

Registration form

**PUMPS AND MOTORS \$200.00**  
**48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00**

**Start and Finish Dates:** \_\_\_\_\_

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

**Name** \_\_\_\_\_ **Signature** \_\_\_\_\_

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

**Address** \_\_\_\_\_

**City** \_\_\_\_\_ **State** \_\_\_\_\_ **Zip** \_\_\_\_\_

**Email** \_\_\_\_\_ **Fax (\_\_\_\_)** \_\_\_\_\_

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

**Operator ID #** \_\_\_\_\_ **Exp. Date** \_\_\_\_\_

**Class/Grade** \_\_\_\_\_

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

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

Water Treatment \_\_\_ Water Distribution \_\_\_ Other \_\_\_\_\_

Collections \_\_\_ Wastewater Treatment \_\_\_\_\_ Onsite Installer \_\_\_\_\_

Oregon CCB (\$50 additional fee) \_\_\_\_\_

**Technical Learning College TLC PO Box 3060, Chino Valley, AZ 86323**  
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## **DISCLAIMER NOTICE**

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

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

## **State Approval Listing URL...**

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

*You can obtain a printed version of the course manual 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.

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

**Additional certificate for another Agency – additional fee \$50**

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

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

**All downloads are electronically tracked and monitored for security purposes.**

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

# Pumps and Motors Answer Key

Name \_\_\_\_\_

Phone \_\_\_\_\_

***You are solely responsible in ensuring that this course is accepted for credit by 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? \_\_\_\_\_

PA DEP Students are required to complete the original version of the text. \_\_\_\_\_  
Please initial

***You are responsible to ensure that TLC receives the Assignment and Registration Key. Please call us to ensure that we received it.***

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

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**Additional certificate for another Agency – additional fee \$50**

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

**Rush Grading Service**

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





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

**PUMPS AND MOTORS CEU COURSE  
CUSTOMER SERVICE RESPONSE CARD**

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

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

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

1. Please rate the difficulty of your course.  
Very Easy 0 1 2 3 4 5 Very Difficult
2. Please rate the difficulty of the testing process.  
Very Easy 0 1 2 3 4 5 Very Difficult
3. Please rate the subject matter on the exam to your actual field or work.  
Very Similar 0 1 2 3 4 5 Very Different
4. How did you hear about this Course? \_\_\_\_\_
5. What would you do to improve the Course?  
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How about the price of the course?

Poor \_\_\_\_ Fair \_\_\_\_ Average \_\_\_\_ Good \_\_\_\_ Great \_\_\_\_

How was your customer service?

Poor \_\_\_\_ Fair \_\_\_\_ Average \_\_\_\_ Good \_\_\_\_ Great \_\_\_\_

Any other concerns or comments.  
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## Pumps and Motors CEU Training Course Assignment

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

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

### Common Hydraulic Terms

1. Which of the following definitions is the engineering science that pertains to liquid pressure and flow?  
A. Pressure, Absolute                      D. Hydrokinetics  
B. Pressure                                      E. Pascal's Law  
C. Hydraulics                                  F. None of the Above
2. Which of the following definitions is the engineering science pertaining to the energy of liquid flow and pressure?  
A. Pressure, Absolute                      D. Hydrokinetics  
B. Pressure                                      E. Pascal's Law  
C. Hydraulics                                  F. None of the Above
3. \_\_\_\_\_ is the pressure applied to a confined fluid at rest and is transmitted with equal intensity throughout the fluid.  
A. Pressure, Absolute                      D. Hydrokinetics  
B. Pressure                                      E. Pascal's Law  
C. Hydraulics                                  F. None of the Above
4. 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                      D. Hydraulics  
B. Head, static                              E. Hydrokinetics  
C. Head    F. None of the Above
5. \_\_\_\_\_ is often used to indicate gauge pressure?  
A. Head, Friction                      D. Hydraulics  
B. Head, static                              E. Hydrokinetics  
C. Head    F. None of the Above

