

Registration form

# HYDRAULIC PRINCIPLES CEU COURSE \$75.00

48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$40.00

Start Date: \_\_\_\_\_ Finish Date: \_\_\_\_\_  
*You will have 90 days from this date in order to complete this course*

Name \_\_\_\_\_ Signature \_\_\_\_\_  
*(This will appear on your certificate as above)*

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City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_ Email \_\_\_\_\_

Phone:  
Home ( ) \_\_\_\_\_ Work ( ) \_\_\_\_\_ Fax ( ) \_\_\_\_\_

Operator ID# \_\_\_\_\_ Class/Grade \_\_\_\_\_

Certificate Expiration Date \_\_\_\_\_

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

Water Treatment    Water Distribution    Wastewater Collection    Wastewater Treatment

Plumbing    Drillers    Pump Installer    Pretreatment    Groundwater    Backflow    Distribution

Water Treatment    Wastewater Treatment    Collections    Other \_\_\_\_\_

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

**Technical Learning College**  
**Western Campus**  
**PO Box 420, Payson AZ 85547-0420**  
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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 \$40.00. 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...

# Hydraulic Principles Answer Sheet

Name

Telephone Number

Address

Please circle only one answer per question or X it

- |               |               |                |                |
|---------------|---------------|----------------|----------------|
| 1. A B C D E  | 41. A B C D E | 81. A B C D E  | 121. A B C D E |
| 2. A B C D E  | 42. A B C D E | 82. A B C D E  | 122. A B C D E |
| 3. A B C D E  | 43. A B C D E | 83. A B C D E  | 123. A B C D E |
| 4. A B C D E  | 44. A B C D E | 84. A B C D E  | 124. A B C D E |
| 5. A B C D E  | 45. A B C D E | 85. A B C D E  | 125. A B C D E |
| 6. A B C D E  | 46. A B C D E | 86. A B C D E  | 126. A B C D E |
| 7. A B C D E  | 47. A B C D E | 87. A B C D E  | 127. A B C D E |
| 8. A B C D E  | 48. A B C D E | 88. A B C D E  | 128. A B C D E |
| 9. A B C D E  | 49. A B C D E | 89. A B C D E  | 129. A B C D E |
| 10. A B C D E | 50. A B C D E | 90. A B C D E  | 130. A B C D E |
| 11. A B C D E | 51. A B C D E | 91. A B C D E  | 131. A B C D E |
| 12. A B C D E | 52. A B C D E | 92. A B C D E  | 132. A B C D E |
| 13. A B C D E | 53. A B C D E | 93. A B C D E  | 133. A B C D E |
| 14. A B C D E | 54. A B C D E | 94. A B C D E  | 134. A B C D E |
| 15. A B C D E | 55. A B C D E | 95. A B C D E  | 135. A B C D E |
| 16. A B C D E | 56. A B C D E | 96. A B C D E  | 136. A B C D E |
| 17. A B C D E | 57. A B C D E | 97. A B C D E  | 137. A B C D E |
| 18. A B C D E | 58. A B C D E | 98. A B C D E  | 138. A B C D E |
| 19. A B C D E | 59. A B C D E | 99. A B C D E  | 139. A B C D E |
| 20. A B C D E | 60. A B C D E | 100. A B C D E | 140. A B C D E |
| 21. A B C D E | 61. A B C D E | 101. A B C D E | 141. A B C D E |
| 22. A B C D E | 62. A B C D E | 102. A B C D E | 142. A B C D E |
| 23. A B C D E | 63. A B C D E | 103. A B C D E | 143. A B C D E |
| 24. A B C D E | 64. A B C D E | 104. A B C D E | 144. A B C D E |
| 25. A B C D E | 65. A B C D E | 105. A B C D E | 145. A B C D E |
| 26. A B C D E | 66. A B C D E | 106. A B C D E | 146. A B C D E |
| 27. A B C D E | 67. A B C D E | 107. A B C D E | 147. A B C D E |
| 28. A B C D E | 68. A B C D E | 108. A B C D E | 148. A B C D E |
| 29. A B C D E | 69. A B C D E | 109. A B C D E | 149. A B C D E |
| 30. A B C D E | 70. A B C D E | 110. A B C D E | 150. A B C D E |
| 31. A B C D E | 71. A B C D E | 111. A B C D E | 151. A B C D E |
| 32. A B C D E | 72. A B C D E | 112. A B C D E | 152. A B C D E |
| 33. A B C D E | 73. A B C D E | 113. A B C D E | 153. A B C D E |
| 34. A B C D E | 74. A B C D E | 114. A B C D E | 154. A B C D E |
| 35. A B C D E | 75. A B C D E | 115. A B C D E | 155. A B C D E |
| 36. A B C D E | 76. A B C D E | 116. A B C D E | 156. A B C D E |
| 37. A B C D E | 77. A B C D E | 117. A B C D E | 157. A B C D E |
| 38. A B C D E | 78. A B C D E | 118. A B C D E | 158. A B C D E |
| 39. A B C D E | 79. A B C D E | 119. A B C D E | 159. A B C D E |
| 40. A B C D E | 80. A B C D E | 120. A B C D E | 160. A B C D E |

161.A B C D E	185.A B C D E	209.A B C D E	233.A B C D E
162.A B C D E	186.A B C D E	210.A B C D E	234.A B C D E
163.A B C D E	187.A B C D E	211.A B C D E	235.A B C D E
164.A B C D E	188.A B C D E	212.A B C D E	236.A B C D E
165.A B C D E	189.A B C D E	213.A B C D E	237.A B C D E
166.A B C D E	190.A B C D E	214.A B C D E	238.A B C D E
167.A B C D E	191.A B C D E	215.A B C D E	239.A B C D E
168.A B C D E	192.A B C D E	216.A B C D E	240.A B C D E
169.A B C D E	193.A B C D E	217.A B C D E	241.A B C D E
170.A B C D E	194.A B C D E	218.A B C D E	242.A B C D E
171.A B C D E	195.A B C D E	219.A B C D E	243.A B C D E
172.A B C D E	196.A B C D E	220.A B C D E	244.A B C D E
173.A B C D E	197.A B C D E	221.A B C D E	245.A B C D E
174.A B C D E	198.A B C D E	222.A B C D E	246.A B C D E
175.A B C D E	199.A B C D E	223.A B C D E	247.A B C D E
176.A B C D E	200.A B C D E	224.A B C D E	248.A B C D E
177.A B C D E	201.A B C D E	225.A B C D E	249.A B C D E
178.A B C D E	202.A B C D E	226.A B C D E	250.A B C D E
179.A B C D E	203.A B C D E	227.A B C D E	
180.A B C D E	204.A B C D E	228.A B C D E	
181.A B C D E	205.A B C D E	229.A B C D E	
182.A B C D E	206.A B C D E	230.A B C D E	
183.A B C D E	207.A B C D E	231.A B C D E	
184.A B C D E	208.A B C D E	232.A B C D E	

**You are finished with your assignment; please complete the Registration page and the Customer Survey sheet on the rear page. You can fax this information to us. (928) 468-0675 *Always call an hour later to make sure we've received it.***

#### **Rush Grading Service**

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**Thank you...**

*Please mail this with your final exam*

## Hydraulic Principles CEU Training Course

### CUSTOMER SERVICE RESPONSE CARD

DATE: \_\_\_\_\_

NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

E-MAIL \_\_\_\_\_ PHONE \_\_\_\_\_

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

1. Please rate the difficulty of your course.

Very Easy    0    1    2    3    4    5    Very Difficult

2. Please rate the difficulty of the testing process.

Very Easy    0    1    2    3    4    5    Very Difficult

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

Very Similar    0    1    2    3    4    5    Very Different

4. How did you hear about this Course? \_\_\_\_\_

5. What would you do to improve the Course?

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Any other concerns or comments.

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# Hydraulic Principles CEU Course Assignment

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

**Multiple Choice Exam** *Please utilize the Answer key in the rear of this section.*

1. \_\_\_\_\_ is a branch of engineering concerned mainly with moving liquids.
  - A. Hydrokinetics
  - B. Hydrostatics
  - C. Hydraulics
  - D. Engineering
  - E. Liquids
  
2. Hydraulics is applied commonly to the study of the mechanical properties of water, other \_\_\_\_\_, and even gases when the effects of compressibility are small.
  - A. Hydrokinetics
  - B. Hydrostatics
  - C. Hydraulics
  - D. Engineering
  - E. Liquids
  
3. Hydraulics can be divided into two areas, \_\_\_\_\_ and hydrokinetics.
  - A. Hydrokinetics
  - B. Hydrostatics
  - C. Hydraulics
  - D. Engineering
  - E. Liquids
  
4. The word \_\_\_\_\_ is based on the Greek word for water, and originally covered the study of the physical behavior of water at rest and in motion.
  - A. Hydrokinetics
  - B. Hydrostatics
  - C. Hydraulics
  - D. Engineering
  - E. Liquids
  
5. Hydraulics includes the manner in which \_\_\_\_\_ act in tanks and pipes, deals with their properties, and explores ways to take advantage of these properties.
  - A. Hydrokinetics
  - B. Hydrostatics
  - C. Hydraulics
  - D. Engineering
  - E. Liquids

