
B. Volume of a liquid D. None of the above
53. Pascal's law covers the situation only for fluids at rest or practically at rest. It is true only for the factors making up _____.
A. Velocity of flow C. Static head
B. Volume of a liquid D. None of the above
54. When velocity becomes a factor it must have a direction, the force related to the velocity must also have a direction, so that Pascal's law alone does not apply to the dynamic factors of?
A. Pressure drop C. Fluid power
B. Volume of a liquid D. None of the above
55. The dynamic factors of inertia and friction are related to the static factors. Velocity head and _____ are obtained at the expense of static head.
A. Friction head C. Static head
B. Volume of a liquid D. None of the above

Volume and Velocity of Flow

56. Which of the following is passing a point in a given time is known as its volume of flow or flow rate?
A. Friction head C. Volume of flow
B. Volume of a liquid D. None of the above
57. Which of the following is usually expressed in gallons per minute (gpm) and is associated with relative pressures of the liquid, such as 5 gpm at 40 psi?
A. Velocity of flow C. Volume of flow
B. Volume of a liquid D. None of the above
58. Which of the following flow terms is defined as the average speed at which the fluid moves past a given point. It is usually expressed in feet per second (fps) or feet per minute (fpm).
A. Velocity of flow C. Volume of flow
B. Volume of a liquid D. None of the above
59. Volume and friction head are often considered together, that is, with volume of input unchanged—the velocity of flow increases as the cross section or size of the pipe decreases.
A. True B. False

Bernoulli's Principle

60. Bernoulli's principle thus says that a rise (or fall) in pressure in a flowing fluid must always be accompanied by a decrease (or increase) in the speed, and conversely, if an increase (decrease) in, the speed of the fluid results in a decrease (or increase) in the pressure.

- A. True B. False

61. Bernoulli's principle is responsible for the fact that a shower curtain gets "sucked inwards" when the water is first turned on. What happens is that the increased water/air velocity inside the curtain causes a pressure drop.

- A. True B. False

62. Which of the following s explains the difference between the outside and inside causes a net force on the shower curtain which sucks it inward?

- A. Pressure C. Velocity of flow
B. Volume of flow D. None of the above

63. Squeezing the bulb over the fluid creates a low _____ area due to the higher speed of the air, which subsequently draws the fluid up.

- A. Pressure C. Velocity of flow
B. Volume of flow D. None of the above

64. Which of the following explains why windows tend to explode, rather than implode in hurricanes: the very high speed of the air just outside the window causes the pressure just outside to be much less than the pressure inside, where the air is still.

- A. Venturi effect C. Conservation of energy
B. Bernoulli's principle D. None of the above

65. Another example of _____ at work is in the lift of aircraft wings and the motion of "curve balls" in baseball. In both cases the design is such as to create a speed differential of the flowing air past the object on the top and the bottom.

- A. Venturi C. Conservation of energy
B. Bernoulli's principle D. None of the Above

Understanding the Venturi

66. It is not easy to understand the reason low pressure occurs in the small diameter area of the venturi.

- A. True B. False

67. In the Venturi, the velocity is slower in the small portion of the tube.

- A. True B. False

68. In the Venturi, if velocity increases the pressure energy must decrease.

- A. True B. False

Fluid Mechanics and Hydraulic Principles Section

69. Which of the following definitions is often used to indicate gauge pressure?

- A. Head, Friction
- B. Head
- C. Hydraulics
- D. None of the above

70. 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
- B. Hydraulics
- C. Pascal's Law
- D. None of the above

71. Which of the following definitions is the application of continuous force by one body upon another that it is touching; compression?

- A. Pressure
- B. Hydraulics
- C. Pascal's Law
- D. None of the above

72. Which of the following definitions is the force per unit area, usually expressed in pounds per square inch?

- A. Pressure
- B. Hydraulics
- C. Pascal's Law
- D. None of the above

73. Which of the following definitions is the pressure differential above or below ambient atmospheric pressure?

- A. Pressure, Atmospheric
- B. Pressure, Static
- C. Pressure, Gauge
- D. None of the above

74. Which of the following definitions is height of a column or body of fluid above a given point expressed in linear units?