6. Which of the following definitions is when the pressure is equal to the height times the density of the liquid?
- A. Head, Friction      D. Hydraulics  
 B. Head, static        E. Hydrokinetics  
 C. Head                F. None of the Above
7. \_\_\_\_\_ is required to overcome the friction at the interior surface of a conductor and between fluid particles in motion?
- A. Head, Friction      D. Hydraulics  
 B. Head, static        E. Hydrokinetics  
 C. Head                F. None of the Above
8. Which of the following definitions varies with flow, size, type, and conditions of conductors and fittings, and the fluid characteristics?
- A. Head, Friction      D. Hydraulics  
 B. Head, static        E. Hydrokinetics  
 C. Head                F. None of the Above
9. \_\_\_\_\_ is the pressure in a fluid at rest?
- A. Pressure, Atmospheric      D. Pressure, Gauge  
 B. Pressure, Static              E. Pascal's Law  
 C. Hydraulics                  F. None of the Above
10. Which of the following definitions is the height of a column or body of fluid above a given point?
- A. Head, Friction      D. Hydraulics  
 B. Head, static        E. Hydrokinetics  
 C. Head                F. None of the Above
11. \_\_\_\_\_ is the pressure exerted by the atmosphere at any specific location?
- A. Pressure, Atmospheric      D. Pressure, Gauge  
 B. Pressure, Static              E. Pascal's Law  
 C. Hydraulics                  F. None of the Above

### **Pump Definitions**

12. Which of the following definitions is any substance that can be pumped such as oil, water, refrigerant, or even air?
- A. Fluid                D. Substance  
 B. Mixed flow pump    E. Flow  
 C. Energy              F. None of the Above
13. \_\_\_\_\_ is a mechanical device that seals the pump stuffing box?
- A. Packing              D. Mechanical seal  
 B. Bearing             E. Lantern ring  
 C. Seal                 F. None of the Above
14. \_\_\_\_\_ is a barrier that separates stages of a multi-stage pump?
- A. Gasket              D. Inter-stage diaphragm  
 B. Keyway              E. Seal  
 C. Bearing             F. None of the Above

15. Which of the following definitions is a flat material that is compressed between two flanges to form a seal?

- A. Gasket
- B. Keyway
- C. Packing
- D. Seal
- E. Bond
- F. None of the Above

16. Which of the following definitions is a line or tube that directs sealing fluid to the stuffing box?

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

17. Which of the following definitions is the part of the pump that increases the speed of the fluid being handled?

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

18. \_\_\_\_\_ is a rectangular piece of metal that prevents the impeller from rotating on the shaft.

- A. Gasket
- B. Key
- C. Energy
- D. Bearing
- E. Seal
- F. None of the Above

19. Which of the following definitions is the area on the shaft that accepts the key?

- A. Gasket
- B. Keyway
- C. Energy
- D. Inter-stage diaphragm
- E. Kinetic energy
- F. None of the Above

20. \_\_\_\_\_ is a pump that uses both axial-flow and radial-flow components in one impeller.

- A. Bellows
- B. Mixed flow pump
- C. Kinetic energy
- D. Dynamic
- E. Diaphragm pump
- F. None of the Above

21. Which of the following definitions 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

22. 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

23. 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

24. Which of the following definitions is force, usually along the centerline of the pump?  
 A. Thrust      D. Vertical power  
 B. Pressure    E. Energy  
 C. Suction     F. None of the Above
25. Which of the following definitions is a metal ring located between rings of packing that distributes gland sealing fluid?  
 A. Leak-off                      D. Lantern ring  
 B. Gland sealing line          E. Gland follower  
 C. Horizontal packing          F. None of the Above
26. \_\_\_\_\_ is the fluid that leaks from the stuffing box.  
 A. Leak-off                      D. Lantern ring  
 B. Gland sealing leakage      E. Gland follower  
 C. Horizontal leakage          F. None of the Above
27. \_\_\_\_\_ is a bushing used to compress the packing in the stuffing box and to control leakoff?  
 A. Leak-off packing            D. Lantern ring  
 B. Gland sealing line          E. Gland follower  
 C. Horizontal packing          F. None of the Above
28. Which of the following definitions are pumps in which the centerline of the shaft runs vertically?  
 A. Thrusters                    D. Vertical pumps  
 B. Vanes                        E. Double pumps  
 C. Suction pumps              F. None of the Above
29. Which of the following definitions are replaceable tubular coverings on the shaft?  
 A. Protectors    D. Shaft sleeve  
 B. Shrouds      E. Stages  
 C. Covers        F. None of the Above
30. Which of the following definitions is the metal covering over the vanes of an impeller?  
 A. Slop drain    D. Shaft sleeve  
 B. Shroud        E. Stages  
 C. Slurry         F. None of the Above
31. \_\_\_\_\_ is the drain from the area that collects leak-off from the stuffing box.  
 A. Slop drain                    D. Shaft sleeve  
 B. Shroud                        E. Stages  
 C. Slurry drain                  F. None of the Above
32. Which of the following definitions is the part of the pump that changes the speed of the fluid into pressure?  
 A. Thrust                        D. Vertical pumps  
 B. Vanes                        E. Volute  
 C. Suction eye                 F. None of the Above