**Please use the Answer Key in rear.**

6. \_\_\_\_\_, the consideration of liquids at rest, involves problems of buoyancy and flotation, pressure on dams and submerged devices, and hydraulic presses.
- A. Hydrokinetics
  - B. Hydrostatics
  - C. Hydraulics
  - D. Engineering
  - E. Liquids
7. The relative incompressibility of \_\_\_\_\_ is one of its basic principles.
- A. Hydrokinetics
  - B. Hydrostatics
  - C. Hydraulics
  - D. Engineering
  - E. Liquids
8. \_\_\_\_\_, the study of liquids in motion, is concerned with such matters as friction and turbulence generated in pipes by flowing liquids, the flow of water over weirs and through nozzles, and the use of hydraulic pressure in machinery.
- A. Hydrokinetics
  - B. Hydrodynamics
  - C. Hydraulics
  - D. Engineering
  - E. Liquids
9. \_\_\_\_\_ is about the pressures exerted by a fluid at rest. Any fluid is meant, not just water.
- A. Hydrokinetics
  - B. Hydrostatics
  - C. Hydraulics
  - D. Engineering
  - E. Liquids
10. Hydrostatics is an excellent example of \_\_\_\_\_, one that can be understood easily and completely from a very few fundamentals, and in which the predictions agree closely with.
- A. Experiment
  - B. Atmosphere
  - C. Geology
  - D. Column
  - E. None of the Above
11. The definition of a fluid deserves careful consideration. Although time is not a factor in hydrostatics, it enters in the approach to hydrostatic equilibrium. It is usually stated that a fluid is a substance that cannot resist a \_\_\_\_\_, so that pressures are normal to confining surfaces.
- A. Experiment
  - B. Atmosphere
  - C. Geology
  - D. Column
  - E. Shearing stress

**Please use the Answer Key in rear.**

12. Geology has now shown us clearly that there are substances which can resist \_\_\_\_\_ forces over short time intervals, and appear to be typical solids, but which flow like liquids over long time intervals.
- A. Experiment.
  - B. Atmosphere
  - C. Geology
  - D. Column
  - E. Shearing
13. The atmosphere is the entire mass of air that surrounds the earth. While it extends upward for about 500 miles, the section of primary interest is the portion that rests on the earth's surface and extends upward for about 7 1/2 miles. This layer is called the \_\_\_\_\_.
- A. Experiment
  - B. Atmosphere
  - C. Geology
  - D. Column
  - E. None of the Above
14. If a \_\_\_\_\_ of air 1-inch square extending all the way to the "**top**" of the atmosphere could be weighed, this column of air would weigh approximately 14.7 pounds at sea level.
- A. Experiment
  - B. Atmosphere
  - C. Geology
  - D. Column
  - E. None of the Above
15. \_\_\_\_\_ pressure at sea level is approximately 14.7 psi.
- A. Experiment
  - B. Atmospheric
  - C. Geology
  - D. Column
  - E. None of the Above
16. As one \_\_\_\_\_, the atmospheric pressure decreases by approximately 1.0 psi for every 2,343 feet.
- A. Experiment
  - B. Atmosphere
  - C. Geology
  - D. Column
  - E. None of the Above
17. Below sea level, in excavations and depressions, atmospheric pressure \_\_\_\_\_.
- A. Pressure
  - B. Weight
  - C. Increases
  - D. Mercury
  - E. None of the Above

18. \_\_\_\_\_ under water differ from those under air only because the weight of the water must be added to the pressure of the air.
- A. Pressures
  - B. Weight
  - C. Increases
  - D. Mercury
  - E. None of the Above
19. Atmospheric pressure can be measured by any of several methods. The common laboratory method uses the mercury column barometer. The height of the \_\_\_\_\_ column serves as an indicator of atmospheric pressure.
- A. Pressure
  - B. Weight
  - C. Increases
  - D. Mercury
  - E. None of the Above
20. At sea level and at a temperature of 0° Celsius (**C**), the height of the mercury column is approximately 30 inches, or 76 centimeters. This represents a pressure of approximately 14.7 psi. The 30-inch column is used as a \_\_\_\_\_.
- A. Pressure
  - B. Weight
  - C. Increases
  - D. Mercury
  - E. None of the Above
21. Another device used to measure atmospheric \_\_\_\_\_ is the aneroid barometer.
- A. Pressure
  - B. Weight
  - C. Increases
  - D. Mercury
  - E. None of the Above
22. The aneroid barometer uses the change in shape of an evacuated metal cell to measure variations in atmospheric \_\_\_\_\_.
- A. Pressure
  - B. Weight
  - C. Increases
  - D. Mercury
  - E. None of the Above
23. The atmospheric pressure does \_\_\_\_\_ with altitude. It changes very rapid.
- A. Pressure
  - B. Weight
  - C. Increases
  - D. Mercury
  - E. None of the Above

24. The barometric loop consists of a continuous section of supply piping that abruptly rises to a height of approximately 35 feet and then returns back down to the originating level. It is a loop in the piping system that effectively protects against \_\_\_\_\_.
- A. Absolute scale
  - B. Barometric loops
  - C. Back-pressure
  - D. Backsiphonage
  - E. None of the Above
25. The barometric loop may not be used to protect against \_\_\_\_\_.
- A. Absolute scale
  - B. Barometric loops
  - C. Back-pressure
  - D. Backsiphonage
  - E. None of the Above
26. Its operation, in the protection against backsiphonage, is based upon the \_\_\_\_\_ that a water column, at sea level pressure, will not rise above 33.9 feet.
- A. Absolute scale
  - B. Barometric loops
  - C. Back-pressure
  - D. Backsiphonage
  - E. None of the Above
27. In general, \_\_\_\_\_ are locally fabricated, and are 35 feet high.
- A. Absolute scale
  - B. Barometric loops
  - C. Back-pressure
  - D. Backsiphonage
  - E. None of the Above
28. Pressure may be referred to using an \_\_\_\_\_, pounds per square inch absolute (**psia**), or gauge scale, (**psiag**).
- A. Absolute scale
  - B. Barometric loops
  - C. Back-pressure
  - D. Backsiphonage
  - E. None of the Above
29. Absolute pressure and gage pressure are related. \_\_\_\_\_ pressure is equal to gauge pressure plus the atmospheric pressure.
- A. Absolute
  - B. Barometric loops
  - C. Back-pressure
  - D. Backsiphonage
  - E. None of the Above

30. Absolute pressure is the \_\_\_\_\_.
- A. Absolute
  - B. Gauge
  - C. Volume
  - D. Incompressible
  - E. None of the Above
31. Gauge pressure is simply the pressure read on the gauge. If there is no pressure on the gauge other than atmospheric, the gauge will read zero. Then the \_\_\_\_\_ pressure would be equal to 14.7 psi, which is the atmospheric pressure.
- A. Absolute
  - B. Gauge
  - C. Volume
  - D. Incompressible
  - E. None of the Above
32. Water is \_\_\_\_\_, while air is very compressible, but both are fluids.
- A. Absolute
  - B. Gauge
  - C. Volume
  - D. Incompressible
  - E. None of the Above
33. Water has a definite \_\_\_\_\_; air does not.
- A. Absolute
  - B. Gauge
  - C. Volume
  - D. Incompressible
  - E. None of the Above
34. Water and air have low \_\_\_\_\_; that is, layers of them slide very easily on one another, and they quickly assume their permanent shapes when disturbed by rapid flows.
- A. Absolute
  - B. Gauge
  - C. Volume
  - D. Incompressible
  - E. None of the Above
35. A fluid, therefore, is a substance that cannot exert any \_\_\_\_\_ tangential to a boundary.
- A. Absolute
  - B. Gauge
  - C. Volume
  - D. Incompressible
  - E. None of the Above

36. Any force that it exerts on a boundary must be normal to the boundary. Such a force is proportional to the area on which it is exerted, and is called a \_\_\_\_\_.
- A. Aneroid barometer
  - B. Specific weight
  - C. Gravity
  - D. Pressure
  - E. None of the Above
37. On earth, fluids are also subject to the force of \_\_\_\_\_.
- A. Aneroid barometer
  - B. Specific weight
  - C. Gravity
  - D. Atmospheric pressure
  - E. None of the Above
38. The density of water is about 1 g/cm<sup>3</sup>, or its \_\_\_\_\_ is 62.4 pcf.
- A. Aneroid barometer
  - B. Specific weight
  - C. Gravity
  - D. Atmospheric pressure
  - E. None of the Above
39. 33.9 ft of water is the maximum height to which water can be raised by a suction pump, or, more correctly, can be supported by \_\_\_\_\_.
- A. Aneroid barometer
  - B. Specific weight
  - C. Gravity
  - D. Atmospheric pressure
  - E. None of the Above
40. When \_\_\_\_\_ acts, the liquid assumes a free surface perpendicular to gravity, which can be proved by Thomson's method.
- A. Aneroid barometer
  - B. Specific weight
  - C. Gravity
  - D. Atmospheric pressure
  - E. None of the Above
41. This definition of the standard \_\_\_\_\_ was established by Regnault in the mid-19th century. In Britain, 30 in Hg (inches of mercury) had been used previously.
- A. Aneroid barometer
  - B. Specific weight
  - C. Gravity
  - D. Atmospheric pressure
  - E. None of the Above