- A. Head, Friction
- B. Head
- C. Hydraulics
- D. None of the above

75. 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. Hydraulics
- D. None of the above

76. Which of the following definitions varies with flow, size, type, and conditions of conductors and fittings, and the fluid characteristics?

- A. Head, Friction
- B. Head, Static
- C. Hydraulics
- D. None of the above

77. Which of the following definitions is the pressure in a fluid at rest?

- A. Pressure, Atmospheric
- B. Pressure, Static
- C. Pressure, Gauge
- D. None of the above

78. Which of the following definitions is the height of a column or body of fluid above a given point?

- A. Head, Friction
- B. Head, Static
- C. Hydraulics
- D. None of the above

79. Which of the following definitions is the pressure exported by the atmosphere at any specific location?

- A. Pressure, Atmospheric
- B. Pressure, Static
- C. Pressure, Gauge
- D. None of the above

80. Which of the following definitions is pressure above zone absolute, i.e. the sum of atmospheric and gauge pressure?

- A. Pressure, Absolute
- B. Pressure
- C. Pressure, Gauge
- D. None of the above

81. Sea level pressure is approximately 2.31 pounds per square inch absolute, 1 bar = .433psi.

- A. True
- B. False

Hydraulics

82. Which of the following includes the behavior of all liquids, although it is primarily concerned with the motion of liquids?

- A. Fluids
- B. Hydrostatics
- C. Hydraulics
- D. None of the above

83. Hydrostatics 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. True
- B. False

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

- A. True
- B. False

85. Which of the following includes the consideration of liquids at rest, involves problems of buoyancy and flotation?

- A. Hydrokinetics
- B. Hydrostatics
- C. Hydraulics
- D. None of the above

86. Hydraulics is applied commonly to the study of the _____, other liquids, and even gases when the effects of compressibility are small.

- A. Fluids
- B. Hydrokinetics
- C. Mechanical properties of water
- D. None of the above

87. Hydraulics can be divided into two areas, _____ and hydrokinetics.

- A. Hydrokinetics
- B. Hydrostatics
- C. Hydraulics
- D. None of the above

88. Which of the following includes the manner in which liquids 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. None of the above

89. Which of the following terms includes the study of liquids in motion, is concerned with such matters as friction and turbulence generated in pipes by flowing liquids?

- A. Pressure
- B. Hydrokinetics
- C. Hydraulics
- D. None of the above

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

- A. Pressure
- B. Hydrostatics
- C. Hydraulics
- D. None of the above

91. Which of the following terms is an excellent example of deductive mathematical physics, and in which the predictions agree closely with experiment?

- A. Pressure
- B. Hydrokinetics
- C. Hydrostatics
- D. None of the above

What is Fluid Mechanics?

92. Fluid mechanics is a science concerned with the response of fluids to _____.

- A. Forces
- B. Its velocity
- C. Forces exerted upon them
- D. None of the above

Properties of Fluids

93. There are a few liquids, known as liquid crystals, in which the molecules are packed together in such a way as to make the properties of the medium locally anisotropic, but the vast majority of fluids - including air and water- are _____.

- A. Isotropic
- B. Anisotropic
- C. Composed of discrete molecules
- D. None of the above

94. In fluid mechanics, the state of an isotropic fluid may be explained by defining its mean mass per unit volume, or density, its temperature, and its velocity at every point in space, and just what the connection is between these macroscopic properties and the positions and velocities of individual molecules is of no direct relevance.

- A. True
- B. False

95. Fluids are _____ in the way that all the successors of Euler and Bernoulli have assumed, for fluids are composed of discrete molecules.

- A. Forces
- B. Its velocity
- C. Not strictly continuous media
- D. None of the above

Isotropic Fluid or Newtonian Fluid

96. If the fluid is also _____, the viscosity tensor reduces to two real coefficients, describing the fluid's resistance to continuous shear deformation and continuous compression or expansion, respectively.

- A. Isotropic
- B. Azeotropic
- C. Composed of discrete molecules
- D. None of the above

Fluid Statics

97. Fluid statics or hydrostatics is the branch of fluid mechanics that studies _____. It embraces the study of the conditions under which fluids are at rest in stable equilibrium; and is contrasted with fluid dynamics, the study of fluids in motion.