33. 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
34. Which of the following definitions is a nut that keeps the parts in place?
- A. Lock nut
  - B. Keyway
  - C. Cotter
  - D. Radial bearings
  - E. Retaining nut
  - F. None of the Above
35. \_\_\_\_\_ are the rotating parts, usually including the impeller, shaft, bearing housings, and all other parts included between the bearing housing and the impeller.
- A. Inboard
  - B. Rotor
  - C. Mechanical
  - D. Flow parts
  - E. Retaining parts
  - F. None of the Above
36. Which of the following definitions is to cause lines, grooves, or scratches?
- A. Wear
  - B. Burn
  - C. Score
  - D. Scratch
  - E. Grover
  - F. None of the Above
37. \_\_\_\_\_ is a cylindrical bar that transmits power from the driver to the pump impeller.
- A. Radial flow
  - B. Shaft
  - C. Transfer
  - D. Gear driver
  - E. Keyway
  - F. None of the Above
38. 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
39. Which of the following definitions are bearings that prevent shaft movement in any direction outward from the centerline of the pump?
- A. Volute
  - B. Rotor
  - C. Spider
  - D. Radial bearings
  - E. Retaining bearings
  - F. None of the Above
40. Which of the following definitions is flow at 90° to the centerline of the shaft?
- A. Radial flow
  - B. Reverse
  - C. Score
  - D. Vertical
  - E. Horizontal
  - F. None of the Above
41. Which of the following definitions is a device that retains solid pieces while letting liquids through?
- A. Strainer
  - B. Lantern ring
  - C. Suction eye
  - D. Stuffing box
  - E. Throat bushing
  - F. None of the Above

42. \_\_\_\_\_ is the area of the pump where the shaft penetrates the casing.
- A. Strainer                      D. Stuffing box  
 B. Leak-off                      E. Throat bushing  
 C. Suction eye                F. None of the Above
43. Which of the following definitions is the place where fluid enters the pump impeller?
- A. Strainer                      D. Stuffing box  
 B. Suction                      E. Throat  
 C. Suction eye                F. None of the Above
44. Which of the following definitions are pumps in which the centerline of the shaft is horizontal?
- A. Dynamic                      D. Turbine  
 B. Centrifugal                E. Radical flow  
 C. Horizontal pumps        F. None of the Above
45. Which of the following definitions are bearings that prevent shaft movement back and forth in the same direction as the centerline of the shaft?
- A. Thrust                      D. Vertical  
 B. Spider                      E. Thrust bearings  
 C. Suction                      F. None of the Above
46. \_\_\_\_\_ are parts of the impeller that push and increase the speed of the fluid in the pump.
- A. Thrusters                    D. Bowls  
 B. Vanes                      E. Volute  
 C. Drivers                      F. None of the Above
47. \_\_\_\_\_ is a thick, viscous fluid, usually containing small particles.
- A. Slap                      D. Drawdown  
 B. Mixed liquid              E. Mud  
 C. Slurry                      F. None of the Above
48. Which of the following definitions are impellers in a multi-stage pump?
- A. Volute                      D. Shaft stages  
 B. Shrouds                    E. Stages  
 C. Bowls                      F. None of the Above
49. Which of the following definitions are pumps with more than one impeller?
- A. Turbine                      D. Multi-stage pumps  
 B. Mixed flow                E. Outboard  
 C. Inboard                      F. None of the Above
50. Which of the following definitions is the end of the pump farthest from the motor?
- A. Outlet                      D. Exit  
 B. Impeller                    E. Outboard  
 C. Inboard                      F. None of the Above



51. Which of the following definitions is the soft, pliable material that seals the stuffing box?

- A. Packing    D. Glands
- B. Rubbers    E. Mechanical seal
- C. Gaskets    F. None of the Above

52. Which of the following definitions are pumps that move fluids by physically displacing the fluid inside the pump?

- A. Bellows    D. Multi-stage pumps
- B. Axial    E. Positive displacement pumps
- C. Dynamic    F. None of the Above

### **Pumps**

53. More complicated pumps have valves check valves that open to allow \_\_\_\_\_, and close automatically to prevent reverse flow.