42. As a practical matter, it is convenient to measure pressure differences by measuring the height of liquid columns, a practice known as \_\_\_\_\_.
- A. Aneroid barometer
  - B. Specific weight
  - C. Gravity
  - D. Atmospheric pressure
  - E. None of the Above
43. The barometer is a familiar example of this, and atmospheric pressures are traditionally given in terms of the length of a \_\_\_\_\_.
- A. Aneroid barometer
  - B. Specific weight
  - C. Gravity
  - D. Atmospheric pressure
  - E. None of the Above
44. To make a barometer, the barometric tube, closed at one end, is filled with mercury and then \_\_\_\_\_ and placed in a mercury reservoir.
- A. Barometer
  - B. Specific weight
  - C. Gravity
  - D. Atmospheric pressure
  - E. None of the Above
45. An \_\_\_\_\_ uses a partially evacuated chamber of thin metal that expands and contracts according to the external pressure. This movement is communicated to a needle that revolves in a dial.
- A. Aneroid barometer
  - B. Specific weight
  - C. Gravity
  - D. Atmospheric pressure
  - E. None of the Above
46. The materials and construction in an aneroid barometer are arranged to give a low temperature \_\_\_\_\_.
- A. Aneroid barometer
  - B. Specific weight
  - C. Gravity
  - D. Atmospheric pressure
  - E. None of the Above
47. The aneroid barometer instrument must be calibrated before use, and is usually arranged to read directly in \_\_\_\_\_.
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Partial
  - E. None of the Above

48. An aneroid barometer is much easier to use in field observations, such as in \_\_\_\_\_ surveys.
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Partial
  - E. None of the Above
49. An absolute pressure is referred to a \_\_\_\_\_, while a gauge pressure is referred to the atmospheric pressure at the moment.
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Partial
  - E. None of the Above
50. Negative gauge pressure is a ( \_\_\_\_\_ ) vacuum.
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Partial
  - E. None of the Above
51. When a \_\_\_\_\_ is stated to be so many inches, this means the pressure below the atmospheric pressure of about 30 in.
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Partial
  - E. None of the Above
52. A vacuum of 25 inches is the same thing as an \_\_\_\_\_ pressure of 5 inches (of mercury).
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Partial
  - E. None of the Above
53. The term **vacuum** indicates that the absolute \_\_\_\_\_ is less than the atmospheric pressure and that the gauge pressure is negative.
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Partial
  - E. None of the Above

54. A complete or total vacuum would mean a \_\_\_\_\_ of 0 psia or -14.7 psig.
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Partial
  - E. None of the Above
55. Since it is impossible to produce a total vacuum, the term \_\_\_\_\_, will mean all degrees of partial vacuum.
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Partial
  - E. None of the Above
56. In a \_\_\_\_\_ vacuum, the pressure would range from slightly less than 14.7 psia (0 psig) to slightly greater than 0 psia (-14.7 psig).
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Partial
  - E. None of the Above
57. Backsiphonage results from atmospheric pressure exerted on a liquid forcing it toward a supply system that is under a \_\_\_\_\_.
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Partial
  - E. None of the Above
58. The weight of a cubic foot of water is 62.4 pounds per square foot. The base can be subdivided into 144-square \_\_\_\_\_ with each subdivision being subjected to a pressure of 0.433 psig.
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Partial
  - E. None of the Above
59. Pressures are very frequently stated in terms of the height of a fluid. If it is the same fluid whose pressure is being given, it is usually called "head," and the factor connecting the head and the pressure is the weight density  $\rho_g$ . In the English \_\_\_\_\_ system, weight density is in pounds per cubic inch or cubic foot.
- A. Gauge
  - B. Vacuum
  - C. Pressure
  - D. Engineer's
  - E. None of the Above

## A little math.

60. What would the static pressure be on a pressure gauge at the bottom of a 60 foot wide water tower that contained 180 feet of water?

- A. 415
- B. 78
- C. 1501.2
- D. 25.98
- E. 10800

61. What would the static pressure be on a pressure gauge at the bottom of a 30 foot wide water tower that contained 180 feet of water?

- A. 415
- B. 78
- C. 1501.2
- D. 25.98
- E. 10800

62. What would the static pressure be on a pressure gauge at the bottom of a 300 foot wide water tower that contained 10 feet of water?

- A. 2.31
- B. 23.10
- C. 43
- D. 4.33
- E. None of the above

63. A fire hydrant has a static pressure of 86 PSI, how much Head is stores in the storage tank?

- A. Not enough information.
- B. 37.22
- C. 198.66
- D. 643.28

64. There is 35 feet of water in a storage tank. The tank was recently pressure cleaned and is located at the top of a hill. What should the natural pressure be on the bottom of this cleaned tank?

- A. Not enough information.
- B. Too much information but the answer is 15 PSI
- C. Too much information but the answer is 283 PSI

65. In studying fluids \_\_\_\_\_, we are concerned with the transmission of force and the factors which affect the forces in liquids. Additionally, pressure in and on liquids and factors affecting pressure are of great importance.

- A. Force
- B. Pressure
- C. Pull
- D. Push
- E. None of the Above



66. Pressure is the force that pushes water through pipes. Water pressure determines the flow of water from the tap. If \_\_\_\_\_ is not sufficient then the flow can reduce to a trickle and it will take a long time to fill a kettle or a cistern.
- A. Force
  - B. Pressure
  - C. Pull
  - D. Push
  - E. None of the Above
67. The terms **force** and \_\_\_\_\_ are used extensively in the study of fluid power. It is essential that we distinguish between the terms.
- A. Force
  - B. Pressure
  - C. Pull
  - D. Push
  - E. None of the Above
68. Force means a total push or \_\_\_\_\_. It is the push or pull exerted against the total area of a particular surface and is expressed in pounds or grams.
- A. Force
  - B. Pressure
  - C. Pull
  - D. Push
  - E. None of the Above
69. Pressure means the amount of \_\_\_\_\_ or pull (force) applied to each unit area of the surface and is expressed in pounds per square inch (lb/in<sup>2</sup>) or grams per square centimeter (gm/cm<sup>2</sup>).
- A. Force
  - B. Pressure
  - C. Pull
  - D. Push
  - E. None of the Above
70. Pressure may be \_\_\_\_\_ in one direction, in several directions, or in all directions.
- A. Force
  - B. Pressure
  - C. Pull
  - D. Push
  - E. None of the Above
71. A formula is used in computing force, pressure, and area in fluid power systems. In this formula, P refers to pressure, F indicates force, and A represents area. \_\_\_\_\_ equals pressure times area.
- A. Force
  - B. Pressure
  - C. Pull
  - D. Push

## Some History

72. Although the modern development of hydraulics is comparatively recent, the ancients were familiar with many \_\_\_\_\_ and their applications.

- A. Submerged bodies
- B. Fundamental law
- C. Hydraulic principles
- D. Domestic purposes
- E. Discharge of water

73. The Egyptians and the ancient people of Persia, India, and China conveyed water along channels for irrigation and \_\_\_\_\_, using dams and sluice gates to control the flow.

- A. Submerged bodies
- B. Fundamental law
- C. Hydraulic principles
- D. Domestic purposes
- E. Discharge of water

74. The ancient Cretans had an elaborate plumbing system. Archimedes studied the laws of floating and \_\_\_\_\_. The Romans constructed aqueducts to carry water to their cities.

- A. Submerged bodies
- B. Fundamental law
- C. Hydraulic principles
- D. Domestic purposes
- E. Discharge of water

75. Beginning near the end of the seventeenth century, Italian physicist, Evangelista Torricelle, French physicist, Edme Mariotte, and later, Daniel Bernoulli conducted experiments to study the elements of force in the \_\_\_\_\_ through small openings in the sides of tanks and through short pipes.

- A. Submerged bodies
- B. Fundamental law
- C. Hydraulic principles
- D. Domestic purposes
- E. Discharge of water

76. Blaise Pascal, a French scientist, discovered the \_\_\_\_\_ for the science of hydraulics.

- A. Submerged bodies
- B. Fundamental law
- C. Hydraulic principles
- D. Domestic purposes
- E. Discharge of water

77. \_\_\_\_\_ states that increase in pressure on the surface of a confined fluid is transmitted undiminished throughout the confining vessel or system.

- A. Pascal's law
- B. Evangelista Torricelli
- C. Galileo
- D. Experimentum crucis

78. For \_\_\_\_\_ to be made effective for practical applications, it was necessary to have a piston that "**fit exactly**." It was not until the latter part of the eighteenth century that methods were found to make these snugly fitted parts required in hydraulic systems.
- A. Pascal's law
  - B. Evangelista Torricelli
  - C. Galileo
  - D. Experimentum cruces
  - E. None of the Above
79. \_\_\_\_\_ was accomplished by the invention of machines that were used to cut and shape the necessary closely fitted parts and, particularly, by the development of gaskets and packings.
- A. Pascal's law
  - B. Evangelista Torricelli
  - C. Galileo
  - D. Experimentum cruces
  - E. None of the Above
80. Since that time, \_\_\_\_\_ such as valves, pumps, actuating cylinders, and motors have been developed and refined to make hydraulics one of the leading methods of transmitting power.
- A. Pascal's law
  - B. Evangelista Torricelli
  - C. Galileo
  - D. Experimentum cruces
  - E. None of the Above
81. Evangelista Torricelli (1608-1647), was \_\_\_\_\_'s student and secretary,
- A. Pascal's law
  - B. Evangelista Torricelli
  - C. Galileo
  - D. Experimentum cruces
  - E. None of the Above
82. \_\_\_\_\_ a member of the Florentine Academy of Experiments, invented the mercury barometer in 1643, and brought the weight of the atmosphere to light.
- A. Pascal's law
  - B. Evangelista Torricelli
  - C. Galileo
  - D. Experimentum cruces
  - E. None of the Above
83. The mercury column was held up by the pressure of the atmosphere, not by horror vacui as \_\_\_\_\_ had supposed.
- A. Aristotle
  - B. Evangelista Torricelli
  - C. Galileo
  - D. Experimentum cruces
  - E. None of the Above