- A. Forces
- B. Its velocity
- C. Fluids at rest
- D. None of the above

98. Hydrostatics is fundamental to hydraulics, the engineering of equipment for storing, transporting and using fluids. It is also relevant to some aspect of geophysics and astrophysics (i.e., in understanding plate tectonics and _____), to meteorology, to medicine (with the context of blood pressure), and many other fields.

- A. Forces
- B. Its velocity
- C. Anomalies in the Earth's gravitational field
- D. None of the above

Fluid Dynamics

99. The solution to a fluid dynamics problem typically involves calculating various properties of the fluid, such as velocity, pressure, density, and temperature, as functions of space and time.

- A. True
- B. False

100. Fluid dynamics has several sub-disciplines itself, including aerodynamics (the study of air and other gases in motion) and hydrodynamics (the study of liquids in motion).

- A. True
- B. False

101. Fluid dynamics offers a systematic structure—which underlies these practical disciplines—that embraces empirical and semi-empirical laws derived from flow measurement and used to solve practical problems.

- A. True
- B. False

102. Fluid dynamics has a wide range of applications, including calculating forces and moments on aircraft, determining the mass flow rate of petroleum through pipelines, predicting evolving weather patterns, even understanding nebulae in interstellar space and modeling explosions.

- A. True
- B. False

103. Fluid dynamics is a sub-discipline of fluid mechanics that deals with fluid flow—the science of liquids and gases in motion.

- A. True
- B. False

Gases and Liquids

104. A word is needed about the _____, though the difference is easier to perceive than to describe.

- A. Volume available
- B. Volume of a liquid
- C. Difference between gases and liquids
- D. None of the above

105. In gases, the molecules are sufficiently far apart to move almost independently of one another, and gases tend to expand to fill _____.

- A. Volume available
- B. Any volume available to them
- C. Settle down into the ordered arrays
- D. None of the above

106. In liquids, the molecules are more or less in contact, and the _____ between them make them cohere; the molecules are moving too fast to settle down into the ordered arrays that are characteristic of solids, but not so fast that they can fly apart.

- A. Volume available
- B. Volume of a liquid
- C. Short-range attractive forces
- D. None of the above

107. Samples of liquid can exist as drops or as jets with free surfaces, or they can sit in beakers constrained only by _____, in a way that samples of gas cannot.

- A. Volume
- B. Gravity
- C. Ordered arrays
- D. None of the above

Solids

108. Solids can be stretched without breaking, and liquids, though not gases, can withstand stretching, too. Therefore, if the pressure is steadily reduced in a specimen of very pure water, bubbles will ultimately appear, but they may not do so until the pressure is negative and well below -10^7 newton per square meter; this is 100 times greater in magnitude than the (positive) pressure exerted by the Earth's atmosphere.

- A. True
- B. False

109. Water owes its low strength to the fact that rupture involves attraction between molecules on either side of the plane on which rupture occurs; work must be done to strengthen these links.

- A. True
- B. False

110. Water owes its strength is extremely reduced by anything that provides a nucleus at which the process known as cavitation can begin, and a liquid containing suspended _____ or dissolved gases is liable to cavitate quite easily.

- A. Surface tension
- B. Liquid surface
- C. Dust particles
- D. None of the above

Surface Tension

111. Work also must be done if a free liquid drop of spherical shape is to be drawn out into a long thin cylinder or deformed in any other way that increases its surface area. Here again work is needed to break _____.

- A. Intermolecular links
- B. Liquid surface
- C. Dissolved gases
- D. None of the above

112. The _____ behaves as if it were an elastic membrane under tension, except that the tension exerted by an elastic membrane increases when the membrane is stretched in a way that the tension exerted by a liquid surface does not.

- A. Surface tension
- B. Surface of a liquid
- C. Dissolved gases
- D. None of the above

113. Surface tension is what causes liquids to rise up capillary tubes, what supports hanging _____, what limits the formation of ripples on the surface of liquids, and so on.