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

54. There are many kinds of \_\_\_\_\_, and can be the most trouble-prone and complicated part of a pump.

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

55. 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

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

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

57. 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

58. According to the text, the force pump has \_\_\_\_\_ in the cylinder, one for supply and the other for delivery.

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

59. The supply valve opens when the cylinder \_\_\_\_\_, the delivery valve when the cylinder volume decreases.

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

60. 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

61. 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

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

- A. True
- B. False

63. 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

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

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

65. 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

66. 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

67. 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

68. 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

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

- A. True
- B. False

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

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

72. 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
  - B. Diaphragm
  - C. Discharged fluid
  - D. Cylinder
  - E. Sliding contact
  - F. None of the Above

73. 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
  - B. Check valves
  - C. Radial flow
  - D. Cavity
  - E. Positive Displacement Pump(s)
  - F. None of the Above

### Basic Water Pump

74. In a centrifugal pump, the water pressure at the edge of the turning impeller rises until it is able to keep water circling with the \_\_\_\_\_.
- A. Centrifugal pump(s)
  - B. Impeller blade(s)
  - C. Bernoulli's equation
  - D. Diaphragm pump(s)
  - E. Cylindrical pump housing
  - F. None of the Above

75. In a centrifugal pump, as water drifts outward between the \_\_\_\_\_ of the pump, it must move faster and faster because its circular path is getting larger and larger.
- A. Centrifugal pump(s)
  - B. Impeller blade(s)
  - C. Bernoulli's equation
  - D. Diaphragm pump(s)
  - E. Cylindrical pump housing
  - F. None of the Above

76. As the water slows down and its kinetic energy decreases, that water's pressure potential energy increases.
- A. True
  - B. False

77. According to the text, the centrifugal pumps work by spinning water around in a circle inside a?
- A. Vortex
  - B. Cylinder
  - C. Viscous drag pump
  - D. Center of the impeller
  - E. Cylindrical pump housing
  - F. None of the Above

78. The pump makes the water spin by pulling it with an impeller.
- A. True
  - B. False

79. 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

80. 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

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

- A. True                      B. False

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

- A. True                      B. False

83. 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

84. 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

85. 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

86. 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

**Venturi (Bernoulli's law):**

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

- A. True                      B. False

88. The area of the restriction in a venture will have a \_\_\_\_\_ than the enlarged area ahead of it.

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

89. \_\_\_\_\_ describes a pump whose impeller has no vanes but relies on fluid contact with a flat rotating plate turning at high speed to move the liquid.
- A. Submersible
  - B. Blower
  - C. Viscous drag pump
  - D. Rotary pump
  - E. Bicycle pump
  - F. None of the Above

### Types of Water Pumps

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

91. 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

92. 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

93. 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

94. 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

95. Which of the following terms are variable displacement pumps that are by far used the most?
- A. Axial flow
  - B. Submersible
  - C. Rotary pump
  - D. Turbine pump(s)
  - E. Centrifugal pumps
  - F. None of the Above

96. 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

97. 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

98. 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

99. 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

100. 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

101. According to the text, column pipe sections can be threaded or coupled 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

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

- A. True
- B. False

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

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

104. 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

105. 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

106. 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

107. 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

108. 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

109. 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

110. 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

### General Pumping Fundamentals

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

- A. True
- B. False

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

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

113. According to the text, the ability of the pump to lift water is the result of a partial vacuum created at the \_\_\_\_\_.

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

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

- A. True
- B. False

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

- A. True
- B. False

### Pump Categories

116. 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

117. 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

118. According to the text, pumps may be classified on the basis of the application they serve.

- A. True
- B. False

119. 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

**There are three main types of diaphragm pumps:**

120. 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

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

- A. True
- B. False

122. 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

123. 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

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

- A. True
- B. False

125. 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



126. Which of the following terms - 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

127. \_\_\_\_\_ 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

### Positive Displacement Pumps

128. 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

129. 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

130. 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

131. 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

132. \_\_\_\_\_ 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

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

- A. True
- B. False

### Plunger Pump

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

- A. True
- B. False

135. 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

136. 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

137. Which of the following terms must be open before the pump is started, to prevent any fast build-up of pressure that could damage the pump?

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

### Diaphragm Pumps

138. 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

139. Which of the following terms 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

### Key Pump Words

140. 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

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

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

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

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

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

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

144. \_\_\_\_\_ 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

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

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

146. \_\_\_\_\_ 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

### **Screw or Auger Pump**

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

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

148. \_\_\_\_\_ is turned as the bottom end of the tube turns, it scoops up a volume of water?

