

Registration form

**Fluid Mechanics CEU Training Course \$200.00
48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00**

Start and Finish Dates: _____ *You will have 90 days from this date in order to complete this course*

List number of hours worked on assignment must match State Requirement. _____

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

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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.

You can obtain a printed version of the course from TLC for an additional \$69.95 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.

Do not solely depend on TLC's Approval list for it may be outdated.

Many States and employers require the final exam to be proctored.

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Fluid Mechanics CEU Course Answer Key

Name _____ Telephone # _____

It is your sole responsibility to ensure this course is accepted for credit in your State. No refunds. Did you check with your State agency to ensure this course is accepted for credit?

Method of Course acceptance confirmation. Please fill this section

Website __ Telephone Call__ Email__ Spoke to_____

Did you receive the approval number if Applicable? _____

What is the 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.

Please use Adobe Acrobat DC to complete this answer Key

Please circle, underline, bold or X only one correct answer

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**FUILD MECHANICS CEU TRAINING COURSE
CUSTOMER SERVICE RESPONSE CARD**

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

Please rate the difficulty of your course.

Very Easy 0 1 2 3 4 5 Very Difficult

Please rate the difficulty of the testing process.

Very Easy 0 1 2 3 4 5 Very Difficult

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

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Any other concerns or comments.

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. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line. Thank you...

Fluid Mechanic CEU Course Assignment

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

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

Water Composition Introduction

Water Key Words

Identify the proper term.

1. _____ has to do with the charge while organic vs. inorganic has to do with the presence or absence of carbon.
A. Capillary action
B. Polar Inorganic Compound
C. Water Chemistry Analysis
D. Supercritical Fluid
E. Surface Tension
F. None of the Above
2. Which of the following terms is the ability of a liquid to flow in narrow spaces without the assistance of, or even in opposition to, external forces like gravity?
A. Capillary action
B. Polar Inorganic Compound
C. Water Chemistry Analysis
D. Supercritical Fluid
E. Surface Tension
F. None of the Above
3. _____ is a compound that is not considered "organic".
A. Inorganic Compound
B. Molecule
C. Atom
D. Organic Material
E. pH
F. None of the Above
4. Which of the following terms allows various insects, usually denser than water, to float and stride on a water surface?
A. Capillary action
B. Polar Inorganic Compound
C. Water Chemistry Analysis
D. Supercritical Fluid
E. Surface Tension
F. None of the Above
5. _____ can occur in three different forms - gaseous, liquid, and solid.
A. Capillary action
B. Properties of Water
C. Water Chemistry Analysis
D. Supercritical Fluid
E. Surface Tension
F. None of the Above

6. Which of the following terms is the elastic tendency of a fluid surface which makes it acquire the least surface area possible?
- | | |
|-----------------------------|------------------------|
| A. Capillary action | D. Supercritical Fluid |
| B. Polar Inorganic Compound | E. Surface Tension |
| C. Water Chemistry Analysis | F. None of the Above |
7. _____ are carried out to identify and quantify the chemical components and properties of a certain water.
- | | |
|-----------------------------|------------------------|
| A. Capillary action | D. Supercritical Fluid |
| B. Polar Inorganic Compound | E. Surface Tension |
| C. Water Chemistry Analysis | F. None of the Above |
8. Which of the following terms is used extensively to determine the possible uses a water may have or to study the interaction it has with its environment?
- | | |
|-----------------------------|------------------------|
| A. Capillary action | D. Supercritical Fluid |
| B. Polar Inorganic Compound | E. Surface Tension |
| C. Water Chemistry Analysis | F. None of the Above |
9. _____ is a numeric scale used to specify the acidity or basicity of an aqueous solution.
- | | |
|-----------------------|----------------------|
| A. Inorganic Compound | D. Acid |
| B. Alkalinity | E. pH |
| C. Atom | F. None of the Above |
10. Which of the following terms is any substance at a temperature and pressure above its critical point, where distinct liquid and gas phases do not exist?
- | | |
|-----------------------------|------------------------|
| A. Capillary action | D. Supercritical Fluid |
| B. Polar Inorganic Compound | E. Surface Tension |
| C. Water Chemistry Analysis | F. None of the Above |
11. Which of the following terms can effuse through solids like a gas, and dissolve materials like a liquid?
- | | |
|-----------------------------|------------------------|
| A. Capillary action | D. Supercritical Fluid |
| B. Polar Inorganic Compound | E. Surface Tension |
| C. Water Chemistry Analysis | F. None of the Above |
12. _____ is roughly the negative of the logarithm to base 10 of the concentration, measured in units of moles per liter, of hydrogen ions.
- | | |
|-----------------------|----------------------|
| A. Inorganic Compound | D. Base |
| B. Molecule | E. pH |
| C. Alkalinity | F. None of the Above |
13. Which of the following terms are traditionally viewed as being synthesized by the agency of geological systems?
- | | |
|------------------------|----------------------|
| A. Inorganic Compounds | D. Organic Material |
| B. Molecule | E. pH |
| C. Atom | F. None of the Above |

14. _____ is an electrically neutral group of two or more atoms held together by chemical bonds.
- A. Inorganic Compound D. Organic Material
 B. Molecule E. Compound
 C. Atom F. None of the Above
15. Which of the following terms can occur in three different forms - gaseous, liquid, and solid?
- A. Capillary action D. Supercritical Fluid
 B. Properties of Water E. Surface Tension
 C. Water Chemistry Analysis F. None of the Above
16. _____ is the elastic tendency of a fluid surface which makes it acquire the least surface area possible.
- A. Capillary action D. Supercritical Fluid
 B. Polar Inorganic Compound E. Surface Tension
 C. Water Chemistry Analysis F. None of the Above
17. Which of the following terms are distinguished from ions by their lack of electrical charge?
- A. Acid D. Electron
 B. Molecule E. Proton
 C. Atom F. None of the Above

High-Specific Heat

18. Because of water unique heat dissipation property, water can moderate temperature because of the two properties: high-specific heat and the high heat of vaporization.
- A. True B. False

The Lower Density of Ice

19. At cooler temperatures, the hydrogen bonds of water molecules form ice crystals. The hydrogen bonds are less stable and will maintain its polygon shape.
- A. True B. False
20. Ice is the solid form of water and is less dense than water because of the hydrogen bonds being spaced out and being relatively apart.
- A. True B. False
21. The high density of ice is what allows icebergs to form and are the reason that only the top part of lakes is frozen.
- A. True B. False
22. Water is a neutral molecule that has a high level of neutrality and attraction to ions and other polar molecules.
- A. True B. False
23. As the atmospheric pressure decreases, the boiling point of a liquid decreases since it takes less pressure for the molecules to leave the liquid.
- A. True B. False

24. A phase diagram is a chart used in physical chemistry, engineering, mineralogy, and materials science to show conditions at which thermodynamically distinct phases occur and coexist at equilibrium.

A. True B. False

25. The solidus is the pressure in which the substance is stable in the solid state.

A. True B. False

26. Supercritical phase occurs in nature, in most normal conditions.

A. True B. False

Water as a Solvent

27. Water is a super solvent, due to its polarity.

A. True B. False

28. The capability of a substance to dissolve in water is governed by whether or not the substance can match or better the strong attractive forces that water molecules generate between other water molecules.

A. True B. False

29. If a substance has properties that do not allow it to overcome these strong intermolecular forces, the molecules are "pushed out" from the water, and will easily dissolve.

A. True B. False

30. Contrary to the common misunderstanding, water and hydrophobic substances do not "repel", and the hydration of a hydrophobic surface is energetically, but not entropically, favorable.

A. True B. False

31. Generally speaking, ionic and polar substances such as acids, alcohols, and salts are relatively non-soluble in water, as polar substances such as fats and oils.

A. True B. False

32. Polar molecules stay together in water because it is energetically more favorable for the water molecules to hydrogen bond to each other than to engage in van der Waals interactions with polar molecules.

A. True B. False

pH Section

33. What is the theory that states that an acid is a substance that produces hydronium ions when it is dissolved in water?

