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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.

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In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

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Thank you...

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Pump Primer 3 Answer Key

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You are solely responsible in ensuring that this course is accepted for credit by your State. Did you check with your State agency to ensure this course is accepted for credit?

Method of Course acceptance confirmation. Please fill this section

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Did you receive the approval number if Applicable? _____

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You can use Adobe Acrobat DC Program to complete the assignment

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

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**Please fax the answer key to TLC Western Campus Fax (928) 272-0747.
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Rush Grading Service

If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of \$50.00. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line.

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PUMP PRIMER 3 CEU TRAINING COURSE

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Pump Primer 3 CEU Training Course Assignment

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

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

We would prefer that you utilize the enclosed answer sheet in the front, but if you are unable to do so, type out your own answer key. Please include your name and address on your manual 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.**

Motor Section

1. The purpose of the _____ is to hold the shaft firmly in place, yet allow it to rotate.

- | | | |
|------------------|----------------------|------------------------------|
| A. Brush(es) | D. Bearing house | |
| B. Pump assembly | E. Bearing(s) | (s) Means Plural or Singular |
| C. Stator | F. None of the Above | |

2. Which of the following terms - supports the bearings and provides a reservoir for the lubricant. An impeller is connected to the shaft?

- | | | |
|------------------|----------------------|------------------------------|
| A. Brush(es) | D. Bearing house | |
| B. Pump assembly | E. Bearing(s) | (s) Means Plural or Singular |
| C. Stator | F. None of the Above | |

3. Which of the following terms - can be a vertical or horizontal set-up; the components for both are basically the same.

- | | | |
|------------------|----------------------|------------------------------|
| A. Brush(es) | D. Bearing house | |
| B. Pump assembly | E. Bearing(s) | (s) Means Plural or Singular |
| C. Stator | F. None of the Above | |

D-C Motors

4. The important characteristic of the _____ is that its speed will vary with the amount of current used.

- | | |
|----------------------|--|
| A. DC motor | D. Three-phase AC synchronous motor(s) |
| B. AC electric motor | E. Computer controlled stepper motors |
| C. Solenoid | F. None of the Above |

A-C Motors

5. There are a number of different types of alternating current motors, such as Synchronous, Induction, wound rotor, and?

- | | |
|----------------------|---------------------------------------|
| A. DC electric motor | D. Three-phase AC synchronous motors |
| B. AC electric motor | E. Computer controlled stepper motors |
| C. Squirrel cage | F. None of the Above |

6. This also means that the _____ is used in large horsepower sizes, usually above 250 HP. The induction type motor uses only alternating current.

- A. DC electric motor
- B. AC electric motor
- C. Squirrel cage
- D. Three-phase AC synchronous motor
- E. Synchronous type of A-C motor
- F. None of the Above

7. Which of the following terms - motor provides a relatively constant speed?

- A. DC electric
- B. AC electric
- C. Squirrel cage
- D. Three-phase AC synchronous
- E. Computer controlled stepper
- F. None of the Above

Motor Starters

8. The purpose of the _____ is to prevent the load from coming on until the amperage is low enough.

- A. Brush(es)
 - B. Pump assembly
 - C. Stator
 - D. Reduced voltage starter
 - E. Bearing(s)
 - F. None of the Above
- (s) Means Plural or Singular

Motor Enclosures

9. Depending on the application, motors may need special protection. Some motors are referred to as open motors. They allow air to pass through to remove heat generated when current passes through the windings. Other motors use _____ for special environments or safety protection.

- A. Brush(es)
 - B. Specific enclosures
 - C. Stator
 - D. Reduced voltage starter
 - E. Bearing(s)
 - F. None of the Above
- (s) Means Plural or Singular

Motor Controls

10. Which of the following terms - can be located at the central control panel at the pump or at the suction or discharge points of the liquid being pumped?

- A. Circuit
 - B. Motor control(s)
 - C. Bearing house
 - D. Bubble regulator
 - E. Manual pump control(s)
 - F. None of the Above
- (s) Means Plural or Singular

11. Two typical level sensors are the _____ and the bubble regulator.

- A. Circuit
 - B. Motor control(s)
 - C. Bearing house
 - D. Float sensor (s)
 - E. A-C motor(s)
 - F. None of the Above
- Means Plural or Singular

12. Which of the following terms - is pear-shaped and hangs in the wet well?

- A. Brush(es)
 - B. Specific enclosures
 - C. Stator
 - D. Reduced voltage starter
 - E. Bearing(s)
 - F. None of the Above
- (s) Means Plural or Singular

13. 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 _____, it closes the circuit.

- A. Circuit
- B. Motor control(s)
- C. Wires
- D. Bubble regulator
- E. A-C motor(s)
- F. None of the Above

14. Which of the following terms - will detect this change and use this information to control pump operation.

- A. Open motor(s)
- B. Sensitive air pressure switches
- C. Float sensor
- D. Pump assembly
- E. Reduced voltage starter
- F. None of the Above

Motor Maintenance

15. Motors should be kept clean, free of moisture, and lubricated properly. Dirt, dust, and grime will plug the ventilating spaces and can actually form an insulating layer over the metal surface of the?

- A. Brush(es)
- B. Pump assembly
- C. Stator
- D. Reduced voltage starter
- E. Bearing(s)
- F. None of the Above

Moisture

16. Moisture harms the insulation on the _____ to the point where they may no longer provide the required insulation for the voltage applied to the motor..