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

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

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

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

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

151. A large screw provides the mechanical action to move the liquid from the suction side to the \_\_\_\_\_.

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

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

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

153. The slope of the \_\_\_\_\_ is normally either 30° or 38°.

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

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

- A. True
- B. False

### Submersible Pumps

155. 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

156. 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

157. 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

158. These types of pumps are often installed in 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

159. Which of the following terms if inserted below the screened interval or below all productive portions of the aquifer, it will not be properly 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

160. 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

161. 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

162. 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

### **Cavitation**

163. 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

164. Cavitation is 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

165. \_\_\_\_\_ 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

166. \_\_\_\_\_ 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

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

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

168. 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                      D. Cavitation bubbles collapse  
B. Residual stresses                E. Collapse of cavities  
C. Shock waves                        F. None of the Above

169. According to the text, although the collapse of a cavity is a relatively low-energy event, highly localized collapses can \_\_\_\_\_.  
A. Cause water hammer            D. Erode metals  
B. Cause residual stresses        E. Collapse of cavities  
C. Cause shock waves               F. None of the Above

170. The pitting caused by the collapse of cavities produces great wear on components and can dramatically shorten a propeller or pump's lifetime. After a surface is initially affected by cavitation, it tends to erode at an accelerating pace.  
A. True                      B. False

### **Impeller**

171. \_\_\_\_\_ is a rotating component of a centrifugal pump, which transfers energy from the motor that drives the pump to the fluid being pumped by accelerating the fluid outwards from the center of rotation?  
A. Volute                      D. Propellers and pumps  
B. Driver                        E. Impeller  
C. Driveshaft                  F. None of the Above

172. The velocity achieved by the impeller transfers into pressure when the outward movement of the fluid is confined by the pump casing.  
A. True                      B. False

173. Impellers are usually short cylinders, vanes to push the fluid radially, and a splined center to accept a?  
A. Cavitation                      D. Propellers and pumps  
B. Turbulence                      E. Center of rotation  
C. Driveshaft                      F. None of the Above

### **Progressing Cavity Pump**

174. 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

175. 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

176. According to the text, as the rotor turns within the stator, cavities are formed which progress from the suction to the \_\_\_\_\_, conveying the pumped material.  
A. Cavitation                      D. Discharge end of the pump  
B. Turbulence                      E. Center of rotation  
C. Driveshaft                      F. None of the Above

177. Which of the following terms between the rotor and the stator helices that 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

178. Which of the following terms are used to pump material that is 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

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

- 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

180. 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

181. \_\_\_\_\_ 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

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

- A. True
- B. False

183. 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

184. 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

185. 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

186. 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

187. Which of the following terms and various rotor/stator pitch ratios exist, but are specialized in that they don't generally allow complete sealing \_\_\_\_\_  
A. Flow rate      D. Pump size  
B. Speeds      E. Different rotor shapes  
C. Drivers      F. None of the Above

188. At a high enough pressure the sliding seals between \_\_\_\_\_ will leak some fluid rather than pumping it?  
A. Drag, or friction      D. High pressure  
B. Helical shaft      E. Eccentric screw pump  
C. Cavities      F. None of the Above

189. In operation, progressive cavity pumps are fundamentally fixed flow rate pumps, like piston pumps and \_\_\_\_\_.  
A. Flow rate      D. Pump size  
B. Hypocycloids      E. Peristaltic pump(s)  
C. Piston pump      F. None of the Above

190. With the progressive cavity pump, you need 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      D. Pressure  
B. Helical shaft      E. Force  
C. Motor      F. None of the Above

191. 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

192. Which of the following terms is there a fixed flow rate pump that is effectively converted to a fixed pressure one?  
A. Drag, or friction      D. Double pump  
B. Centrifugal      E. Dynamic pump  
C. Bypass fitted      F. None of the Above

193. Which of the following terms refers to where the rotor touches the stator, the surfaces are generally traveling transversely, in that small areas of sliding contact occur, these areas need to be lubricated by the fluid being pumped?  
A. Torque      D. Hydrodynamic lubrication  
B. Lubrication layer      E. Liquid's resistance to flow  
C. Elastomer core      F. None of the Above



194. 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

195. 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

196. 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

197. \_\_\_\_\_ 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

198. \_\_\_\_\_ 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

199. 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

### **Lineshaft Lubrication**

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

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

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

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

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

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

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

- A. True
- B. False

### General Maintenance Section

204. Which of the following terms or operation from what is expected can be traced back to some specific cause?

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

205. Which of the following terms or improper operation is essential to the correction of the trouble — whether the correction is done by the user, the dealer or reported back to the factory?