84. Torricelli's early death was a blow to science, but his ideas were furthered by \_\_\_\_\_ (1623-1662).
- A. Pascal
  - B. Evangelista Torricelli
  - C. Galileo
  - D. Experimentum crucis
  - E. None of the Above
85. \_\_\_\_\_ had a barometer carried up the 1465 m high Puy de Dôme, an extinct volcano in the Auvergne just west of his home of Clermont-Ferrand in 1648 by Périer, his brother-in-law. Pascal's experimentum crucis is one of the triumphs of early modern science.
- A. Pascal
  - B. Evangelista Torricelli
  - C. Galileo
  - D. Experimentum crucis
  - E. None of the Above
86. The Puy de Dôme is not the highest peak in the Massif Central--the Puy de Sancy, at 1866 m is, but it was the closest. \_\_\_\_\_ is now the centre of the French pneumatics industry.
- A. Pascal
  - B. Evangelista Torricelli
  - C. Galileo
  - D. Experimentum crucis
  - E. None of the Above
87. The remarkable \_\_\_\_\_ (1602-1686), Burgomeister of Magdeburg, Saxony, took up the cause, making the first vacuum pump, which he used in vivid demonstrations of the pressure of the atmosphere to the Imperial Diet at Regensburg in 1654.
- A. Pascal
  - B. Otto von Guericke
  - C. Robert Boyle
  - D. Torricelli's
  - E. None of the Above Famous Scientists
88. Famously, he evacuated a sphere consisting of two well-fitting hemispheres about a foot in diameter, and showed that 16 horses, 8 on each side, could not pull them apart. An original vacuum pump and hemispheres from 1663.
- A. Pascal
  - B. Otto von Guericke
  - C. Robert Boyle
  - D. Torricelli's
  - E. None of the Above Famous Scientists
89. He also showed that air had weight, and how much force it required to separate evacuated hemispheres.
- A. Pascal
  - B. Otto von Guericke
  - C. Robert Boyle
  - D. Torricelli's

90. In England, Robert Hooke (1635-1703) made a vacuum pump for \_\_\_\_\_ (1627-1691). Christian Huygens (1629-1695) became interested in a visit to London in 1661 and had a vacuum pump built for him.
- A. Pascal
  - B. Otto von Guericke
  - C. Robert Boyle
  - D. Torricelli's
  - E. None of the Above Famous Scientists
91. By this time, \_\_\_\_\_ doctrine had triumphed over the Church's support for horror vacui. This was one of the first victories for rational physics over the illusions of experience, and is well worth consideration.
- A. Pascal
  - B. Otto von Guericke
  - C. Robert Boyle
  - D. Torricelli's
  - E. None of the Above Famous Scientists
92. \_\_\_\_\_ demonstrated that the siphon worked by atmospheric pressure, not by horror vacui.
- A. Pascal
  - B. Otto von Guericke
  - C. Robert Boyle
  - D. Torricelli's
  - E. None of the Above Famous Scientists
93. The mm of mercury is sometimes called a torr after Torricelli, and \_\_\_\_\_ also has been honored by a unit of pressure, a newton per square meter or 10 dyne/cm<sup>2</sup>
- A. Pascal
  - B. Otto von Guericke
  - C. Robert Boyle
  - D. Torricelli's

**These questions will come from the Glossary**

94. \_\_\_\_\_ The Law of Conservation of Mass states that mass can be neither created nor destroyed. Using the Mass Conservation Law on a **steady flow** process - flow where the flow rate don't change over time - through a control volume where the stored mass in the control volume don't change - implements that inflow equals outflow.
- A. Conservation laws
  - B. Euler Equations
  - C. Equation of Mechanical Energy
  - D. Equation of Continuity
  - E. The Bernoulli Equation

95. \_\_\_\_\_ is a statement of the first law of thermodynamics. The energy equation involves energy, heat transfer and work.
- A. Conservation laws
  - B. Euler Equations
  - C. Equation of Mechanical Energy
  - D. Equation of Continuity
  - E. The Bernoulli Equation
96. With certain limitations the mechanical energy equation can be compared to the Bernoulli Equation and transferred to the Mechanical Energy Equation in Terms of Energy per Unit Mass.
- A. Conservation laws
  - B. Euler Equations
  - C. Equation of Mechanical Energy
  - D. Equation of Continuity
  - E. The Bernoulli Equation
97. \_\_\_\_\_ - A statement of the conservation of energy in a form useful for solving problems involving fluids. For a non-viscous, incompressible fluid in steady flow, the sum of pressure, potential and kinetic energies per unit volume is constant at any point.
- A. Conservation laws
  - B. Euler Equations
  - C. Equation of Mechanical Energy
  - D. Equation of Continuity
  - E. The Bernoulli Equation
98. The \_\_\_\_\_ states that particular measurable properties of an isolated physical system does not change as the system evolves.
- A. Conservation laws
  - B. Euler Equations
  - C. Equation of Mechanical Energy
  - D. Equation of Continuity
  - E. The Bernoulli Equation
99. \_\_\_\_\_ Pressure Loss and Head Loss due to Friction in Ducts and Tubes - Major loss - head loss or pressure loss - due to friction in pipes and ducts.
- A. Conservation laws
  - B. Euler Equations
  - C. Darcy-Weisbach Equation
  - D. Laplace Equations
  - E. The Bernoulli Equation
100. In fluid dynamics, the \_\_\_\_\_ govern the motion of a compressible, inviscid fluid. They correspond to the Navier-Stokes equations with zero viscosity, although they are usually written in the form shown here because this emphasizes the fact that they directly represent conservation of mass, momentum, and energy.
- A. Conservation laws
  - B. Euler Equations
  - C. Equation of Mechanical Energy
  - D. Equation of Continuity

101. The \_\_\_\_\_ describes the behavior of gravitational, electric, and fluid potentials.

- A. Conservation laws
- B. Euler Equations
- C. Darcy-Weisbach Equation
- D. Laplace Equations
- E. The Bernoulli Equation

102. The \_\_\_\_\_ - For a perfect or ideal gas the change in density is directly related to the change in temperature and pressure as expressed in the Ideal Gas Law.

- A. Mechanical Energy Equation
- B. Pressure
- C. Navier-Stokes Equations
- D. Euler Equations
- E. Ideal Gas Law

103. The motion of a non-turbulent, Newtonian fluid is governed by the \_\_\_\_\_. The equation can be used to model turbulent flow, where the fluid parameters are interpreted as time-averaged values.

- A. Mechanical Energy Equation
- B. Pressure
- C. Navier-Stokes Equations
- D. Euler Equations
- E. Ideal Gas Law

104. The \_\_\_\_\_ - The mechanical energy equation in Terms of Energy per Unit Mass, in Terms of Energy per Unit Volume and in Terms of Energy per Unit Weight involves Heads.

- A. Mechanical Energy Equation
- B. Pressure
- C. Navier-Stokes Equations
- D. Euler Equations
- E. Ideal Gas Law

105. Static Pressure and Pressure Head in a Fluid - \_\_\_\_\_ and \_\_\_\_\_ head in a static fluid.

- A. Mechanical Energy Equation
- B. Pressure
- C. Navier-Stokes Equations
- D. Euler Equations
- E. Ideal Gas Law

106. In fluid dynamics, the \_\_\_\_\_ govern the motion of a compressible, inviscid fluid. They correspond to the Navier-Stokes equations with zero viscosity, although they are usually written in the form shown here because this emphasizes the fact that they directly represent conservation of mass, momentum, and energy.

- A. Mechanical Energy Equation
- B. Navier-Stokes Equations
- C. Euler Equations

107. \_\_\_\_\_: If the compression or expansion takes place under constant temperature conditions - the process is called **isothermal**.

- A. Contaminant
- B. Compression and Expansion of Gases
- C. Conservation Laws
- D. Contamination
- E. Isothermal

108. The \_\_\_\_\_ states that particular measurable properties of an isolated physical system does not change as the system evolves: Conservation of energy (including mass). Fluid Mechanics and Conservation of Mass - The law of conservation of mass states that mass can neither be created or destroyed.

- A. Contaminant
- B. Compression and Expansion of Gases
- C. Conservation Laws
- D. Contamination
- E. Isothermal

109. \_\_\_\_\_ Any natural or man-made physical, chemical, biological, or radiological substance or matter in water, which is at a level that may have an adverse effect on public health, and which is known or anticipated to occur in public water systems.

- A. Contaminant
- B. Compression and Expansion of Gases
- C. Conservation Laws
- D. Contamination
- E. Isothermal

110. \_\_\_\_\_ To make something bad. To pollute or infect something. To reduce the quality of the potable (drinking) water and create an actual hazard to the water supply by poisoning or through spread of diseases.

- A. Contaminant
- B. Compression and Expansion of Gases
- C. Conservation Laws
- D. Contamination
- E. Isothermal

111. The Bernoulli's Equation describes the behavior of \_\_\_\_\_ along a streamline.

- A. Energy principle
- B. Counterintuitive
- C. Moving fluids
- D. Qualitative behavior
- E. Viscosity will decrease

112. The Bernoulli Equation can be considered to be a statement of the conservation of \_\_\_\_\_ appropriate for flowing fluids.