- A. Surface tension
- B. Liquid surface
- C. Liquid drops
- D. None of the above

Several Types of Friction

114. Which type of friction is a case of fluid friction where a lubricant fluid separates two solid surfaces?

- A. Dry
- B. Fluid
- C. Lubricated
- D. None of the above

115. Which type of friction is the force resisting motion between the elements making up a solid material while it undergoes deformation?

- A. Dry C. Internal
- B. Fluid D. None of the above

116. Which type of friction resists relative lateral motion of two solid surfaces in contact?

- A. Dry C. Lubricated
- B. Fluid D. None of the above

117. Which type of friction describes the friction between layers of a viscous fluid that are moving relative to each other?

- A. Dry C. Lubricated
- B. Fluid D. None of the above

Water and Electrical Principles are Very Similar

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

- A. True B. False

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

- A. True B. False

120. 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 C. Hydraulic equivalents
- B. Hydraulic ohm analogy D. None of the above

Basic Ideas

121. Flow and pressure variables can be calculated in fluid flow network with the use of the?

- A. Electron fluids C. Hydraulic ohm analogy
- B. Pressures D. None of the above

122. 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

Component Equivalents

123. Electric potential: In general, it is equivalent to kinetic energy.

- A. True B. False

124. 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

125. 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

126. Memristor is a needle valve operated by a flow meter.
A. True B. False
127. A capacitor cannot "filter out" constant pressure differences frequency pressure differences.
A. True B. False
128. A resistor is considered a constriction in the bore of the pipe that requires less pressure to pass the same amount of water.
A. True B. False
129. Voltage is the difference in pressure between two points, usually measured in volts.
A. True B. False
130. A diode is equivalent to a two-way check valve with a tight valve seal.
A. True B. False
131. A wire with only one end attached to a circuit will do nothing; the pipe remains capped on the free end, and?
A. Voltage in a capacitor C. Thus adds nothing to the circuit
B. Force of gravity D. None of the above
132. If water is flowing horizontally, so that the force of gravity can be overlooked, and then electric potential is equivalent to?
A. Nothing to the circuit C. Pressure
B. Force of gravity D. None of the above
133. Normally measured in amperes, current is equivalent to a _____; that is, the volumetric quantity of flowing water over time.
A. Stretched rubber C. Hydraulic volume flow rate
B. Flow meter D. None of the above
134. 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 C. A needle valve
B. Voltage in a capacitor D. None of the above
135. An Inductor is a heavy paddle wheel placed in?
A. Potential difference C. The current
B. Feedback control D. None of the above
136. Which of the following does the inductor and its blades are analogous to inductance, and friction between its axle and the axle bearings corresponds to?
A. Resistance to current C. The mass and surface area of the wheel
B. Water level D. None of the above
137. The perfect voltage source, or ideal battery is a dynamic pump with?
A. Potential difference C. Water flow
B. Feedback control D. None of the above

138. Another analogy is _____, if one terminal is kept fixed at ground, sufficiently large that the drawn water does not affect the water level.

- A. Quantity of water
- B. Water level
- C. A large body of water at a high elevation
- D. None of the above

139. All pipes have _____, just as all wires have some resistance to current.

- A. Quantity of water
- B. Water level
- C. Some resistance to flow
- D. None of the above

140. Voltage is also called voltage drop or?

- A. Valve assembly
- B. Potential difference
- C. A positive displacement pump
- D. None of the above

141. According to the text, electric charge is equivalent to?

- A. Resistance to current
- B. Quantity of water
- C. The mass and surface area of the wheel
- D. None of the above

142. As with a diode, a small pressure difference is needed before the valve opens. In addition, like a diode, too much reverse bias can damage or destroy the?

- A. Valve assembly
- B. Feedback control
- C. A positive displacement pump
- D. None of the above

Fluid/Hydraulic Forces & Pressures Section

Atmospheric Pressure

143. The atmosphere is the entire mass of air that surrounds the earth.

- A. True
- B. False

144. Which of the following is the layer called 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. Troposphere
- B. Sea level
- C. Atmospheric pressure
- D. None of the above

145. 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

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

- A. Pressure
- B. Gauge pressure
- C. Atmospheric pressure
- D. None of the above