- | | |
|------------------|----------------------|
| A. Newton's | D. Amadeus |
| B. Alkalinity | E. Arrhenius |
| C. Lord Calvin's | F. None of the Above |

34. What is the term associated with a charged species, an atom or a molecule, that has lost or gained one or more electrons?
- A. A proton D. An electron
 B. Ion E. A cation
 C. Anti-matter F. None of the Above
35. What is a substance that has the ability to reduce other substances and is said to be reductive in nature?
- A. Protons D. Electrons
 B. An electron donor E. Cations
 C. Anti-matter F. None of the Above
36. In chemistry, pH is a measure of the acidity or basicity of an aqueous solution. Solutions with a pH less than 7 are said to be acidic and solutions with a pH greater than 7 are basic or alkaline. Pure water has a pH very close to?
- A. 5 D. 7.7
 B. 6 E. 7.5
 C. 7 F. None of the Above
37. According to the manual, which of the following parameter/methods/measurements determine a parameter using a concentration cell with transference by measuring the potential difference.
- A. Primary pH standard values D. pH measurement(s)
 B. Alkalinity E. Measurement of pH
 C. pH F. None of the Above
38. Mathematically speaking, pH is the negative logarithm of the activity of the (solvated) hydronium ion, often expressed as the measurement of?
- A. Electrons D. Cation measurement(s)
 B. Alkalinity E. Ions
 C. Hydronium ion concentration F. None of the Above
39. When measuring alkalinity in determining a stream's ability to neutralize acidic pollution from rainfall or wastewater, this measurement can be one of the best measures of the sensitivity of the stream to acid inputs.
- A. True B. False
40. One definition of pH is that it is defined as the decimal logarithm of the reciprocal of the _____, a_{H^+} , in a solution.
- A. Hydrogen ion activity D. Brønsted–Lowry acid–base theory
 B. Ion-selective electrode(s) E. Acid-base behavior
 C. (Solvated) hydronium ion F. None of the Above
41. With respect to standard buffer values, when more than two buffer solutions are used the electrode can be calibrated by fitting observed pH values to a straight line.
- A. True B. False

42. Commercial standard buffer solutions usually comes with information about value and a correction factor to be applied for what temperatures?
- A. 4 °C D. 10 °C
 B. 25 °C E. 70 °F
 C. 39 °F F. None of the Above
43. Because the pH scale is logarithmic, therefore pH is?
- A. Universal indicator D. Excess of Ion concentrations
 B. A dimensionless quantity E. A set of non-linear equations
 C. A Spectrophotometer F. None of the Above
44. What is the new pH scale is referred to as?
- A. Total scale D. Ph₃
 B. POH E. POE
 C. P3H F. None of the Above
45. Alkalinity is able to neutralize _____ and is measured in a quantitative capacity in an aqueous solution.
- A. Acid D. pH measurement(s)
 B. Base E. Bond formation
 C. pH F. None of the Above
46. When using a visual comparison of the test solution with a standard color chart, measuring pH values should be done to the?
- A. Universal indicator D. Spectrophotometer Example
 B. Colorwheel measurement E. Lab test
 C. Nearest whole number F. None of the Above
47. According to the manual, this device/method/calculation consists of a mixture of indicators that shows a continuous color change from pH 2 to pH 10.
- A. Universal indicator D. Excess of alkaline earth metal concentrations
 B. Colorimeter of spectrophotometer E. A set of non-linear simultaneous equations
 C. Spectrophotometer F. None of the Above
48. Which of the following term is an example of a mathematical procedure for calculating the concentrations of all chemical species that are present in the solution?
- A. Universal indicator D. A chemical speciation calculation
 B. pH log E. A set of non-linear simultaneous equations
 C. A set of linear equations F. None of the Above
49. According to the manual, under normal circumstances strong acids and bases are compounds that, for practical purposes, are completely dissociated in water, this means that the concentration of hydrogen ions in acidic solution can be taken to be equal to the concentration of the acid. The pH is then equal to minus the logarithm of?
- A. The concentration value D. End-point pH
 B. The pH E. A set of non-linear simultaneous equations
 C. The Spectrophotometer F. None of the Above

50. The sum of all the titratable bases is the Alkalinity of water and its acid-neutralizing capacity. What would cause the measured value to vary significantly?
- A. Acid D. pH measurement(s)
 B. Alkalinity E. End-point pH
 C. pH F. None of the Above
51. For strong acids and bases no calculations are necessary except in extreme situations. The pH of a solution containing a weak acid requires the solution of a quadratic equation.
- A. True B. False
52. If the pH of a solution contains a weak base, this may require?
- A. The solution of a cubic equation D. A set of linear simultaneous equations
 B. The solution of a linear equation E. A set of non-linear simultaneous equations
 C. The solution of a squared equation F. None of the Above
53. While the general case requires the pH solution of?
- A. The solution of a cubic equation D. A set of linear simultaneous equations
 B. The solution of a linear equation E. A set of non-linear simultaneous equations
 C. The solution of a squared equation F. None of the Above
54. Because alkalinity is significant in many uses and treatments of natural waters and wastewaters. The measured values also may include contributions from _____ or other bases if these are present.
- A. Acids D. Borates, phosphates, silicates
 B. Light metals E. Caustics
 C. Rare earths F. None of the Above
55. Calculations are not necessary except in extreme situations for strong acids and bases. The pH of a solution containing a weak acid requires?
- A. The concentration value D. Visual comparison
 B. The solution of a quadratic equation E. The solution of a cubic equation
 C. The Spectrophotometer F. None of the Above
56. What factor is key in determining the suitability of water for irrigation.
- A. pH of 8 D. Alkaline earth metal concentrations
 B. pH of 7 E. Borates, phosphates, silicates
 C. pH of 3 F. None of the Above
57. The calculation of the pH of a solution containing acids and/or bases is an example of a _____ calculation.
- A. Universal indicator D. Visual comparison
 B. Colorwheel measurement E. Chemical speciation
 C. Spectrophotometer F. None of the Above
58. Since pH is a logarithmic scale, a difference of one pH unit is equivalent to a _____ difference in hydrogen ion concentration
- A. 1 D. 10
 B. 2 E. 100
 C. 5 F. None of the Above

59. According to the manual, this key water measurement is used in the interpretation and control of water and wastewater treatment processes.

- A. Acid
- B. Alkalinity
- C. pH
- D. Chemical ion
- E. Hydrogen bond formation
- F. None of the Above

60. These compounds for all practical purposes are completely dissociated in water.

- A. Strong acids and bases
- B. Strong bases
- C. Chemical ions in chains
- D. Strong bases and weak acids
- E. Weak acids and weak bases
- F. None of the Above

61. Sodium hydroxide, NaOH, is an example of?

- A. Strong acid and base
- B. Strong base
- C. Weak base
- D. Strong base and weak acid
- E. Weak acids and weak bases
- F. None of the Above

62. According to the text, what is the pH of pure water at 50 °C?

- A. 7.7
- B. 8.0
- C. 9.0
- D. 6.55
- E. 7.00
- F. None of the Above

Section 2 - Physical Science and Related Laws

63. Physical laws are:

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

- A. Time
- B. Stable
- C. Universal
- D. Observations
- E. Space and time
- F. None of the Above

64. _____ represents unchanged since first discovered although they may have been shown to be approximations of more accurate laws.

- A. Universe
- B. Stable
- C. Absolute
- D. Time
- E. Space and time
- F. None of the Above

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

- A. Time
- B. Stable
- C. Universal
- D. Universe
- E. Omnipotent
- F. None of the Above

66. _____ represents that this appears to apply everywhere in the universe?

- A. Time
- B. Stable
- C. Universal
- D. Mass
- E. Space and time
- F. None of the Above

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

- A. Universe D. Time
- B. Stable E. Simple
- C. Absolute F. None of the Above

68. _____ represents that nothing in the universe appears to affect them?

- A. Time D. Universe
- B. Stable E. Space and time
- C. Universal F. None of the Above

69. Often expressions of existing homogeneities of?

- A. Universe D. Time
- B. Stable E. Space and time
- C. Absolute F. None of the Above

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

- A. Universe D. Time
- B. Mass E. Space
- C. Force F. None of the Above

Section 2 - Physical Science Key Terms

71. _____ 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 D. Continuum Assumption
- B. Gravity E. Inertia
- C. Mass F. None of the Above

72. Which of the following terms are three physical laws that directly relate the forces acting on a body to the motion of the body?