- A. Energy principle
- B. Counterintuitive
- C. Moving fluids
- D. Qualitative behavior

113. The \_\_\_\_\_ that is usually labeled with the term "**Bernoulli effect**" is the lowering of fluid pressure in regions where the flow velocity is increased.

- A. Energy principle
- B. Counterintuitive
- C. Moving fluids
- D. Qualitative behavior
- E. Viscosity will decrease

114. This lowering of pressure in a constriction of a flow path may seem \_\_\_\_\_, but seems less so when you consider pressure to be energy density. In the high velocity flow through the constriction, kinetic energy must increase at the expense of pressure energy.

- A. Energy principle
- B. Counterintuitive
- C. Moving fluids
- D. Qualitative behavior
- E. Viscosity will decrease

115. Bingham Plastic Fluids have a yield value which must be exceeded before it will start to flow like a fluid. From that point the \_\_\_\_\_ with increase of agitation. Toothpaste, mayonnaise and tomato catsup are examples of such products.

- A. Energy principle
- B. Counterintuitive
- C. Moving fluids
- D. Qualitative behavior
- E. Viscosity will decrease

116. The boundary layer is the layer of fluid in the immediate vicinity of a \_\_\_\_\_.

- A. Velocity
- B. Bounding surface
- C. Significant factor
- D. Capillary action
- E. Compressibility of fluids

117. **Bulk Modulus and Fluid Elasticity:** An introduction to and a definition of the Bulk Modulus Elasticity commonly used to characterize the \_\_\_\_\_

- A. Velocity
- B. Convex surface
- C. Significant factor
- D. Capillary action
- E. Compressibility of fluids

118. **Capillarity:** Capillarity or \_\_\_\_\_ is the ability of a narrow tube to draw a liquid upwards against the force of gravity.

- A. Velocity
- B. Convex surface
- C. Significant factor
- D. Capillary action
- E. Compressibility of fluids

119. **Cauchy Number:** The Cauchy Number is a dimensionless value useful for analyzing fluid flow dynamics problems where compressibility is a \_\_\_\_\_.

- A. Velocity
- B. Convex surface
- C. Significant factor
- D. Capillary action
- E. Compressibility of fluids

120. **Chezy Formula:** Conduits flow and mean \_\_\_\_\_.

- A. Velocity
- B. Convex surface
- C. Significant factor
- D. Capillary action
- E. Compressibility of fluids

121. The Coanda Effect is the tendency of a stream of fluid to stay attached to a \_\_\_\_\_, rather than follow a straight line in its original direction.

- A. Velocity
- B. Convex surface
- C. Significant factor
- D. Capillary action
- E. Compressibility of fluids

122. Under the wrong condition, \_\_\_\_\_ will reduce the component's lifetime dramatically.

- A. Suction
- B. Cavities
- C. Collapse
- D. Fluid accelerates
- E. Cavitation

123. \_\_\_\_\_ may occur when the local static pressure in a fluid reach as a level below the vapor pressure of the liquid at the actual temperature.

- A. Suction
- B. Cavities
- C. Collapse
- D. Cavitation

124. According to the Bernoulli Equation this may happen when the \_\_\_\_\_ in a control valve or around a pump impeller.

- A. Suction
- B. Cavities
- C. Collapse
- D. Fluid accelerates
- E. Cavitation

125. The vaporization itself does not cause the damage - the damage happens when the vapor almost immediately \_\_\_\_\_ after evaporation when the velocity is decreased and pressure increased.

- A. Suction
- B. Cavities
- C. Collapse
- D. Fluid accelerates
- E. Cavitation

126. Cavitation means that \_\_\_\_\_ are forming in the liquid that we are pumping.

- A. Suction
- B. Cavities
- C. Collapse
- D. Fluid accelerates
- E. Cavitation

127. When these cavities form at the suction of the pump several things happen all at once: We experience a loss in capacity. We can no longer build the same head (pressure). The efficiency drops. The cavities or bubbles will \_\_\_\_\_ when they pass into the higher regions of pressure causing noise, vibration, and damage to many of the components.

- A. Suction
- B. Cavities
- C. Collapse
- D. Fluid accelerates
- E. Cavitation

128. The \_\_\_\_\_ form for five basic reasons and it is common practice to lump all of them into the general classification of cavitation.

- A. Suction
- B. Cavities
- C. Collapse
- D. Fluid accelerates
- E. Cavitation

129. **Colebrook Equation:** The \_\_\_\_\_ used to calculate pressure loss (or major loss) in ducts, tubes and pipes can be calculated with the Colebrook equation.

and can be used to calculate the friction coefficients in different kinds of fluid flows - air ventilation ducts, pipes and tubes with water or oil, compressed air and much more.

- A. Physical separation
- B. Undergo significant
- C. Friction coefficients
- D. Usually expressed
- E. None of Above

130. **Compressible Flow:** We know that fluids are classified as Incompressible and Compressible fluids. Incompressible fluids do not undergo significant changes in density as they flow. In general, liquids are incompressible; water being an excellent example. In contrast compressible fluids do undergo \_\_\_\_\_.

- A. Physical separation
- B. Undergo significant
- C. Friction coefficients
- D. Usually expressed
- E. None of Above

131. **Air Break:** An air break is a \_\_\_\_\_ which may be a low inlet into the indirect waste receptor from the fixture, or device that is indirectly connected. You will most likely find an air break on waste fixtures or on non-potable lines. You should never allow an air break on an ice machine.

- A. Physical separation
- B. Undergo significant
- C. Friction coefficients
- D. Usually expressed
- E. None of Above

132. **Air Gap Separation:** A \_\_\_\_\_ space that is present between the discharge vessel and the receiving vessel, for an example, a kitchen faucet.

- A. Physical separation
- B. Undergo significant
- C. Friction coefficients
- D. Usually expressed
- E. None of Above

133. **Absolute Pressure:** The pressure above zone absolute, i.e. the sum of atmospheric and gage pressure. In vacuum related work it is \_\_\_\_\_ in millimeters of mercury. (mmHg).

- A. Physical separation
- B. Undergo significant
- C. Friction coefficients
- D. Usually expressed
- E. None of Above

134. **Aerodynamics:** Aerodynamics is the study of the flow of gases. The Ideal Gas Law - For a perfect or ideal gas the \_\_\_\_\_ is directly related to the change in temperature and pressure as expressed in the Ideal Gas Law.

- A. Physical separation
- B. Undergo significant
- C. Friction coefficients
- D. Usually expressed
- E. None of Above

135. **Aeronautics:** Aeronautics is the mathematics and mechanics of \_\_\_\_\_, in particular airplanes.

- A. Physical separation
- B. Undergo significant
- C. Friction coefficients
- D. Usually expressed
- E. None of Above

136. **Atmospheric Pressure:** Pressure exerted by the atmosphere at any \_\_\_\_\_. (Sea level pressure is approximately 14.7 pounds per square inch absolute, 1 bar = 14.5psi.)

- A. Undesirable effect
- B. Specific location
- C. Stop or prevent
- D. Destructive manner
- E. None of Above

137. **Backflow Prevention:** To \_\_\_\_\_ the occurrence of, the unnatural act of reversing the normal direction of the flow of liquid, gases, or solid substances back in to the public potable (drinking) water supply. See Cross-connection control.

- A. Undesirable effect
- B. Specific location
- C. Stop or prevent
- D. Destructive manner

138. **Backflow:** To reverse the natural and normal directional flow of a liquid, gases, or solid substances back in to the public potable (drinking) water supply. This is normally an \_\_\_\_\_.

- A. Undesirable effect
- B. Specific location
- C. Stop or prevent
- D. Destructive manner
- E. None of Above

139. **Backsiphonage:** A liquid substance that is carried over a higher point. It is the method by which the \_\_\_\_\_ may be forced by excess pressure over or into a higher point.

- A. Undesirable effect
- B. Specific location
- C. Stop or prevent
- D. Destructive manner
- E. None of Above

140. **Corrosion:** The removal of metal from copper, other metal surfaces and concrete surfaces in a \_\_\_\_\_. Corrosion is caused by improperly balanced water or excessive water velocity through piping or heat exchangers.

- A. Undesirable effect
- B. Specific location
- C. Stop or prevent
- D. Destructive manner

E. None of Above

141. **Cross-Contamination:** The \_\_\_\_\_ of two unlike qualities of water. For example the mixing of good water with a polluting substance like a chemical substance.

- A. Undesirable effect
- B. Specific location
- C. Stop or prevent
- D. Destructive manner
- E. None of Above

142. **Density:** Is a \_\_\_\_\_ of matter, as each element and compound has a unique density associated with it.

- A. Inhibit growth
- B. Physical property
- C. With agitation
- D. Treatment
- E. Object moving

143. Density defined in a \_\_\_\_\_ as the measure of the relative "heaviness" of objects with a constant volume.

- A. Inhibit growth
- B. Physical property
- C. Qualitative manner
- D. Treatment

144. **Dilatant Fluids:** Shear Thickening Fluids or Dilatant Fluids increase their viscosity with agitation. Some of these liquids can become almost solid within a pump or pipe line.

\_\_\_\_\_, cream becomes butter and Candy compounds, clay slurries and similar heavily filled liquids do the same thing.

- A. Inhibit growth
- B. Physical property
- C. With agitation
- D. Treatment
- E. Object moving

145. **Disinfect:** To kill and \_\_\_\_\_ of harmful bacterial and viruses in drinking water.