147. Which of the following if you could be below, in excavations and depressions, atmospheric pressure increases?

- A. Static pressure
- B. Pressure
- C. Sea level
- D. None of the above

148. Pressures under water differ from those under air only because the weight of the water must be added to the?

- A. Pressure(s) of the air
- B. Height
- C. Seal Level
- D. None of the above

149. Which of the following can be measured by any of several methods, one method is the mercury column barometer?

- A. Pressure
- B. Gauge pressure
- C. Atmospheric pressure
- D. None of the above

150. Which of the following could be measured with the aneroid Barometer?

- A. Pressure
- B. Gauge pressure
- C. Atmospheric pressure
- D. None of the above

151. The atmospheric pressure does not vary uniformly with?

- A. Barometric pressure
- B. Weight
- C. Altitude
- D. None of the above

152. Atmospheric pressure is defined as the force per unit area exerted against a surface by the _____ of the air above that surface.

- A. Barometric pressure
- B. Weight
- C. Altitude
- D. None of the above

Barometric Loop

153. 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

154. 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

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

- A. True
- B. False

156. 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

157. The barometric loop is a loop in the piping system that effectively protects against backpressure.

- A. True
- B. False

158. The barometric loop may not be used to protect against backsiphonage.

- A. True
- B. False

159. Absolute pressure and gauge pressure?

- A. Are the same
- B. Are related
- C. That effectively protects
- D. None of the above

160. Which of the following terms could be measured an absolute scale, pounds per square inch absolute (psia), or gauge scale, (psiag).

- A. Static pressure
- B. Pressure
- C. Sea level
- D. None of the above

161. Which of the following at sea level is 14.7 psai?
 A. Pressure C. Atmospheric pressure
 B. Gauge pressure D. None of the above
162. Which of the following is the total pressure?
 A. Absolute pressure C. Atmospheric pressure
 B. Gauge pressure D. None of the above
163. Which of the following would be equal to 14.7 psi, which is the atmospheric pressure?
 A. Absolute pressure C. Atmospheric pressure
 B. Gauge pressure D. None of the above

Pressure

164. Water is incompressible, while air is very compressible.
 A. True B. False
165. 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
166. Both air and water are considered to be?
 A. Gases C. Volume
 B. Fluid(s) D. None of the above
167. Which of the following terms does water possess and air does not?
 A. Gases C. Volume
 B. Fluid(s) D. None of the above
168. A force is proportional to the _____, and is called a pressure.
 A. Pascal's Principle C. Permanent forces tangential
 B. Area on which it is exerted D. None of the above
169. In order for the fluid to be in equilibrium, the pressure must be the same in all directions (or the element would move in the direction of least pressure), and if no other forces are?
 A. Permanent forces tangential C. Area on which it is exerted
 B. Acting on the body of the fluid D. None of the above
170. Which of the following does water and air have; that is, layers of them slide very easily on one another?
 A. Low viscosity C. Volume
 B. Fluid(s) D. None of the above
171. The coefficient of viscosity is the ratio of _____ to the velocity gradient.
 A. Absolute pressure C. Volume
 B. Shearing force D. None of the above
172. Which of the following deals with permanent, time-independent states of fluids, so viscosity does not appear?
 A. Pascal's Principle C. Permanent forces tangential
 B. Hydrostatics D. None of the above

173. In permanent, time-independent states of fluids, the pressure will be the same throughout the fluid, and the same in any direction at a point?

- A. Pascal's Principle
- B. Acting on the body of the fluid
- C. Permanent forces tangential
- D. None of the above

174. Which of the following that if a certain volume of fluid were somehow made solid, the equilibrium of forces would not be disturbed?

- A. Axiom
- B. Pressure
- C. Displaced fluid
- D. None of the above

175. Which of the following is an example of a body force that disturbs the equality of pressure in a fluid?

- A. Gravitational body force
- B. Pressure
- C. Gravitation
- D. None of the above

176. We call this relation the barometric equation, for when this equation is integrated, we find the variation of pressure with?

- A. Height or depth
- B. Gravitation
- C. Displaced fluid
- D. None of the above

Free Surface Perpendicular to Gravity

177. Archimedes' Principle says that the buoyant force is equal to the weight of the displaced fluid, and passes through the center of mass of?