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

206. Which of the following terms from initial performance will indicate changing system conditions, wear or impending breakdown of unit?

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

207. According to the text, deep well turbine pumps must have \_\_\_\_\_ between the pump and the power unit.

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

208. \_\_\_\_\_ is made easy by using a head assembly that matches the motor and column/pump assembly?

- A. Packing gland
- B. Oil reservoir
- C. Impending trouble
- D. Correct alignment
- E. Variances
- F. None of the Above

209. Which of the following terms must be vertically aligned so that no part touches the well casing?

- A. Periodic inspection
- B. Stuffing box
- C. Correct alignment
- D. Pump column assembly
- E. Gravity flow system
- F. None of the Above

210. Spacers are usually attached to the pump column to prevent the pump assembly from touching the well casing.

- A. True
- B. False

211. Which of the following terms out of vertical alignment may also cause excessive bearing wear?

- A. Periodic inspection
- B. Stuffing box
- C. Correct alignment
- D. Pump column
- E. Gravity flow system
- F. None of the Above

212. \_\_\_\_\_ must be mounted on a good foundation at least 12 inches above the ground surface?

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

213. The foundation should have at least 12 inches of bearing surface on all sides of the well. In the case of a gravel-packed well, the 12-inch clearance is measured from the outside edge of the?

- A. Periodic inspection
- B. Stuffing box
- C. Correct alignment
- D. Gravel packing
- E. Gravity flow system
- F. None of the Above

### Centrifugal Pump

214. 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

215. 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

216. In operation, a centrifugal pump “\_\_\_\_\_” liquid out of the impeller via centrifugal force.

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

217. 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

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

- A. True
- B. False

219. 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

220. \_\_\_\_\_ are also classified as Closed or Open?

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

221. \_\_\_\_\_ have side walls 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

222. 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

223. 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

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

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

225. 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

226. 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

227. 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

### Centrifugal Pump

228. 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

229. 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

### NPSH - Net Positive Suction Head

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

- A. True
- B. False

231. 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

232. 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

233. 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

234. 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

235. Reducing the impeller's 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

236. 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

237. 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

238. 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

239. Which of the following terms give reasonably close results when the changes are not more than 50% of the original speed or 15% of the original diameter?

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

240. Which of the following terms can be 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**

241. 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

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

- A. True
- B. False

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

- A. True
- B. False

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

- A. True
- B. False

245. 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

246. 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

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

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

248. 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
- B. Transmit tension
- C. Maximum suction lift
- D. Atmospheric pressure
- E. Laws of Affinity
- F. None of the Above

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

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

250. Vapor pressure increases as liquid temperature increases. \_\_\_\_\_ decreases as vapor pressure rises.

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

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

- A. True
- B. False

### **Cavitation - Two Main Causes:**

252. 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
- B. Speed
- C. Suction conditions
- D. Water vaporizes (boils)
- E. Hydraulic efficiency
- F. None of the Above

253. 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
- B. Speed
- C. Suction conditions
- D. Turbulence and vortexes
- E. Hydraulic efficiency
- F. None of the Above

### **Affinity laws**

254. 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

255. 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

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

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

### **Pump Casing**

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

- A. True
- B. False

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

- A. True
- B. False

259. The line shaft turbine is a single stage centrifugal pump.

- A. True
- B. False

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

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

### **Impeller**

261. In most centrifugal pumps, the impeller looks like a number of cupped vanes on blades mounted on\_\_\_\_\_.

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

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

- A. True
- B. False

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

- A. True
- B. False

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

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



265. \_\_\_\_\_ of the impeller and how it is installed in the casing will determine if it is high volume / low pressure or the type of liquid that could be pumped?
- A. Shape of the vanes
  - B. Line shaft turbine
  - C. Parallel to the shaft
  - D. Critical distance
  - E. Discharge piping outlet
  - F. None of the Above

266. Which of the following terms looks like a propeller and creates a flow that is parallel to the shaft?
- A. Radial flow impellers
  - B. Axial flow impellers
  - C. Parallel to the shaft
  - D. Cupped vanes on blades
  - E. Shape of the vanes
  - F. None of the Above

### Motor and Pump Calculations

267. \_\_\_\_\_ 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

268. Which of the following terms, pumping to a pressurized vessel we must convert the pressure units to head units?
- A. Positive suction head
  - B. Pressure head
  - C. Friction Loss
  - D. Negative suction head
  - E. Total Dynamic Head (TDH)
  - F. None of the Above

269. Which of the following terms is caused by friction in the pipes, fittings, and system components?
- A. Static head
  - B. Pump discharge head
  - C. Friction Loss
  - D. System or dynamic head
  - E. Negative suction head
  - F. None of the Above

### Suction Head is Measured the Same Way.

270. If the liquid level is above the pump centerline, that level is a positive suction head.
- A. True
  - B. False

271. 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

272. If the pump is pumping liquid from a pressurized vessel, you must convert this pressure to a positive suction head.
- A. True
  - B. False

273. 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

274. 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

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

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

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

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

277. Which of the following terms is the total height in that a fluid is to be pumped, taking into account friction losses in the pipe?