- A. Inhibit growth
- B. Physical property
- C. With agitation
- D. Treatment
- E. Object moving

146. **Disinfection:** The \_\_\_\_\_ of water to inactivate, destroy, and/or remove pathogenic bacteria, viruses, protozoa, and other parasites.

- A. Inhibit growth
- B. Physical property
- C. With agitation
- D. Treatment
- E. Object moving

147. **Drag Coefficient:** The drag coefficient is used to express the drag of an object in moving fluid. Any \_\_\_\_\_ through a fluid will experience a drag - the net force in direction of flow due to the pressure and shear stress forces on the surface of the object.

- A. Inhibit growth
- B. Physical property
- C. With agitation
- D. Treatment
- E. Object moving

148. **Dynamic, Absolute and Kinematic Viscosity:** The viscosity of a fluid is an important property in the analysis of liquid behavior and fluid motion near solid boundaries. The viscosity is the fluid resistance to shear or flow and is a measure of the \_\_\_\_\_ or frictional fluid property. The resistance is caused by intermolecular friction exerted when layers of fluids attempt to slide by one other.

- A. Fluids kinetic energy
- B. Adhesive/cohesive
- C. Horizontal plane
- D. Resistance to shear
- E. None of the Above

149. **Dynamic (absolute) Viscosity:** is the tangential force per unit area required to move one \_\_\_\_\_ with respect to the other at unit velocity when maintained a unit distance apart by the fluid.

- A. Fluids kinetic energy
- B. Adhesive/cohesive
- C. Horizontal plane
- D. Resistance to shear
- E. None of the Above

150. **Dynamic or Absolute Viscosity:** The viscosity of a fluid is an important property in the analysis of liquid behavior and fluid motion near solid boundaries. The viscosity of a fluid is its resistance to shear or flow and is a measure of the \_\_\_\_\_ or frictional properties of a fluid. The resistance is caused by intermolecular friction exerted when layers of fluids attempts to slide by an other.

- A. Fluids kinetic energy
- B. Adhesive/cohesive
- C. Horizontal plane
- D. Resistance to shear
- E. None of the Above

151. **Dynamic Pressure:** Dynamic pressure is the component of fluid pressure that represents a \_\_\_\_\_.

- A. Fluids kinetic energy
- B. Adhesive/cohesive
- C. Horizontal plane
- D. Resistance to shear
- E. None of the Above

152. **Elevation Head:** The \_\_\_\_\_ per unit weight of a fluid because of its elevation. 1 foot of water will produce .433 pounds of pressure head.

- A. Ability to do work
- B. Hydraulic grade
- C. Velocity profile
- D. Energy possessed
- E. None of the Above

153. **Energy:** The \_\_\_\_\_. Energy can exist in one of several forms, such as heat, light, mechanical, electrical, or chemical. Energy can be transferred to different forms. It also can exist in one of two states, either potential or kinetic.

- A. Ability to do work
- B. Hydraulic grade
- C. Velocity profile

154. **Energy and Hydraulic Grade Line:** The \_\_\_\_\_ and the energy line are graphical forms of the Bernoulli equation. For steady, in viscid, incompressible flow the total energy remains constant along a stream line as expressed through the Bernoulli

- A. Ability to do work
- B. Hydraulic grade
- C. Velocity profile
- D. Energy possessed
- E. None of the Above

155. **Entrance Length and Developed Flow:** Fluids need some length to \_\_\_\_\_ profile after entering the pipe or after passing through components as bend, valves, pumps, turbines or similar.

- A. Ability to do work
- B. Hydraulic grade
- C. Velocity profile
- D. Energy possessed
- E. None of the Above

156. A fluid is defined as a substance that continually deforms (flows) under an applied shear \_\_\_\_\_ regardless of the magnitude of the applied stress.

- A. Stress
- B. Pressure
- C. Static equilibrium
- D. Temperatures
- E. None of the Above

157. It is a subset of the phases of matter and includes \_\_\_\_\_, gases, plasmas and, to some extent, plastic solids.

- A. Stress
- B. Pressure
- C. Static equilibrium
- D. Temperatures
- E. None of the Above

158. Fluids are also divided into liquids and gases. Liquids form a free surface (that is, a surface not created by their container) while \_\_\_\_\_ do not.

- A. Stress
- B. Pressure
- C. Static equilibrium
- D. Temperatures
- E. None of the Above

159. The distinction between solids and fluids is not so obvious. The distinction is made by evaluating the \_\_\_\_\_ of the matter: for example silly putty can be considered either a solid or a fluid, depending on the time period over which it is observed.

- A. Stress
- B. Pressure
- C. Static equilibrium
- D. None of the Above

160. \_\_\_\_\_ share the properties of not resisting deformation and the ability to flow (also described as their ability to take on the shape of their containers).

- A. Stress
- B. Pressure
- C. Static equilibrium
- D. Temperatures
- E. None of the Above

161. These properties are typically a function of their inability to support a shear \_\_\_\_\_ in static equilibrium.

- A. Stress
- B. Pressure
- C. Static equilibrium
- D. Temperatures
- E. None of the Above

162. While in a solid, \_\_\_\_\_ is a function of strain, in a fluid, stress is a function of rate of strain.

- A. Stress
- B. Pressure
- C. Static equilibrium
- D. Temperatures
- E. None of the Above

163. A consequence of this behavior is Pascal's law which entails the important role of pressure in characterizing a fluid's state. Based on how the \_\_\_\_\_ depends on the rate of strain and its derivatives, fluids can be characterized as: Newtonian fluids are where stress is directly proportional to rate of strain.

- A. Stress
- B. Pressure
- C. Static equilibrium
- D. Temperatures
- E. None of the Above

164. Non-Newtonian fluids are where \_\_\_\_\_ is proportional to rate of strain, its higher powers and derivatives (basically everything other than Newtonian fluid).

- A. Stress
- B. Pressure
- C. Static equilibrium
- D. Temperatures

165. The behavior of fluids can be described by a set of partial differential equations, which are based on the \_\_\_\_\_ of mass, linear and angular momentum (Navier-Stokes equations) and energy. The study of fluids is fluid mechanics, which is subdivided into fluid dynamics and fluid statics depending on whether the fluid is in motion or not.

- A. Stress
- B. Pressure
- C. Static equilibrium
- D. None of the Above

166. A gas is one of the four major phases of matter (after solid and liquid, and followed by plasma that subsequently appear as a solid material is subjected to increasingly higher \_\_\_\_\_).

- A. Stress
- B. Pressure
- C. Static equilibrium
- D. Temperatures
- E. None of the Above

167. As energy in the form of heat is added, a solid (e.g., ice) will first melt to become a liquid (e.g., water), which will then boil or evaporate to become a gas (e.g., water vapor). In some circumstances, a solid (e.g., "dry ice") can directly turn into a gas: this is called \_\_\_\_\_.

- A. Stress
- B. Pressure
- C. Static equilibrium
- D. Temperatures
- E. None of the Above

168. **Gauge Pressure:** Pressure differential above or below ambient \_\_\_\_\_ pressure.

- A. Atmosphere
- B. Atmospheric
- C. Head
- D. Pressure
- E. None of the Above

169. **Hazardous Atmosphere:** An \_\_\_\_\_ which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

- A. Atmosphere
- B. Atmospheric
- C. Head
- D. Pressure
- E. None of the Above

170. **Hazen-Williams Factor:** Hazen-Williams factor for some common piping materials. Hazen-Williams coefficients are used in the \_\_\_\_\_ for friction loss calculation in ducts and pipes.

- A. Atmosphere
- B. Atmospheric
- C. Head
- D. Pressure
- E. None of the Above

171. **Head:** The height of a column or body of fluid above a given point expressed in linear units. \_\_\_\_\_ if often used to indicate gauge pressure.

- A. Atmosphere
- B. Atmospheric
- C. Head
- D. Pressure

172. \_\_\_\_\_ is equal to the height times the density of the liquid. The measure of the pressure of water expressed in feet of height of water. 1 psi = 2.31 feet of water. There are various types of heads of water depending upon what is being measured. Static (water at rest) and Residual (water at flow conditions).

- A. Atmosphere
- B. Atmospheric
- C. Head
- D. Pressure
- E. None of the Above

173. \_\_\_\_\_ is a branch of science and engineering concerned with the use of liquids to perform mechanical tasks.

- A. Knudsen Number
- B. Hydraulics
- C. Laminar Flow
- D. Kinematic Viscosity
- E. Hydrodynamics

174. \_\_\_\_\_ is the fluid dynamics applied to liquids, such as water, alcohol, and oil.

- A. Knudsen Number
- B. Hydraulics
- C. Laminar Flow
- D. Kinematic Viscosity
- E. Hydrodynamics

175. \_\_\_\_\_: Is the ratio of absolute or dynamic viscosity to density.

- A. Knudsen Number
- B. Hydraulics
- C. Laminar Flow
- D. Kinematic Viscosity
- E. Hydrodynamics

176. \_\_\_\_\_ The ability of an object to do work by virtue of its motion. The energy terms that are used to describe the operation of a pump are pressure and head.

- A. Knudsen Number
- B. Hydraulics
- C. Laminar Flow
- D. Kinematic Viscosity
- E. None of the Above

177. \_\_\_\_\_ Used by modelers who wish to non dimensionless speed

- A. Knudsen Number
- B. Hydraulics
- C. Laminar Flow
- D. Kinematic Viscosity
- E. Hydrodynamics

178. \_\_\_\_\_ : The resistance to flow in a liquid can be characterized in terms of the viscosity of the fluid if the flow is smooth. In the case of a moving plate in a liquid, it is found that there is a layer or lamina which moves with the plate, and a layer which is essentially stationary if it is next to a stationary plate.