- A. Newton's Laws D. Laws of Thermodynamics
- B. First law E. Newton's laws of motion
- C. Physical Law F. None of the Above

73. _____ 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. Newton's Laws D. Laws of Thermodynamics
- B. First law E. Newton's laws of motion
- C. Physical Law F. None of the Above

74. Which of the following terms can also be described intuitively as a push or a pull?

- A. Force D. Push
- B. Friction E. Inertia
- C. Pull F. None of the Above

75. _____ is both a property of a physical body and a measure of its resistance to acceleration when a net force is applied.
- A. Force D. Weight
 B. Gravity E. Inertia
 C. Mass F. None of the Above
76. Which of the following terms is any interaction that, when unopposed, will change the motion of an object?
- A. Force D. Push
 B. Friction E. Inertia
 C. Pull F. None of the Above
77. _____ is the force that attracts a body toward the center of the earth, or toward any other physical body having mass.
- A. Force D. Continuum Assumption
 B. Gravity E. Inertia
 C. Mass F. None of the Above
78. Which of the following terms is the resistance of any physical object to any change in its state of motion?
- A. Force D. Drag
 B. Gravity E. Inertia
 C. Mass F. None of the Above
79. _____ is 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. Newton's Laws D. Laws of Thermodynamics
 B. Pascal's Law E. Bernoulli's Principle
 C. Physical Law F. None of the Above
80. Which of the following terms 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 D. Laws of Thermodynamics
 B. Pascal's Law E. Bernoulli's Principle
 C. Physical Law F. None of the Above
81. _____ is the tendency of objects to keep moving in a straight line at constant velocity.
- A. Force D. Friction
 B. Gravity E. Inertia
 C. Mass F. None of the Above
82. Which of the following terms can cause an object with mass to change its velocity to accelerate?
- A. Force D. Push
 B. Friction E. Inertia
 C. Pull F. None of the Above

83. _____ determines the strength of its mutual gravitational attraction to other bodies.

- A. Force
- B. Gravity
- C. Mass
- D. Weight
- E. Inertia
- F. None of the Above

84. Which of the following terms are three physical laws that, together, laid the foundation for classical mechanics?

- A. Newton's Laws of motion
- B. Pascal's Law
- C. Physical Law
- D. Laws of Thermodynamics
- E. Bernoulli's Principle
- F. None of the Above

85. _____ 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
- B. Pascal's Law
- C. Physical Law
- D. Laws of Thermodynamics
- E. Bernoulli's Principle
- F. None of the Above

86. Which of the following terms define fundamental physical quantities that characterize thermodynamic systems?

- A. Newton's Laws
- B. Pascal's Law
- C. Physical Law
- D. Laws of Thermodynamics
- E. Bernoulli's Principle
- F. None of the Above

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

- A. Newton's Laws
- B. Pascal's Law
- C. Physical Law
- D. Laws of Thermodynamics
- E. Bernoulli's Principle
- F. None of the Above

88. Which of the following terms is 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. Newton's Laws
- B. Pascal's Law
- C. Physical Law
- D. Laws of Thermodynamics
- E. Bernoulli's Principle
- F. None of the Above

Physical Science and Related Laws - Introduction

Newton's Laws

89. 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

90. 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

91. If an external force is applied, the velocity will change because of the mass.
A. True B. False

Subjective Section- the following 3 questions are not in the book but are subjective in nature.

92. Can a scientific law, such as Newton's laws be broken?
A. Yes B. No

93. The first Law of Thermodynamics, states that matter can be neither created nor destroyed.
A. True B. False

94. Is the Big Bang scientifically possible if Newton's Laws are true?
A. Yes B. No

95. 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 D. Torque
B. Fundamental interactions E. Gravity
C. Mass F. None of the Above

96. Which of the following terms represents cause no acceleration of that body as the forces balance one another?
A. Acceleration D. Stress
B. Gravity E. Internal mechanical stresses
C. Fundamental interactions F. None of the Above

97. _____ 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 D. Torque
B. Fundamental interactions E. Gravity
C. Mass F. None of the Above

98. Which of the following terms represents usually causes deformation of solid materials, or flow in fluids?
A. Acceleration D. Stress
B. Gravity E. Internal mechanical stresses
C. Fundamental interactions F. None of the Above

99. Gravity is one of the four forces of nature. The strength of the gravitational force between two objects depends on their _____.
A. Pressure D. Torque
B. Masses E. Gravity
C. Mass F. None of the Above

100. Which of the following terms represents, applied forces, and atmospheric pressure are static factors that apply equally to fluids at rest or in motion?

- A. Acceleration
- B. Gravity
- C. Fundamental interactions
- D. Stress
- E. Internal mechanical stresses
- F. None of the Above

101. _____ is also known as fundamental forces, are the interactions in physical systems that do not appear to be reducible to more basic interactions.

- A. Pressure
- B. Fundamental interactions
- C. Mass
- D. Torque
- E. Gravity
- F. None of the Above

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

- A. True
- B. False

103. Which of the following terms is the resistance of any physical object to any change in its state of motion?

- A. Pressure
- B. Fundamental interactions
- C. Mass
- D. Torque
- E. Inertia
- F. None of the Above

104. _____ is both a property of a physical body and a measure of its resistance to acceleration when a net force is applied.

- A. Acceleration
- B. Gravity
- C. Fundamental interactions
- D. Stress
- E. Mass
- F. None of the Above

105. 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

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

- A. True
- B. False

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

- A. True
- B. False

108. 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

109. Pressure in a _____ of direction.

- A. Modern hydraulics
- B. Liquid at a specific depth
- C. Liquid is independent
- D. Weight of a liquid
- E. Height of a liquid
- F. None of the Above

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

- A. Modern hydraulics
- B. Liquid at a specific depth
- C. Liquid is independent
- D. Weight of a liquid
- E. Height of a liquid
- F. None of the Above

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

- A. Depth is doubled
- B. Pressure will be less
- C. Pressure of a liquid
- D. Column is tripled
- E. Is equal
- F. None of the Above

112. The indicated pressure is doubled, when the?

- A. Depth is doubled
- B. Pressure will be less
- C. Pressure of a liquid
- D. Column is tripled
- E. Is equal
- F. None of the Above

113. The pressure at any depth in _____ of the column of liquid at that depth divided by the cross-sectional area of the column at that depth.

- A. Depth is doubled
- B. Pressure will be less
- C. Pressure of a liquid
- D. Liquid is equal to the weight
- E. Is equal
- F. None of the Above

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

- A. Depth is doubled
- B. Pressure will be less
- C. Pressure of a liquid
- D. Volume of a liquid
- E. Is equal
- F. None of the Above

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

- A. Depth is doubled
- B. Pressure will be less
- C. Pressure of a liquid
- D. Volume of a liquid
- E. Is equal
- F. None of the Above

Static Pressure

116. Static pressure exists in addition to Gravity may be present at the same time.

- A. True
- B. False

117. 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

118. 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. Pressure drop
- B. Velocity of flow
- C. Volume of a liquid
- D. Speed
- E. Static head
- F. None of the Above

119. 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
- B. Velocity of flow
- C. Volume of a liquid
- D. Fluid power
- E. Static head
- F. None of the Above

120. 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. Pressure drop
- B. Friction head
- C. Volume of a liquid
- D. Fluid power
- E. Static head
- F. None of the Above

121. _____ can be produced by pressure or head when dealing with fluids.

- A. Pressure drop
- B. Velocity of flow
- C. Force
- D. Fluid power
- E. Static head
- F. None of the Above

Volume and Velocity of Flow

122. Which of the following flow terms is passing a point in a given time is known as its volume of flow or flow rate?

- A. Pressure drop
- B. Friction head
- C. Volume of a liquid
- D. Velocity of flow
- E. Volume of flow
- F. None of the Above

123. Which of the following flow terms 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. Pressure drop
- B. Friction head
- C. Volume of a liquid
- D. Velocity of flow
- E. Volume of flow
- F. None of the Above

124. _____ 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. Pressure drop
- B. Friction head
- C. Volume of a liquid
- D. Velocity of flow
- E. Volume of flow
- F. None of the Above

125. Which of the following flow terms is an important consideration in sizing the hydraulic lines?

- A. Pressure drop
- B. Friction head
- C. Volume of a liquid
- D. Velocity of flow
- E. Volume of flow
- F. None of the Above

126. 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

127. 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

128. 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

129. _____ explains the difference between the outside and inside, causing a net force on the shower curtain which sucks it inward.