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

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

### **Motor, Coupling and Bearing Section**

279. The purpose of the bearing house is to hold the shaft firmly in place, yet allow it to rotate.

- A. True      B. False

280. The pump assembly can only be a vertical set-up.

- A. True      B. False

281. The power source of the pump is usually an electric motor. The motor is connected by a coupling to the \_\_\_\_\_.

- A. Static head      D. System or dynamic head  
B. Bearings      E. Pump shaft  
C. Pump assembly      F. None of the Above

282. Which of the following terms supports the bearings and provides a reservoir for the lubricant?

- A. Static head      D. System or dynamic head  
B. Bearings      E. Bearing house  
C. Pump assembly      F. None of the Above

283. An impeller is connected to the?

- A. Static head      D. System or dynamic head  
B. Bearings      E. Shaft  
C. Pump assembly      F. None of the Above

### **D-C Motors**

284. The important characteristic of the D-C motor is that its speed will not vary with the amount of current used.

- A. True      B. False

285. There are many different kinds of D-C motors, depending on how they are wound and totally enclosed motors.

- A. True      B. False

### **A-C Motors**

286. The synchronous type of A-C motor is used for smaller horsepower sizes, usually above 100 HP.

- A. True      B. False

287. There are a number of different types of alternating current motors, such as synchronous, induction, wound rotor, and?

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

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

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

289. The induction type motor uses only alternating current.

- A. True      B. False

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

- A. True      B. False

291. The wound rotor type could be used as a \_\_\_\_\_.

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

### **Motor Starters**

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

- A. True      B. False

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

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

294. The purpose of the \_\_\_\_\_ is to prevent the load from coming on until the amperage is low enough.
- A. Bubbler pipe
  - B. Manual pump controls
  - C. Reduced voltage starter
  - D. Totally enclosed motors
  - E. Reduced voltage starter
  - F. None of the Above

### Motor Enclosures

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

- A. True
- B. False

296. Some motors are referred to as “open” motors.

- A. True
- B. False

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

- A. True
- B. False

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

- A. True
- B. False

299. Other motors use \_\_\_\_\_ for special environments or safety protection.

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

300. \_\_\_\_\_ must be provided on any motor where dangerous gases might accumulate.

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

### Motor Controls

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

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

302. \_\_\_\_\_ can be located at the central control panel at the pump or at the suction or discharge points of the liquid being pumped?

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

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

- A. True
- B. False

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

- A. True
- B. False

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

- A. True      B. False

306. A low-pressure air supply is allowed to escape from a \_\_\_\_\_ in the wet well.

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

### Motor Maintenance

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

- A. True      B. False

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

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

### Moisture

309. Moisture on windings tend to repel acid and alkali fumes, causing no damage to both insulation and metals.

- A. True      B. False

310. To increase problems caused by moisture, the most suitable motor enclosure for the existing environment will normally be used, it is recommended to run stand by motors to dry up any grease which accumulates in the motor.

- A. True      B. False

### Understanding the Operation of a Vertical Turbine Pump

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

- A. True      B. False

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

- A. True      B. False

313. \_\_\_\_\_ are available in deep well, shallow well, or cased configurations?

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

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

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

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

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

316. \_\_\_\_\_ are also used in surface water systems?

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

### **Bowl Assembly**

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

- A. True
- B. False

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

- A. True
- B. False

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

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

### **Drivers**

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

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

321. With the solid shaft driver, the \_\_\_\_\_ is solid and projects below the driver mounting base.

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

### **Discharge Head Assembly**

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

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

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

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

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

- A. True      B. False

**Column Assembly**

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

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

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

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

327. According to the text, oil-lubricated bearings are commonly placed on \_\_\_\_\_.

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

328. Which of the following terms encloses the impeller?

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

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

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

**Column assembly will consist of:**

330. According to the text, column pipe, which connects the \_\_\_\_\_ to the discharge head,

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

331. Shaft, connecting the bowl shaft to the?

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

332. Column pipe may be either threaded or flanged.

- A. True      B. False

333. Some units will not require \_\_\_\_\_, having the bowl assembly connected directly to the discharge head instead.
- A. Bowl shaft
  - B. Bowls
  - C. Suction bell
  - D. Column assembly
  - E. Discharge head
  - F. None of the Above

### **Bowl Assemblies**

#### **The bowl consists of:**

334. \_\_\_\_\_ are normally made by lowering the impellers to the bottom of the bowls and adjusting them upward?