- A. Knudsen Number
- B. Hydraulics
- C. Laminar Flow
- D. Kinematic Viscosity
- E. Hydrodynamics

179. \_\_\_\_\_ The maximum allowable level of a contaminant that federal or state regulations allow in a public water system. If the MCL is exceeded, the water system must treat the water so that it meets the MCL. Or provide adequate backflow protection.

- A. Microbe, Microbial
- B. Microbial Contaminants
- C. Maximum Contamination Levels
- D. Pathogens
- E. None of the Above

180. \_\_\_\_\_ The process of breaking down organic wastes into simpler elemental forms or by products. Also used to separate combined chlorine and convert it into free chlorine.

- A. Microbe, Microbial
- B. Microbial Contaminants
- C. Maximum Contamination Levels
- D. Pathogens
- E. None of the Above

181. \_\_\_\_\_ A measure of the acidity of water.

- A. Microbe, Microbial
- B. Microbial Contaminants
- C. Maximum Contamination Levels
- D. Pathogens
- E. None of the Above

182. \_\_\_\_\_ Any minute, simple, single-celled form of life, especially one that causes disease.

- A. Microbe, Microbial
- B. Microbial Contaminants
- C. Maximum Contamination Levels
- D. Pathogens
- E. None of the Above

183. \_\_\_\_\_ Disease-causing pathogens; waterborne pathogens. A pathogen is a bacterium, virus or parasite that causes or is capable of causing disease. Pathogens may contaminate water and cause waterborne disease.

- A. Microbe, Microbial
- B. Microbial Contaminants
- C. Pathogens

184. \_\_\_\_\_ Microscopic organisms present in untreated water that can cause waterborne diseases.

- A. Microbe, Microbial
- B. Microbial Contaminants
- C. Maximum Contamination Levels
- D. Pathogens
- E. None of the Above

185. **Pascal's Law:** A pressure applied to a confined fluid at rest is transmitted with \_\_\_\_\_ throughout the fluid.

- A. Gradually fills
- B. Incompressible and viscosity
- C. Equal intensity
- D. Turbulent flow
- E. Shear stress

186. **Navier-Stokes Equations:** The motion of a non-turbulent, Newtonian fluid is governed by the Navier-Stokes equation. The equation can be used to model \_\_\_\_\_, where the fluid parameters are interpreted as time-averaged values.

- A. Gradually fills
- B. Incompressible and viscosity
- C. Equal intensity
- D. Turbulent flow
- E. Shear stress

187. **Newtonian Fluid:** Newtonian fluid (named for Isaac Newton) is a fluid that flows like water—its \_\_\_\_\_ is linearly proportional to the velocity gradient in the direction perpendicular to the plane of shear.

- A. Gradually fills
- B. Incompressible and viscosity
- C. Equal intensity
- D. Turbulent flow
- E. Shear stress

188. The constant of proportionality is known as the viscosity. \_\_\_\_\_, because it continues to exemplify fluid properties no matter how fast it is stirred or mixed.

- A. Water is Newtonian
- B. Incompressible and viscosity
- C. Equal intensity
- D. Turbulent flow
- E. Shear stress

189. Contrast this with a non-Newtonian fluid, in which stirring can leave a "hole" behind (that \_\_\_\_\_ up over time - this behavior is seen in materials such as pudding, or to a less rigorous extent, sand), or cause the fluid to become thinner, the drop in viscosity causing it to flow more (this is seen in non-drip paints).

- A. Gradually fills
- B. Incompressible and viscosity
- C. Equal intensity

190. For a Newtonian fluid, the viscosity, by definition, depends only on temperature and pressure (and also the chemical composition of the fluid if the fluid is not a pure substance), not on the forces acting upon it. If the fluid is \_\_\_\_\_ is constant across the fluid, the equation governing the shear stress.

- A. Gradually fills
- B. Incompressible and viscosity
- C. Equal intensity
- D. Turbulent flow
- E. Shear stress

191. \_\_\_\_\_ describes the forces acting on objects interacting with each other.

- A. Isentropic
- B. Ideal Gas Law
- C. Non-Newtonian fluid
- D. Newton's Third Law
- E. Lift

192. \_\_\_\_\_ can be expressed as "If one object exerts a force  $\mathbf{F}$  on an other object, then the second object exerts an equal but opposite force  $\mathbf{F}$  on the first object"

- A. Isentropic
- B. Ideal Gas Law
- C. Non-Newtonian fluid
- D. Newton's Third Law
- E. Lift

193. Force is a convenient abstraction to represent mentally the pushing and pulling interaction between objects.

- A. Isentropic
- B. Ideal Gas Law
- C. Non-Newtonian fluid
- D. Newton's Third Law

194. It is common to express forces as vectors with magnitude, direction and point of application. The net effect of two or more forces acting on the same point is the vector sum of the forces.

- A. Isentropic
- B. Ideal Gas Law
- C. Non-Newtonian fluid
- D. Newton's Third Law

195. \_\_\_\_\_ viscosity changes with the applied shear force.

- A. Isentropic
- B. Ideal Gas Law
- C. Non-Newtonian fluid
- D. Newton's Third Law

196. \_\_\_\_\_ For a perfect or ideal gas the change in density is directly related to the change in temperature and pressure as expressed in the Ideal Gas Law.

- A. Isentropic
- B. Ideal Gas Law
- C. Non-Newtonian fluid
- D. Newton's Third Law
- E. Lift

197. \_\_\_\_\_ Describes the behavior of gravitational, electric, and fluid potentials.

- A. Isentropic
- B. Laplace's Equation
- C. Non-Newtonian fluid
- D. Newton's Third Law
- E. Lift

198. \_\_\_\_\_ consists of the sum of all the aerodynamic forces normal to the direction of the external airflow.

- A. Isentropic
- B. Ideal Gas Law
- C. Non-Newtonian fluid
- D. Newton's Third Law
- E. Lift

199. Liquids are an in-between state of \_\_\_\_\_.

- A. Compress
- B. Matter
- C. Gas
- D. Liquids
- E. Solids

200. Liquids can be found in between the solid and \_\_\_\_\_ states.

- A. Compress
- B. Matter
- C. Gas

201. \_\_\_\_\_ don't have to be made up of the same compounds. If you have a variety of materials in a liquid, it is called a solution.

- A. Compress
- B. Matter
- C. Gas
- D. Liquids
- E. Solids

202. Another trait of \_\_\_\_\_ is that they are difficult to compress.

- A. Compress
- B. Matter
- C. Gas
- D. Liquids
- E. Solids

203. When you compress something, you take a certain amount and force it into a smaller space. \_\_\_\_\_ are very difficult to compress and gases are very easy.

- A. Compress
- B. Matter
- C. Gas
- D. Liquids
- E. Solids

204. Liquids are in the middle but tend to be difficult. When you compress something, you force the atoms closer together. When \_\_\_\_\_ go up, substances are compressed.

- A. Bounce
- B. Molecules
- C. Evaporation
- D. Shock absorbers
- E. None of the Above

205. Liquids already have their atoms close together, so they are hard to compress. Many \_\_\_\_\_ in cars compress liquids in tubes.

- A. Bounce
- B. Molecules
- C. Evaporation
- D. Shock absorbers
- E. None of the Above

206. A special force keeps \_\_\_\_\_. Solids are stuck together and you have to force them apart.

- A. Bounce
- B. Molecules
- C. Evaporation
- D. Shock absorbers
- E. None of the Above

207. Gases \_\_\_\_\_ everywhere and they try to spread themselves out.

- A. Bounce
- B. Molecules
- C. Evaporation
- D. Shock absorbers
- E. None of the Above

208. Liquids actually want to stick together. There will always be the occasional evaporation where extra energy gets a \_\_\_\_\_ excited and the molecule leaves the system.

- A. Bounce
- B. Molecule
- C. Evaporation
- D. Shock absorbers
- E. None of the Above

209. Overall, liquids have cohesive (sticky) forces at work that hold the \_\_\_\_\_ together.

- A. Bounce
- B. Molecules
- C. Evaporation
- D. Shock absorbers

210. **Isentropic Compression/Expansion Process:** If the compression or expansion takes place under constant volume conditions - the process is called \_\_\_\_\_.

- A. Isentropic
- B. Ideal Gas Law
- C. Non-Newtonian fluid
- D. Newton's Third Law
- E. Lift

211. **Manning Formula for Gravity Flow:** Manning's equation can be used to calculate cross-sectional \_\_\_\_\_ in open channels.

- A. Average velocity flow
- B. State enabling
- C. Virtue of its position
- D. Control leakage
- E. Speed of sound

212. **Mechanical Seal:** A mechanical device used to \_\_\_\_\_ from the stuffing box of a pump. Usually made of two flat surfaces, one of which rotates on the shaft. The two flat surfaces are of such tolerances as to prevent the passage of water between them.

- A. Average velocity flow
- B. State enabling
- C. Virtue of its position
- D. Control leakage
- E. Speed of sound

213. **Mach Number:** When an object travels through a medium, then its Mach number is the ratio of the object's \_\_\_\_\_ in that medium.