- A. Pressure D. Velocity of flow
B. Friction head E. Volume of flow
C. Volume of a liquid F. None of the Above

130. 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 D. Velocity of flow
B. Friction head E. Volume of flow
C. Volume of a liquid F. None of the Above

131. _____ 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 D. Conservation of energy
B. Bernoulli's principle E. Friction head
C. Velocity changes F. None of the Above

132. 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
B. Bernoulli's principle
C. Velocity changes
D. Conservation of energy
E. None of the Above

Understanding the Venturi

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

- A. True B. False

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

- A. True B. False

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

- A. True B. False

Section 3 - Fluid Mechanics and Hydraulic Principles

Key Terms

136. Which of the following definitions is the pressure applied to a confined fluid at rest is transmitted with equal intensity throughout the fluid?

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

137. _____ is the application of continuous force by one body upon another that it is touching; compression.

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

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

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

139. _____ is the pressure differential above or below ambient atmospheric pressure.

- A. Pressure, Atmospheric
- B. Pressure, Static
- C. Hydraulics
- D. Pressure, Gauge
- E. Pascal's Law
- F. None of the Above

140. 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, static
- C. Head
- D. Hydraulics
- E. Hydrokinetics
- F. None of the Above

141. _____ is often used to indicate gauge pressure.

- A. Head, Friction
- B. Head, static
- C. Head
- D. Hydraulics
- E. Hydrokinetics
- F. None of the Above

142. Which of the following definitions is the pressure is equal to the height times the density of the liquid?

- A. Head, Friction
- B. Head, static
- C. Head
- D. Hydraulics
- E. Hydrokinetics
- F. None of the Above

143. _____ is required to overcome the friction at the interior surface of a conductor and between fluid particles in motion.

- A. Head, Friction
- B. Head, static
- C. Head
- D. Hydraulics
- E. Hydrokinetics
- F. None of the Above

144. 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. Head
- D. Hydraulics
- E. Hydrokinetics
- F. None of the Above

145. _____ is the pressure in a fluid at rest.

- A. Pressure, Atmospheric
- B. Pressure, Static
- C. Hydraulics
- D. Pressure, Gauge
- E. Pascal's Law
- F. None of the Above

146. 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. Head
- D. Hydraulics
- E. Hydrokinetics
- F. None of the Above

147. _____ is the pressure exported by the atmosphere at any specific location.

- A. Pressure, Atmospheric
- B. Pressure, Static
- C. Hydraulics
- D. Pressure, Gauge
- E. Pascal's Law
- F. None of the Above

148. 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. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

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

- A. True
- B. False

Hydraulics

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

- A. True
- B. False

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

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

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

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

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

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

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

155. 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

156. _____ includes the behavior of all liquids, although it is primarily concerned with the motion of liquids.

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

157. 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. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

158. _____ is about pressures exerted by a fluid at rest.

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

159. 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. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

160. _____ is usually stated in that, a fluid is a substance that cannot resist a shearing stress, so that pressures are normal to confining surfaces.

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

161. According to the text, hydraulics may be the physical property that varies over the largest numerical range, competing with electrical resistivity.

- A. True
- B. False

Section 4 - Fluid/Hydraulic Forces & Pressures

Atmospheric Pressure

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

- A. True B. False

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

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

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

- A. True B. False

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

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

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

- A. True B. False

167. _____ if you could be below, in excavations and depressions, atmospheric pressure increases.

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

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

- A. Barometer D. Altitude
B. Pressure(s) of the air E. Seal Level
C. Height F. None of the Above

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

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

170. 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.

- A. True B. False

171. _____ could be measured with the aneroid barometer.
A. Static pressure D. Sea level
B. Pressure E. Atmospheric pressure
C. Gauge pressure F. None of the Above

172. The atmospheric pressure does not vary uniformly with _____.
A. Barometer D. Altitude
B. Pressure(s) E. Equipment
C. Weight F. None of the Above

173. Atmospheric pressure is defined as the force per unit area exerted against a surface by the _____ of the air above that surface.
A. Barometer D. Altitude
B. Pressure(s) E. Equipment
C. Weight F. None of the Above

Barometric Loop

174. 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

175. Which of the following terms could be measured on an absolute scale, pounds per square inch absolute (psia), or gauge scale, (psig).
A. Static pressure D. Sea level
B. Pressure E. Atmospheric pressure
C. Gauge pressure F. None of the Above

176. Absolute pressure is equal to gauge pressure plus the atmospheric pressure.
A. True B. False

177. 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

178. The barometric loop is a loop in the piping system that effectively protects against backpressure.
A. True B. False

179. The barometric loop may not be used to protect against backsiphonage.
A. True B. False

180. According to the text, absolute pressure and gauge pressure?
A. Are the same D. That effectively protects
B. Referred to using pressure E. Permanent forces tangential
C. Are related F. None of the Above

181. Which of the following terms at sea level is 14.7 psai?

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

182. _____ is the total pressure.

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

183. 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

184. _____ would be equal to 14.7 psi, which is the atmospheric pressure.

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

Pressure

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

- A. True
- B. False

186. Both air and water are considered to be _____.

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

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

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

188. 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

189. According to the text, a force is proportional to the _____, and is called a pressure.

- A. Pascal's Principle
- B. Hydrostatics
- C. Acting on the body of the fluid
- D. Permanent forces tangential
- E. Area on which it is exerted
- F. None of the Above

190. 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. Pascal's Principle
- B. Hydrostatics
- C. Acting on the body of the fluid
- D. Permanent forces tangential
- E. Area on which it is exerted
- F. None of the Above

191. Which of the following terms does water and air have; that is, layers of them slide very easily on one another?

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

192. The coefficient of viscosity is the ratio of _____ to the velocity gradient.

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

193. Which of the following terms deals with permanent, time-independent states of fluids, so viscosity does not appear?

- A. Pascal's Principle
- B. Hydrostatics
- C. Acting on the body of the fluid
- D. Permanent forces tangential
- E. Area on which it is exerted
- F. None of the Above

194. Therefore, in this case the pressure will be the same throughout the fluid, and the same in any direction at a point?

- A. Pascal's Principle
- B. Hydrostatics
- C. Acting on the body of the fluid
- D. Permanent forces tangential
- E. Area on which it is exerted
- F. None of the Above

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

- A. Axiom
- B. Gravitational body force
- C. Pressure
- D. Displaced fluid
- E. Gravitation
- F. None of the Above

196. _____ is an example of a body force that disturbs the equality of pressure in a fluid?

- A. Axiom
- B. Gravitational body force
- C. Pressure
- D. Displaced fluid
- E. Gravitation
- F. None of the Above

197. When the barometric equation is integrated, we find the variation of pressure with?

- A. Height or depth
- B. Gravitational body force
- C. Pressure
- D. Displaced fluid
- E. Gravitation
- F. None of the Above

Free Surface Perpendicular to Gravity

198. 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. Axiom
- B. Gravitational body force
- C. Pressure
- D. Displaced fluid
- E. Gravitation
- F. None of the Above

Standard Atmospheric Pressure

199. _____ is a practice that is conveniently used to measure pressure differences by measuring the height of liquid columns.

- A. Barometer measurement
- B. Total vacuum
- C. Capillarity
- D. Partial vacuum measurement
- E. Manometer
- F. None of the Above

200. _____ uses a partially evacuated chamber of thin metal that expands and contracts according to the external pressure.