- A. Gravitation
- B. Pressure
- C. Displaced fluid
- D. None of the above

Standard Atmospheric Pressure

178. Which of the following is a practice that is convenient to measure pressure differences by measuring the height of liquid columns?

- A. Barometer measurement
- B. Manometer
- C. Partial vacuum measurement
- D. None of the above

179. Which of the following uses a partially evacuated chamber of thin metal that expands and contracts according to the external pressure?

- A. Aneroid barometer
- B. Capillarity tube
- C. Partial vacuum
- D. None of the above

Vacuum

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

- A. Pressure
- B. Gauge pressure
- C. Atmospheric pressure
- D. None of the above

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

- A. Static pressure
- B. Gauge pressure
- C. Total vacuum
- D. None of the above

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

- A. Pressure
- B. Gauge pressure
- C. Partial vacuum
- D. None of the above

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

- A. Static pressure
- B. Gauge pressure
- C. Atmospheric pressure
- D. None of the above

Water Pressure

184. 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.

- A. True
- B. False

185. Which of the following are very frequently stated in terms of the height of a fluid.

- A. Weight
- B. Pressure(s)
- C. Depth
- D. None of the above

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

- A. Weight
- B. Pressure(s)
- C. Energy
- D. None of the above

187. Water flowing in a pipe is subject to head loss because of?

- A. Friction
- B. Pressure(s)
- C. Siphon
- D. None of the above

188. When a siphon goes below the free water levels, it is called an?

- A. Water bearer
- B. Siphon
- C. Inverted siphon
- D. None of the above

Experiments and Early Applications Section

189. Which of the following arises from our failure to accept, at first sight, the conclusion published by Blaise Pascal in 1663?

- A. Hydrostatic paradox
- B. Coriolis Force
- C. Specific gravity
- D. None of the above

190. Which of the following is a law of physics fundamental to fluid mechanics?

- A. Archimedes' principle
- B. Coriolis Force
- C. Downthrust
- D. None of the above

191. Which of the following is an effect whereby a mass moving in a rotating system experiences a force acting perpendicular to the direction of motion and to the axis of rotation.

- A. Hydrostatic paradox
- B. Coriolis Force
- C. Isobaric process
- D. None of the above

192. Which of the following is an upward force exerted by a fluid that opposes the weight of an immersed object?

- A. Archimedes' principle
- B. Coriolis Force
- C. Buoyancy or upthrust
- D. None of the above

193. _____ in a column of fluid, pressure increases with depth as a result of the weight of the overlying fluid. Thus the pressure at the bottom of a column of fluid is greater than at the top of the column.

- A. Hydrostatic paradox
- B. Buoyancy
- C. Isobaric process
- D. None of the above

194. Which of the following indicates that the upward buoyant force that is exerted on a body immersed in a fluid, whether fully or partially submerged, is equal to the weight of the fluid.

- A. Hydrostatic paradox
- B. Archimedes' principle
- C. Isobaric process
- D. None of the above

195. Which of the following is the pressure at a certain level in a fluid is proportional to the vertical distance to the surface of the liquid?

- A. Hydrostatic paradox
- B. Coriolis Force
- C. Isobaric process
- D. None of the above

196. Which of the following is the ratio of the density of a substance to the density of a reference substance; equivalently, it is the ratio of the mass of a substance to the mass of a reference substance for the same given volume?

- A. Hydrostatic paradox
- B. Coriolis Force
- C. Specific gravity
- D. None of the above

197. Which of the following is the ratio of the weight of a volume of the substance to the weight of an equal volume of the reference substance?

- A. Hydrostatic paradox
- B. Coriolis Force
- C. Specific gravity
- D. None of the above

198. Which of the following is of great importance in meteorology, since it determines the winds?

- A. Stratosphere
- B. Atmosphere
- C. Atmospheric pressure
- D. None of the above

199. Certain typical weather patterns are associated with relatively high and relatively low _____, and how they vary with time.

- A. Forces
- B. Physics
- C. Pressures
- D. None of the above

Experiments and Early Applications Key Terms

200. Which of the following to be made effective for practical applications, it was necessary to have a piston that "fit exactly?"

- A. Pascal's law
- B. Archimedes' law
- C. Aristotle' law
- D. None of the above