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

335. The amount of \_\_\_\_\_ is determined by how much the line shaft will stretch during pumping.

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

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

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

### **Stuffing Box Adjustment**

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

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

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

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

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

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

### **Hydraulics**

340. Which of the following terms 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



341. Which of the following terms includes the consideration of liquids at rest, involves problems of buoyancy and flotation?  
A. Pressure                      D. Hydraulics  
B. Hydrostatics                  E. Flow  
C. Hydrokinetics                 F. None of the Above

342. \_\_\_\_\_ includes the behavior of all liquids, although it is primarily concerned with the motion of liquids.  
A. Fluids                          D. Hydraulics  
B. Hydrostatics                  E. Flow  
C. Hydrokinetics                 F. None of the Above

343. 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                      D. Hydraulics  
B. Hydrostatics                  E. Flow  
C. Hydrokinetics                 F. None of the Above

344. Which of the following terms is about the pressures exerted by a fluid at rest?  
A. Pressure                      D. Hydraulics  
B. Hydrostatics                  E. Flow  
C. Hydrokinetics                 F. None of the Above

### **Atmospheric Pressure**

345. 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

346. 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

347. If you were to ascend, the atmospheric pressure increases by approximately 1.0 psi for every 2,343 feet.  
A. True                      B. False

### **Pressure**

348. Water is incompressible, while air is very compressible.  
A. True                      B. False

349. Both air and water are considered to be \_\_\_\_\_.  
A. Absolute pressure              D. Volume  
B. Atmospheric pressure          E. Shearing force  
C. Fluid(s)                          F. None of the Above

350. Which of the following terms does water possess and air does not?  
A. Absolute pressure              D. Volume  
B. Atmospheric pressure          E. Shearing force  
C. Fluid(s)                          F. None of the Above

351. 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

352. According to the text, a force is proportional to the \_\_\_\_\_, and is called a pressure.

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

353. 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                      D. Permanent forces tangential  
B. Hydrostatics                            E. Area on which it is exerted  
C. Acting on the body of the fluid      F. None of the Above

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

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

355. 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                      D. Permanent forces tangential  
B. Hydrostatics                            E. Area on which it is exerted  
C. Acting on the body of the fluid      F. None of the Above

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

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

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

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

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

### Free Surface Perpendicular to Gravity

359. 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

360. Which of the following terms 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

### Vacuum

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

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

362. 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

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

- A. True
- B. False

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

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

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

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

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

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

## Pressure and Force

367. \_\_\_\_\_ 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

368. 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

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

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

## Computing Force, Pressure, and Area

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

## Development of Hydraulics

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

373. 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

374. One characteristic of a liquid is the tendency to keep its free surface level.  
A. True      B. False

375. Liquids will flow in the direction that will tend to make the surface level, if the surface is not level.  
A. True      B. False

## Pascal's Law

376. Pascal discovered that pressure in a fluid acts equally in some directions.  
A. True      B. False

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

- A. True      B. False

378. 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

379. Pressure in a \_\_\_\_\_ of direction.

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

380. Pressure due to the \_\_\_\_\_, at any level, depends on the depth of the fluid from the surface.

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

### Static Pressure

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

382. Velocity head and \_\_\_\_\_ are obtained at the expense of static head.

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

### Volume and Velocity of Flow

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

384. Which of the following flow terms is defined as the average speed at which the fluid moves past a given point. It is expressed in feet per second (fps) or feet per minute (fpm).

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

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

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

## Backflow Introduction

386. \_\_\_\_\_ 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

387. Which of the following definition terms 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

388. \_\_\_\_\_ 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

## What is backflow? Reverse flow condition

389. 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

390. Which of the following terms 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

391. Which of the following terms is a form 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

392. Which of the following terms 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

393. \_\_\_\_\_ can have two forms-backpressure and backsiphonage?

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

394. 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

395. 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

396. 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

#### **Types of Backflow Prevention Methods and Assemblies**

397. Which of the following terms 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

398. 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

399. 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

400. 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