- A. Aneroid barometer
- B. Total vacuum
- C. Capillarity tube
- D. Partial vacuum
- E. Barometric loop
- F. None of the Above

Vacuum

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

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

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

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

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

- A. True
- B. False

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

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

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

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

Water Pressure

206. 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

207. Which of the following terms are normally stated in terms of the height of a fluid?
- A. Friction D. Siphon
 B. Weight E. Depth
 C. Pressure(s) F. None of the Above
208. Water with a pressure head of 10 ft can provide the same _____ as an equal amount of water raised by 10 ft.
- A. Friction D. Siphon
 B. Weight E. Energy
 C. Pressure(s) F. None of the Above
209. Water flowing in a pipe is subject to head loss because of?
- A. Friction D. Siphon
 B. Weight E. Energy
 C. Pressure(s) F. None of the Above
210. When a siphon goes below the free water levels, it is called an _____ .
- A. Epihydro D. Hydrostat
 B. Water bearer E. Inverted siphon
 C. Siphon F. None of the Above
211. _____ can be made by filling the tube, closing the ends, and then putting the ends under the surface on both sides.
- A. Epihydro D. Hydrostat
 B. Water bearer E. Inverted siphon
 C. Siphon F. None of the Above

Pressure and Force

212. Which of the following terms is the force that pushes water through pipes?
- A. Absolute pressure D. Volume
 B. Pressure E. Shearing force
 C. Fluid(s) F. None of the Above
213. Water pressure determines the flow of water from the tap.
- A. True B. False
214. _____ and force are used extensively in the study of fluid power.
- A. Absolute pressure D. Volume
 B. Pressure E. Shearing force
 C. Fluid(s) F. None of the Above
215. Which of the following terms means a total push or pull. It is the push or pull exerted against the total area of a particular surface?
- A. Absolute pressure D. Volume
 B. Pressure E. Force
 C. Fluid(s) F. None of the Above

216. _____ means the amount of push or pull applied to each unit area of the surface.

- A. Absolute pressure
- B. Pressure
- C. Fluid(s)
- D. Volume
- E. Force
- F. None of the Above

217. Which of the following terms maybe exerted in one direction, in several directions, or in all directions?

- A. Absolute pressure
- B. Pressure
- C. Fluid(s)
- D. Volume
- E. Force
- F. None of the Above

Computing Force, Pressure, and Area

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

- A. True
- B. False

Section 5 – Experiments and Early Applications

Key Terms

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

- A. Hydrostatic paradox
- B. Archimedes' principle
- C. Coriolis Force
- D. Specific gravity
- E. Buoyancy or upthrust
- F. None of the Above

220. _____ is a law of physics fundamental to fluid mechanics.

- A. Hydrostatic paradox
- B. Archimedes' principle
- C. Coriolis Force
- D. Isobaric process
- E. Buoyancy or upthrust
- F. None of the Above

221. Which of the following terms 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. Archimedes' principle
- C. Coriolis Force
- D. Isobaric process
- E. Buoyancy or upthrust
- F. None of the Above

222. _____ is an upward force exerted by a fluid that opposes the weight of an immersed object.

- A. Hydrostatic paradox
- B. Archimedes' principle
- C. Coriolis Force
- D. Isobaric process
- E. Buoyancy or upthrust
- F. None of the Above

223. Which of the following terms - 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. Archimedes' principle
- C. Coriolis Force
- D. Isobaric process
- E. Buoyancy
- F. None of the Above

224. _____ 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. Coriolis Force
- D. Isobaric process
- E. Buoyancy or upthrust
- F. None of the Above

225. Which of the following terms 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. Archimedes' principle
- C. Coriolis Force
- D. Specific gravity
- E. Buoyancy or upthrust
- F. None of the Above

226. _____ is the ratio of the density of a substance to the density of a reference substance.

- A. Hydrostatic paradox
- B. Archimedes' principle
- C. Coriolis Force
- D. Specific gravity
- E. Buoyancy or upthrust
- F. None of the Above

227. Which of the following terms - On the earth, the effect tends to deflect moving objects to the right in the northern hemisphere and to the left in the southern and is important in the formation of cyclonic weather systems.

- A. Hydrostatic paradox
- B. Archimedes' principle
- C. Coriolis Force
- D. Isobaric process
- E. Buoyancy or upthrust
- F. None of the Above

228. _____ 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. Archimedes' principle
- C. Coriolis Force
- D. Specific gravity
- E. Buoyancy or upthrust
- F. None of the Above

229. _____ is the pressure difference results in a net upwards force on the object.

- A. Hydrostatic paradox
- B. Archimedes' principle
- C. Coriolis Force
- D. Isobaric process
- E. Buoyancy
- F. None of the Above

Section 5 –Modern Applications of Ancient Technology

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

- A. Stratosphere
- B. Tropopause
- C. Atmosphere
- D. Atmospheric pressure
- E. Sea level
- F. None of the Above

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

- A. Stratosphere
- B. Tropopause
- C. Atmosphere
- D. Pressures
- E. Sea level
- F. None of the Above

Section 6 - Hydraulic Foundations and Theories

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

- A. Pascal's law
- B. Evangelista Torricelli
- C. Blaise Pascal
- D. Aristotle' law
- E. Archimedes' law
- F. None of the Above

233. According to the text, valves, pumps, actuating cylinders, and motors have been developed and refined to make hydraulics one of the leading methods of transmitting power.

- A. True
- B. False

234. One characteristic of a liquid is the tendency to keep its free surface level.

- A. True
- B. False

235. Liquids will flow in the direction that will tend to make the surface level, if the surface is not level.

- A. True
- B. False

236. Daniel Bernoulli conducted experiments to study the elements of force in the discharge of water through small openings in the sides of tanks and through short pipes.

- A. True
- B. False

237. During the same period, Blaise Pascal, a French scientist, discovered the fundamental law for the science of _____.

- A. Pressure
- B. Experiments
- C. Hydraulics
- D. Force
- E. Physics
- F. None of the Above

238. _____ 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. Blaise Pascal
- D. Aristotle' law
- E. Archimedes' law
- F. None of the Above

239. The mercury column was held up by horror vacui as Aristotle had supposed.

- A. True
- B. False

240. Which of the following scientists 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?

- A. Aristotle
- B. Otto von Guericke
- C. Evangelista Torricelli
- D. Blaise Pascal
- E. Archimedes'
- F. None of the Above

241. Which of the following scientists making the first vacuum pump, which he used in vivid demonstrations of the pressure of the atmosphere?

- A. Aristotle
- B. Otto von Guericke
- C. Evangelista Torricelli
- D. Blaise Pascal
- E. Archimedes'
- F. None of the Above

242. Air, which is by no means incompressible. As we rise in the atmosphere and the pressure decreases, the air also expands.

- A. True
- B. False

243. Which of the following terms is by no means isothermal close to the ground?

- A. Stratosphere
- B. Tropopause
- C. Atmosphere
- D. Atmospheric pressure
- E. Sea level
- F. None of the Above

Section 7 - Backflow/Cross-Connection Introduction

244. Which of the following rules are required to be at least as stringent as the federal regulations as developed and enforced by the E.P.A.?

- A. Enforcement responsibility
- B. Federal laws
- C. State program regulations
- D. Cross-Connection Control
- E. Local level laws
- F. None of the Above

245. _____ is "the link or channel connecting a source of pollution with a potable water supply?"

- A. Direct piping
- B. Backflow
- C. Direct connection
- D. Cross-Connection
- E. Air break
- F. None of the Above

246. Which of the following definition terms, also referred to as Cross-Connection Control, addresses a serious health issue?

- A. Direct piping
- B. Backflow prevention
- C. Direct connection
- D. Cross-Connection
- E. Water purveyor rules
- F. None of the Above

247. Cross-Connection control was addressed by passage of the "Federal Safe Drinking Water Act" as developed by the Environmental Protection Agency (E.P.A.).

- A. True
- B. False

248. The SDWA tasked each state with primary enforcement responsibility for a program to assure access to safe drinking water by all citizens.

- A. True
- B. False

249. The first level of the law is protection of the _____ of persons subject to such risks involving service to a single customer.

- A. Internal or external piping
- B. General public and the second is protection
- C. Residential environment the pollutant source
- D. Certainly not usually intentional
- E. Certainly intentional
- F. None of the Above

250. Sources of pollution, which may result in a danger to health, are not always obvious and such cross-connections are?

- A. Internal or external piping
- B. Public and the second is protection
- C. Residential environment the pollutant source
- D. Certainly not usually intentional
- E. Certainly intentional
- F. None of the Above

251. Within a business environment, the pollutant source may involve the unintentional cross-connection of this condition with chemical processes or a heating boiler.

- A. Direct piping
- B. Backflow
- C. Direct connection
- D. Internal or external piping
- E. Air break
- F. None of the Above

252. _____ may be an improper cross-connection with a landscape sprinkler system or reserve tank fire protection system.

- A. Internal or external piping
- B. Public and the second is protection
- C. Residential environment the pollutant source
- D. Certainly not usually intentional
- E. None of the Above

253. The following could be a cause of a cross-connection: A Situation as simple as leaving a garden hose nozzle submerged in a bucket of liquid or attached to a chemical sprayer.