- A. Average velocity flow
- B. State enabling
- C. Virtue of its position
- D. Control leakage
- E. Speed to the speed of sound

214. **Potential Energy:** The energy that a body has by virtue of its position or \_\_\_\_\_ it to do work.

- A. Average velocity flow
- B. State enabling
- C. Virtue of its position
- D. Control leakage

215. **Prandtl Number:** The Prandtl Number is a dimensionless number approximating the ratio of momentum diffusivity and \_\_\_\_\_.

- A. Average velocity flow
- B. State enabling
- C. Virtue of its position
- D. Control leakage
- E. Thermal diffusivity

216. **Static Head:** The height of a column or body of \_\_\_\_\_ above a given point

- A. Temperature
- B. Liquid
- C. Pressure
- D. Fluid
- E. Specific weight

217. **Static Pressure:** The \_\_\_\_\_ in a fluid at rest.

- A. Temperature
- B. Liquid
- C. Pressure
- D. Fluid
- E. Specific weight

218. **Static Pressure and Pressure Head in Fluids:** The pressure indicates the normal force per unit area at a given point acting on a given plane. Since there is no shearing stresses present in a fluid at rest - the \_\_\_\_\_ in a fluid is independent of direction.

- A. Temperature
- B. Liquid
- C. Pressure
- D. Fluid
- E. Specific weight

219. For fluids - liquids or gases - at rest the pressure gradient in the vertical direction depends only on the \_\_\_\_\_ of the fluid.

- A. Temperature
- B. Liquid
- C. Pressure
- D. Fluid
- E. Specific weight

220. The atmospheric pressure is the pressure in the surrounding air. It varies with \_\_\_\_\_ and altitude above sea level.

- A. Temperature
- B. Liquid
- C. Pressure
- D. Fluid

221. **Pressure Head:** The height to which \_\_\_\_\_ can be raised by a given pressure.

- A. Temperature
- B. Liquid
- C. Pressure
- D. Fluid
- E. Specific weight

222. **Pressure Units:** Since 1 Pa is a small \_\_\_\_\_ unit, the unit hectopascal (hPa) is widely used, especially in meteorology. The unit kilopascal (kPa) is commonly used designing technical applications like HVAC systems, piping systems and similar.

- A. Temperature
- B. Liquid
- C. Pressure
- D. Fluid

223. **Reynolds Number:** The Reynolds number is used for determine whether a flow is laminar or turbulent. The Reynolds Number is a \_\_\_\_\_ defined by the ratio of dynamic pressure ( $\rho u^2$ ) and shearing stress ( $\mu u / L$ ).

- A. Kinetic energy
- B. Weight
- C. Temperature
- D. Nondimensional parameter

224. **Richardson Number:** A dimensionless number that expresses the ratio of potential to \_\_\_\_\_.

- A. Kinetic energy
- B. Weight
- C. Temperature
- D. Nondimensional parameter

225. **Specific Gravity:** The Specific Gravity - SG - is a dimensionless unit defined as the ratio of density of the material to the density of water at a specified \_\_\_\_\_.

- A. Kinetic energy
- B. Weight
- C. Temperature
- D. Nondimensional parameter
- E. Fluid flow dynamics

226. **Specific Weight:** Specific Weight is defined as weight per unit volume. \_\_\_\_\_ is a force.

- A. Kinetic energy
- B. Weight
- C. Temperature
- D. Nondimensional parameter
- E. Fluid flow dynamics

227. **Strouhal Number:** The Strouhal number is a quantity describing oscillating flow mechanisms. The Strouhal Number is a dimensionless value useful for analyzing oscillating, unsteady \_\_\_\_\_ problems.

- A. Kinetic energy
- B. Weight
- C. Temperature
- D. Nondimensional parameter
- E. Fluid flow dynamics

228. **Stuffing Box:** That portion of the pump which houses the packing or \_\_\_\_\_.

- A. Mechanical seal
- B. Volute
- C. Ball
- D. Supersonic
- E. None of the Above

229. **Valve:** A device that opens and closes to regulate the flow of liquids. Faucets, hose bibs, and \_\_\_\_\_ are examples of valves.

- A. Mechanical seal
- B. Volute
- C. Ball
- D. Supersonic
- E. None of the Above

230. **Vane:** That portion of an impeller which throws the water toward the \_\_\_\_\_.

- A. Mechanical seal
- B. Volute
- C. Ball
- D. Supersonic
- E. None of the Above

231. **Supersonic Flow:** Flow with speed above the speed of sound, 1,225 km/h at sea level, is said to be \_\_\_\_\_.
- A. Mechanical seal
  - B. Volute
  - C. Ball
  - D. Supersonic
232. Surface tension is a force within the surface layer of a liquid that causes the layer to behave as an \_\_\_\_\_.
- A. Surface tension
  - B. Elastic sheet
  - C. Surface
  - D. All of the Above
  - E. None of the Above
233. The cohesive forces between liquid molecules are responsible for the phenomenon known as \_\_\_\_\_.
- A. Surface tension
  - B. Elastic sheet
  - C. Surface
  - D. All of the Above
  - E. None of the Above
234. The molecules at the surface do not have other like molecules on all sides of them and consequently they cohere more strongly to those directly associated with them on the \_\_\_\_\_.
- A. Surface tension
  - B. Elastic sheet
  - C. Surface
235. This forms a surface "film" which makes it more difficult to move an object through the \_\_\_\_\_ than to move it when it is completely submersed.
- A. Surface tension
  - B. Elastic sheet
  - C. Surface
236. Surface tension is typically measured in dynes/cm, the force in dynes required to break a film of length 1 cm. Equivalently, it can be stated as surface energy in \_\_\_\_\_ per square centimeter.
- A. Surface tension
  - B. Elastic sheet
  - C. Surface
  - D. All of the Above
  - E. None of the Above

237. Water at 20°C has a \_\_\_\_\_ of 72.8 dynes/cm compared to 22.3 for ethyl alcohol and 465 for mercury.

- A. Surface tension
- B. Elastic sheet
- C. Surface
- D. All of the Above

238. **Thixotropic Fluids: Shear Thinning Fluids** or **Thixotropic Fluids** reduce their \_\_\_\_\_ or pressure is increased at a constant temperature. Ketchup and mayonnaise are examples of thixotropic materials. They appear thick or viscous but are possible to pump quite easily.

- A. Viscosity as agitation
- B. Used to measure
- C. Speed at velocities
- D. Measure of the cloudiness

239. **Transonic:** Flow with \_\_\_\_\_ just below and above the speed of sound is said to be transonic.

- A. Viscosity as agitation
- B. Used to measure
- C. Speed at velocities
- D. Measure of the cloudiness
- E. Using liquid columns

240. **Turbidity:** A \_\_\_\_\_ of water caused by suspended particles.

- A. Viscosity as agitation
- B. Used to measure
- C. Speed at velocities
- D. Measure of the cloudiness
- E. Using liquid columns

241. **U-Tube Manometer:** Pressure measuring devices \_\_\_\_\_ in vertical or inclined tubes are called manometers.

- A. Viscosity as agitation
- B. Used to measure
- C. Speed at velocities
- D. Measure of the cloudiness
- E. Using liquid columns

242. One of the most common is the water filled u-tube manometer \_\_\_\_\_ pressure difference in pitot or orifices located in the airflow in air handling or ventilation system.

- A. Viscosity as agitation
- B. Used to measure
- C. Speed at velocities
- D. Measure of the cloudiness
- E. Using liquid columns

243. Vorticity is defined as the \_\_\_\_\_ per unit area at a point in the flow field.
- A. Viscosity
  - B. Velocity Head
  - C. Vorticity
  - D. Vapor Pressure
  - E. None of the Above
244. \_\_\_\_\_ For a particular substance at any given temperature there is a pressure at which the vapor of that substance is in equilibrium with its liquid or solid forms.
- A. Viscosity
  - B. Velocity Head
  - C. Vorticity
  - D. Vapor Pressure
  - E. None of the Above
245. \_\_\_\_\_ The vertical distance a liquid must fall to acquire the velocity with which it flows through the piping system.
- A. Viscosity
  - B. Velocity Head
  - C. Vorticity
  - D. Vapor Pressure
  - E. None of the Above
246. \_\_\_\_\_ For a given quantity of flow, the velocity head will vary indirectly as the pipe diameter varies.
- A. Viscosity
  - B. Velocity Head
  - C. Vorticity
  - D. Vapor Pressure
  - E. None of the Above
247. Informally, \_\_\_\_\_ is the quantity that describes a fluid's resistance to flow.
- A. Viscosity
  - B. Velocity Head
  - C. Vorticity
  - D. Vapor Pressure
  - E. None of the Above
248. Fluids resist the relative motion of immersed objects through them as well as to the motion of layers with differing velocities within them.
- A. Viscosity
  - B. Velocity Head
  - C. Vorticity
  - D. Vapor Pressure
  - E. None of the Above

249. Wave drag refer to a sudden and very powerful drag that appears on aircrafts flying at \_\_\_\_\_.

- A. Viscosity
- B. Velocity Head
- C. Vorticity
- D. Vapor Pressure
- E. None of the Above

250. Hydraulics is applied commonly to the study of the mechanical properties of water, other liquids, and even gases when the effects of \_\_\_\_\_ are small.

- A. Hydrokinetics
- B. Hydrostatics
- C. Hydraulics
- D. Compressibility

**Please fax the answer key to TLC Western Campus Fax (928) 468-0675.**

#### **Rush Grading Service**

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