- A. True
- B. False

254. As far as a cross-connection, another potential hazard source within any environment may be a cross-connection of piping _____.

- A. With an air gap
- B. Backwater
- C. Without a direct connection
- D. Involving a water well located on the property.
- E. Air break
- F. None of the Above

255. The proper control of cross-connections is possible but?

- A. Only through knowledge and vigilance
- B. The key is public safety and the second is protection
- C. Residential environment is always the pollutant source
- D. Certainly not usually intentional
- E. None of the Above

256. According to the text, public education is not essential, for many that are educated in piping and plumbing installations are able to recognize cross-connection dangers.

- A. True
- B. False

What is backflow? Reverse flow condition

257. Backflow is the undesirable reversal of flow of nonpotable water or other substances through a _____ and into the piping of a public water system or consumer's potable water system.

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

258. _____ can occur when there is a stoppage of water supply due to nearby firefighting, a break in a water main.

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

259. Which of the following terms is a type of backflow caused by a downstream pressure that is greater than the upstream or supply pressure in a public water system or consumer's potable water system?

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

260. _____ can result from an increase in downstream pressure, a reduction in the potable water supply pressure, or a combination of both.

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

261. Which of the following terms can have two forms-backpressure and backsiphonage?

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

262. The basic mechanism for preventing backflow is a mechanical _____, which provides a physical barrier to backflow.

- A. High hazard installations
- B. Air gap
- C. Backflow preventer
- D. Backflow
- E. Device or method
- F. None of the Above

263. The principal types of mechanical backflow preventers are the reduced-pressure principle assembly, the _____, and the double check valve assembly.

- A. High hazard installations
- B. Air gap
- C. Vacuum breaker
- D. Backflow
- E. Device or method
- F. None of the Above

264. Which of the following terms is any temporary or permanent connection between a public water system or consumer's potable water system and any source or system containing nonpotable water or other substances?

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

265. _____ is a form of backflow caused by a negative pressure (i.e., a vacuum or partial vacuum) in a public water system or consumer's potable water system.

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

266. Which of the following terms can occur whenever the amount of water being used exceeds the amount of water being supplied?

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Reductions
- F. None of the Above

267. Which of the following terms is the means or mechanism to prevent backflow?

- A. High hazard installations
- B. Air gap
- C. Backflow preventer
- D. Backflow
- E. Device or method
- F. None of the Above

268. According to the text, basic means of preventing backflow is an _____, which either eliminates a cross-connection or provides a barrier to backflow.

- A. High hazard installations
- B. Air gap
- C. Backflow preventer
- D. Backflow
- E. Device or method
- F. None of the Above

Types of Backflow Prevention Methods and Assemblies

269. _____ must either be physically disconnected or have an approved backflow prevention device installed to protect the public water system.

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

270. The type of device selected for a particular installation depends on several factors.

- A. True
- B. False

271. When the airflow is restricted, such as the case of an air gap located near a wall, the _____ separation must be increased.

- A. Open receiving vessel
- B. Backflow preventer
- C. Barrier to backflow
- D. Air gap
- E. Air break
- F. None of the Above

272. An air gap is a physical disconnection between the free flowing discharge end of a potable water pipeline and the top of an _____ .

- A. Open receiving vessel
- B. Backflow preventer
- C. Barrier to backflow
- D. Air gap
- E. Air break
- F. None of the Above

273. Which of the following terms must be at least two times the diameter of the supply pipe and not less than one inch?

- A. Open receiving vessel
- B. Backflow preventer
- C. Barrier to backflow
- D. Air gap
- E. Air break
- F. None of the Above

274. According to the text, an air break is a physical separation between the free flowing discharge end of a potable water supply pipeline, and the overflow rim of an open or non-pressure receiving vessel.

- A. True
- B. False

275. According to the text, air gap separations must be vertically orientated a distance of at least twice the inside diameter of the supply, but never less than _____ .

- A. 1 inch
- B. 2 inches
- C. 3 inches
- D. Backflow
- E. Depends
- F. None of the Above

276. An obstruction around or near an _____ may restrict the flow of air into the outlet pipe and nullify the effectiveness of the air gap to prevent backsiphonage.

- A. High hazard installations
- B. Backflow preventer
- C. Barrier to backflow
- D. Air gap
- E. Air break
- F. None of the Above

277. An air gap is acceptable for _____ and is theoretically the most effective protection.

- A. High hazard installations
- B. Backflow preventer
- C. Barrier to backflow
- D. Low pollutional hazards
- E. High pollutional concerns
- F. None of the Above

Vacuum Breakers

278. _____ can have two types: atmospheric and pressure.

- A. Downstream piping
- B. Atmospheric vacuum breakers
- C. Vacuum breaker(s)
- D. Hazard application(s)
- E. Backflow preventor(s)
- F. None of the Above

279. Both vacuum breakers devices primary purpose is to protect the water system from cross connections due to submerged inlets, such as irrigation systems and tank applications.

- A. True
- B. False

280. The difference between the two types them is that the pressure vacuum breaker is spring loaded to assist the device's opening.

- A. True
- B. False

Section 8 –Pumps and Pumping Water

General Pumping Fundamentals

281. Sometimes suction lift is also referred to as 'positive suction head'.

- A. True B. False

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

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

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

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

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

- A. True B. False

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

- A. True B. False

Basic Water Pump

286. According to the text, the centrifugal pumps work by spinning water around in a circle inside a?

- A. Vortex D. Center of the impeller
B. Cylinder E. Cylindrical pump housing
C. Viscous drag pump F. None of the Above

287. The pump makes the water spin by pulling it with an impeller.

- A. True B. False

288. The blades of this impeller project inward from an axle like the arms of a turnstile and, as the impeller spins, the water moves through it.

- A. True B. False

289. In a centrifugal pump, the water pressure at the edge of the turning impeller rises until it is able to keep water circling with the _____.

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

290. In a centrifugal pump, as water drifts outward between the _____ of the pump, it must move faster and faster because its circular path is getting larger and larger.

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

291. As the water slows down and its kinetic energy decreases, that water's pressure potential energy increases.

- A. True B. False

292. As the water spins, the pressure near the outer edge of the pump housing becomes much lower than near the center of the impeller.

- A. True B. False

293. The impeller blades cause the water to move faster and faster.

- A. True B. False

294. The impellers may be of either a semi-open or closed type.

- A. True B. False

295. According to the text, without an inward force, an object will travel in a straight line and will not complete the _____.

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

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

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

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

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

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

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

299. Pumps are excellent examples of _____.

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

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

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

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

- A. True
- B. False

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

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

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

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

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

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

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

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

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

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

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

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

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

- A. True
- B. False

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

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

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

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

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

- A. True
- B. False

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

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

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

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

314. Fire fighting force pumps usually have two cylinders feeding one receiver alternately.

- A. True
- B. False

315. The air space in the receiver helps to make the?

- A. Rotor
- B. Water pressure uniform
- C. Volume decreases
- D. Air space
- E. Delivery
- F. None of the Above

316. The Roots blower has no valves, their place taken by the _____ between the rotors and the housing.

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

317. The Roots blower can either exhaust a receiver or provide _____ under moderate pressure, in large volumes.

- A. Air
- B. Mixed flow
- C. Dynamic
- D. Discharge tube
- E. Roots blower
- F. None of the Above

318. The Bellows is a very old device, requiring no accurate machining.

- A. True
- B. False

319. The single valve is in one or both sides of the expandable _____ .
A. Cylinder D. Cavity
B. Chamber E. Positive Displacement Pump(s)
C. Radial flow F. None of the Above

320. _____ uses the valve on the valve stem of the tire or inner tube to hold pressure in the tire.
A. Bellows pump D. Bicycle pump
B. Chamber pump E. Positive Displacement Pump
C. Radial flow pump F. None of the Above

321. Which of the following terms, 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. Piston D. Cylinder
B. Diaphragm E. Sliding contact
C. Discharged fluid F. None of the Above

322. According to the text, diaphragm and vane pumps act the same way by varying the volume of a chamber, and directing the flow with _____ .
A. Cylinder D. Cavity
B. Check valves E. Positive Displacement Pump(s)
C. Radial flow F. None of the Above

Types of Pumps

323. The family of pumps comprises a large number of types based on application and capabilities. The two major groups of pumps are?
A. Plunger and bicycle pump D. Discharge and radical displacement
B. Mixed flow and single E. Dynamic and positive displacement
C. Dynamic and radical F. None of the Above

Centrifugal pumps are classified into three general categories:

324. _____ is a centrifugal pump in which the pressure is developed wholly by centrifugal force.
A. Cylinder D. Cavity
B. Chamber E. Positive Displacement Pump(s)
C. Radial flow F. None of the Above

325. Which of the following terms is 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. Plunger pump D. Discharge tube
B. Mixed flow E. Roots blower
C. Dynamic F. None of the Above

326. _____ is 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 D. Cavity
B. Chamber E. Positive Displacement Pump(s)
C. Radial flow F. None of the Above

Positive Displacement Pumps

327. A Positive Displacement Pump has an expanding cavity on the _____ of the pump and a decreasing cavity on the discharge side.

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

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

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

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

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

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

- A. True
- B. False

331. _____ cannot be operated against a closed valve on the discharge side of the pump.

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

332. If a Positive Displacement Pump 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. True
- B. False

333. The plunger pump cannot be used for heavy sludge.

- A. True
- B. False

334. The plunger pump is a positive displacement pump that uses a _____ to force liquid from the suction side to the discharge side of the pump.

- A. Plunger pump
- B. Mixed flow
- C. Dynamic
- D. Discharge tube
- E. Plunger or piston
- F. None of the Above

335. According to the text, the movement of the plunger or piston inside the pump creates pressure inside the pump, never operated against any _____.

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

336. _____ must be open before the pump is started, to prevent any fast build-up of pressure that could damage the pump.
- A. Inward force
 - B. Discharge valves
 - C. Viscous drag pump
 - D. Center of the impeller
 - E. Incompressible fluid
 - F. None of the Above

Diaphragm Pumps

337. Which of the following terms provides the mechanical action used to force liquid from the suction to the discharge side of the pump?
- A. Centrifugal pump(s)
 - B. Impeller blade(s)
 - C. Bernoulli's equation
 - D. Diaphragm
 - E. Cylindrical pump housing
 - F. None of the Above

338. _____ has an advantage that this pump does not come in contact with moving metal.
- A. Plunger pump
 - B. Mixed flow
 - C. Dynamic
 - D. Diaphragm
 - E. Plunger or piston
 - F. None of the Above

Pump Categories

339. The key to understanding a pumps operation is that a pump is to move water and generate the _____ we call pressure.
- A. Centrifugal pump(s)
 - B. Impeller blade(s)
 - C. Delivery force
 - D. Diaphragm pump(s)
 - E. Cylindrical pump housing
 - F. None of the Above

340. Pump operation like with a centrifugal pump — pressure is not referred to in pounds per square inch but rather as the equivalent in elevation, called _____ .
- A. Inward force
 - B. Head
 - C. Viscous drag pump
 - D. Center of the impeller
 - E. Incompressible fluid
 - F. None of the Above

341. According to the text, pumps may be classified on the basis of the application they serve.
- A. True
 - B. False

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

Types of Water Pumps

343. The water production well industry almost exclusively uses turbine pumps, which are a type of centrifugal pump.
- A. True
 - B. False

344. The most common type of water pumps used for municipal and domestic water supplies are _____.

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

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

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

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

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

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

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

348. _____ are variable displacement pumps that are by far used the most.

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

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

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

350. Vertical turbine pumps are commonly used in groundwater wells. These pumps are driven by a shaft rotated by a motor on the surface.

- A. True
- B. False

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

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

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

- A. True
- B. False

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

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

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

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

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

- A. True
- B. False

356. _____ provide both a seal at the column pipe joints and keep the shaft aligned within the column.

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

357. Some vertical turbines are lubricated by oil rather than water. These pumps are essentially the same as _____; only the drive shaft is enclosed within an oil tube.

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

358. The oil tube is suspended within the column by _____, while the line shaft is supported within the oil tube by brass or redwood bearings.

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

359. A continuous supply of _____ the drive shaft as it proceeds downward through the oil tube.

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

360. A small hole located at the top of the _____ allows excess oil to enter the well. This results in the formation of an oil film _____ on the water surface within oil-lubricated wells.

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

361. Careful operation of oil lubricated turbines is needed to ensure that the pumping levels do not drop enough to allow oil to enter the pump.

- A. True
- B. False

362. According to the text, water and oil lubricated turbine pump units can be driven by?

- A. Gears
- B. Drive shaft
- C. Column pipe
- D. Electric or fuel powered motors
- E. Pump's lifting capacity
- F. None of the Above

363. Often an electric motor that is connected to the _____ by a keyway and nut.

- A. Drive shaft
- B. Rotor
- C. Inboard
- D. Sprocket
- E. Time delay or ratchet assembly
- F. None of the Above

364. Where electricity is not readily available, fuel powered engines may be connected to the drive shaft by a?

- A. Gear
- B. Lantern ring
- C. Drive shaft
- D. Volumetric positive displacement
- E. Right angle drive gear
- F. None of the Above

365. Oil and water lubricated systems will have a strainer attached to the _____ to prevent sediment from entering the pump.

- A. Intake
- B. Diaphragm
- C. Inboard
- D. Lantern ring
- E. Sump
- F. None of the Above

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

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

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

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

There are three main types of diaphragm pumps:

368. In the first type, the _____ with one side in the fluid to be pumped, and the other in air or hydraulic fluid.

- A. Vapor bubbles
- B. Chamber pressure
- C. Drive shaft
- D. Volumetric positive displacement
- E. Diaphragm is sealed
- F. None of the Above

369. The diaphragm is flexed, causing the volume of the pump chamber to increase and decrease.

- A. True
- B. False

370. A pair of _____ prevents reverse flow of the fluid.

- A. Strainers
- B. Diaphragms
- C. Springs
- D. Non-return check valves
- E. Check valves
- F. None of the Above

371. The second type of diaphragm pump works with volumetric positive displacement, but differs in that the prime mover of the diaphragm is neither oil nor air; but is?

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

372. The third type of diaphragm pump has one or more springs with the fluid to be pumped on both sides.

- A. True
- B. False

373. According to the text, when the volume of a chamber of either type of pump is increased (the diaphragm moving up), the pressure decreases, and fluid is drawn into the?

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

374. Which of the following terms represents pressure later increases from decreased volume (the diaphragm moving down); the fluid previously drawn in is forced out?

- A. Vapor bubbles
- B. Chamber
- C. Drive shaft
- D. Volumetric positive displacement
- E. Diaphragm
- F. None of the Above

375. Which of the following terms - moving up once again draws fluid into the chamber, completing the cycle?

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

Centrifugal Pump

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

- A. True
- B. False

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

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

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

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

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

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

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

- A. True
- B. False

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

- A. True
- B. False

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

- A. True
- B. False

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

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

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

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

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

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

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

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

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

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

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

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

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

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

390. _____ is installed to cool the shaft and the packing, to lubricate the packing, and to seal the rotating joint between the shaft and the packing against air leakage.

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

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

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

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

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

393. According to the text, the web of the ring is perforated so that the water can flow in either direction along the shaft between the?

- A. Web of the ring
- B. Shaft and the packing
- C. Pump shaft
- D. Mechanical seal
- E. Packing ring
- F. None of the Above

394. _____ are fitted on the shaft between the packing gland and the pump bearing housing.

- A. Staging
- B. Water flinger rings
- C. Seals
- D. Lantern ring spacer
- E. Packing gland
- F. None of the Above

395. These flingers prevent water in the _____ from flowing along the shaft and entering the bearing housing.

- A. Web of the ring
- B. Stuffing box
- C. Pump shaft
- D. Stage
- E. Volute
- F. None of the Above

Centrifugal Pump

396. As the impeller rotates, it sucks the liquid into the center of the pump and throws it out under pressure through the?

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

397. The casing that houses the impeller is referred to as the _____, the impeller fits on the shaft inside.

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

Progressing Cavity Pump Section

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

- A. True
- B. False

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

- A. True
- B. False

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

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

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

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

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

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

More on the Progressive Cavity Pump

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

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

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

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

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

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

406. Progressive cavity pumps have application in fluid metering and pumping of viscous or shear sensitive materials.

- A. True
- B. False

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

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

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

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

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

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

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

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

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

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

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

- A. True
- B. False

413. _____ and various rotor/stator pitch ratios exist, but are specialized in that they don't generally allow complete sealing.

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

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

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

415. In operation, progressive cavity pumps are fundamentally fixed flow rate pumps, like piston pumps and _____.

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

416. With the progressive cavity pump, needs a fundamentally different understanding to the types of pumps to which people are more commonly first introduced, namely ones that can be thought of as generating a _____.

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

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

- A. True
- B. False

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

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

419. _____ refers to where the rotor touches the stator, the surfaces are generally traveling transversely, so small areas of sliding contact occur, these areas need to be lubricated by the fluid being pumped.

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

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

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

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

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

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

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

423. _____ of the stator forms the required complex cavities.

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

424. _____ is used for the stator to simplify the creation of the complex internal shape.

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

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

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

Vapor Pressure and Cavitation

426. According to the text, cavitation is defined as the phenomenon of formation of vapor bubbles of a flowing liquid in a region where the pressure of the liquid falls below its?

- A. Vapor bubbles
- B. Chamber pressure
- C. Drive shaft
- D. Volumetric positive displacement
- E. Vapor pressure
- F. None of the Above

427. Cavitation is usually divided into two classes of behavior: inertial (or transient) cavitation and _____.

- A. Vapor bubbles
- B. Chamber pressure
- C. Drive shaft
- D. Volumetric positive displacement
- E. Non-inertial cavitation
- F. None of the Above

428. _____ is the process where a void or bubble in a liquid rapidly collapses, producing a shock wave.

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

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

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

430. The cavitation pits increase the turbulence of the fluid flow and create crevasses that act as nucleation sites for_____.

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

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

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

432. _____ is the process in which a bubble in a fluid is forced to oscillate in size or shape due to some form of energy input, such as an acoustic field.

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

433. According to the text, cavitation causes a great deal of _____, vibrations, and a loss of efficiency.

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

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

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

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

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

436. The pitting caused by the collapse of cavities 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. True
- B. False

Submersible Pumps

437. Submersible pumps are in essence very similar to?

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

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

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

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

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

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

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

441. _____ if inserted below the screened interval or below all productive portions of the aquifer, it will not be cooled, resulting in premature motor failure.

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

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

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

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

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

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

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

Pump Glossary

445. Which of the following definitions is any substance that can be pumped such as oil, water, refrigerant, or even air?

- A. Fluid
- B. Mixed flow pump
- C. Energy
- D. Substance
- E. Flow
- F. None of the Above

446. _____ is the end of the pump closest to the motor.

- A. Packing
- B. Impeller
- C. Inboard
- D. Bowl
- E. Outboard
- F. None of the Above

447. Which of the following definitions is the energy associated with motion?

- A. Soft start
- B. Phase
- C. Energy
- D. Flow
- E. Kinetic energy
- F. None of the Above

448. Which of the following definitions is bushing at the bottom of the stuffing box that prevents packing from being pushed out of the stuffing box into the suction eye of the impeller?

- A. Strainer
- B. Suction
- C. Suction eye
- D. Stuffing box
- E. Throat bushing
- F. None of the Above

449. _____ is force, usually along the center line of the pump.

- A. Thrust
- B. Pressure
- C. Suction
- D. Vertical power
- E. Energy
- F. None of the Above

450. Which of the following definitions is a metal ring located between rings of packing that distributes gland sealing fluid?

- A. Leak-off
- B. Gland sealing line
- C. Horizontal packing
- D. Lantern ring
- E. Gland follower
- F. None of the Above

451. _____ are pumps in which the center line of the shaft runs vertically.

- A. Thrusters
- B. Vanes
- C. Suction pumps
- D. Vertical pumps
- E. Double pumps
- F. None of the Above

452. Which of the following definitions are replaceable tubular coverings on the shaft?

- A. Protectors
- B. Shrouds
- C. Covers
- D. Shaft sleeve
- E. Stages
- F. None of the Above

453. _____ is the metal covering over the vanes of an impeller.

- A. Slop drain
- B. Shroud
- C. Slurry
- D. Shaft sleeve
- E. Stages
- F. None of the Above

454. Which of the following definitions is the drain from the area that collects leak-off from the stuffing box?

- A. Slop drain
- B. Shroud
- C. Slurry drain
- D. Shaft sleeve
- E. Stages
- F. None of the Above

455. _____ is the part of the pump that changes the speed of the fluid into pressure.

- A. Thrust
- B. Vanes
- C. Suction eye
- D. Vertical pumps
- E. Volute
- F. None of the Above

456. Which of the following definitions are the replaceable rings on the impeller or the casing that wear as the pump operates.

- A. Seals
- B. Vanes
- C. Packing glands
- D. Glands
- E. Wearing rings
- F. None of the Above

457. Which of the following definitions is the place where fluid enters the pump?

- A. Strainer
- B. Suction
- C. Entrance
- D. Stuffing box
- E. Throat
- F. None of the Above

Section 9- Pump Operation & Performance

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

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

459. _____ is the weight of liquid in comparison to water at approx. 20 degrees C.

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

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

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

461. _____ determines the type of pump used, the speed it can run at, and with gear pumps, the internal clearances required.

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

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

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

463. _____ is related to how much suction lift a pump can achieve by creating a partial vacuum.

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

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

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

NPSH - Net Positive Suction Head Section

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

- A. True
- B. False

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

- A. True
- B. False

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

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

Affinity Laws

468. The Centrifugal Pump is a very capable and?

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

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

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

470. Reducing impeller diameter is probably the most common change and is usually the?

- A. Most economical
- B. Transmit tension
- C. Most economical
- D. Atmospheric pressure
- E. Laws of Affinity
- F. None of the Above

471. The speed can be altered by changing _____ or by changing the speed of the driver.

- A. Pump suction
- B. Pulley diameters
- C. Suction conditions
- D. Rotational speed
- E. Hydraulic efficiency
- F. None of the Above

472. Which of the following terms or change in impeller diameter, the Laws of Affinity give results that are approximate?

- A. Centrifugal Pump
- B. Transmit tension
- C. Most economical
- D. Speed change
- E. Laws of Affinity
- F. None of the Above

473. According to the text, the discrepancy between the _____ and the actual values obtained in test are due to hydraulic efficiency changes that result from the modification.

- A. Calculated values
- B. Speed
- C. Suction conditions
- D. Rotational speed
- E. Hydraulic efficiency
- F. None of the Above

474. _____ give reasonably close results when the changes are not more than 50% of the original speed or 15% of the original diameter.

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

475. Which of the following terms are some of the most important factors affecting centrifugal pump operation?

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

Suction Lift

476. According to the text, atmospheric pressure at sea level is called absolute pressure (PSIA) because it is a measurement using absolute zero (a perfect vacuum) as a base.

- A. True
- B. False

477. A pump cannot push or "force" a liquid up its suction pipe because liquids do not exhibit tensile strength.

- A. True
- B. False

478. The vapor pressure of a liquid is the pressure necessary to keep the liquid from vaporizing at a given temperature.

- A. True
- B. False

479. When a pump creates a suction, it is simply reducing local pressure by creating a partial vacuum.

- A. True
- B. False

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

- A. True B. False

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

- A. True B. False

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

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

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

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

Cavitation - Two Main Causes:

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

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

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

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

Affinity laws

486. The flow changes proportionally to speed.

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

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

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

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

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

Motor and Pump Calculations Defined

489. _____ is the height we are pumping to, or the height to the discharge piping outlet that is filling the tank from the top.

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

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

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

491. _____ is caused by friction in the pipes, fittings, and system components?

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

Suction Head is Measured the Same Way.

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

- A. True
- B. False

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

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

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

- A. True
- B. False

495. A vacuum in the tank would be converted to a?

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

496. Friction loss is calculated via a formula or a chart, taking into account the pipe diameter and roughness and the fluid flow rate, density, and viscosity.

- A. True
- B. False

497. According to the text, friction in the pipes, fittings, and associated hardware is a?

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

497. Negative suction heads are added to the pump discharge head; positive suction heads are subtracted from the?

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

499. _____ is the total height that a fluid is to be pumped, taking into account friction losses in the pipe.

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

500. Which of the following terms is the head equivalent to the energy losses due to viscous drag of fluid flowing in the pipe?

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