- A. Circuit
- B. Motor control(s)
- C. Wires
- D. Windings
- E. Motor enclosure
- F. None of the Above

17. To reduce problems caused by moisture, the most suitable _____ for the existing environment will normally be used.

- A. Circuit
- B. Motor control(s)
- C. Wires
- D. Windings
- E. Motor enclosure
- F. None of the Above

Motor Lubrication

18. You have to be careful not to add too much grease or oil, as this could cause more friction and?

- A. Vacuum
- B. Friction loss
- C. Vibration
- D. Generate heat
- E. Vapor bubbles
- F. None of the Above

More Detailed Information on Motors

19. Many classic _____ run happily on AC power.

- A. Motor(s)
- B. AC power
- C. DC motor(s)
- D. Direct Current (DC)
- E. An asynchronous motor
- F. None of the Above

20. Driver circuits are relied upon to generate _____, or some approximation of.

- A. Sinusoidal AC drive currents
- B. AC power
- C. DC motor(s)
- D. Direct Current (DC)
- E. Asynchronous sinusoidal AC drive currents
- F. None of the Above

21. The two best examples are: the _____ and the stepping motor, both being polyphase AC motors requiring external electronic control.

- A. Brushless DC motor
- B. AC power
- C. DC motor(s)
- D. Direct Current (DC)
- E. An asynchronous motor
- F. None of the Above

22. There is a clearer distinction between a _____ and asynchronous types. In the synchronous types, the rotor rotates in synchrony with the oscillating field or current (e.g. permanent magnet motors).

- A. Sinusoidal AC drive currents
- B. AC power
- C. DC motor(s)
- D. Synchronous motor
- E. Asynchronous sinusoidal AC drive currents
- F. None of the Above

23. In contrast, an asynchronous motor is designed to slip; the most ubiquitous example being the common _____ which must slip in order to generate torque.

- A. Sinusoidal AC drive currents
- B. AC induction motor
- C. DC motor(s)
- D. Synchronous motor
- E. Asynchronous sinusoidal AC drive currents
- F. None of the Above

24. Which of the following terms - is designed to run on DC electric power?

- A. Synchronous motor
- B. AC power
- C. DC motor(s)
- D. Direct Current (DC)
- E. An asynchronous motor
- F. None of the Above

25. Two examples of pure DC designs are Michael Faraday's _____, and the ball bearing motor, which is a novelty.

- A. Sinusoidal AC drive currents
- B. AC induction motor
- C. DC motor(s)
- D. Synchronous motor
- E. Homopolar motor
- F. None of the Above

26. By far the most common _____ types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source -- so they are not purely DC machines in a strict sense.

- A. Motor(s)
- B. AC power
- C. DC motor(s)
- D. Direct Current (DC)
- E. An asynchronous motor
- F. None of the Above

Brushed DC motors

27. The classic DC motor design generates an oscillating current in a _____ with a split ring commutator, and either a wound or permanent magnet stator.

- A. Brush(es)
- B. Rotating switch
- C. Stator
- D. Permanent magnet stator
- E. Wound rotor
- F. None of the Above

28. Which of the following terms - consists of a coil wound around a rotor which is then powered by any type of battery?

- A. Brush(es)
- B. Rotating switch
- C. Stator
- D. Permanent magnet stator
- E. Rotor
- F. None of the Above

29. Many of the limitations of the classic commutator DC motor are due to the need for _____ to press against the commutator. This creates friction.

- A. Brushes
- B. Motor control(s)
- C. Wires
- D. Windings
- E. Motor enclosure
- F. None of the Above

30. Which of the following terms - may bounce off the irregularities in the commutator surface, creating sparks. This limits the maximum speed of the machine.

- A. Brushes
- B. Motor control(s)
- C. Wires
- D. Windings
- E. Motor enclosure
- F. None of the Above

31. The current density per unit area of the _____ limits the output of the motor. The imperfect electric contact also causes electrical noise.

- A. Brush(es)
- B. Rotating switch
- C. Stator
- D. Permanent magnet stator
- E. DC motor(s)
- F. None of the Above

32. Which of the following terms - eventually wear out and require replacement, and the commutator itself is subject to wear and maintenance?

- A. Brush(es)
- B. Rotating switch
- C. Stator
- D. Permanent magnet stator
- E. DC motor(s)
- F. None of the Above

Brushless DC Motors

33. Some of the problems of the brushed DC motor are eliminated in the brushless design. In this motor, the mechanical "rotating switch" or commutator/brush gear assembly is replaced by _____ synchronized to the rotor's position.

- A. Brush(es)
- B. Rotating switch
- C. Stator
- D. Permanent magnet stator
- E. An external electronic switch
- F. None of the Above

34. Which of the following terms - motors are typically 85-90% efficient, whereas DC motors with brush gear are typically 75-80% efficient.

- A. Brush(es)
- B. Rotating switch
- C. Stator
- D. Permanent magnet stator
- E. Brushless
- F. None of the Above

35. Midway between ordinary DC motors and _____ lies the realm of the brushless DC motor.

- A. Stepper motors
- B. AC power
- C. DC motor(s)
- D. Direct Current (DC)
- E. An asynchronous motor
- F. None of the Above

36. The coils are activated one phase after the other by the drive electronics, as cued by the signals from the _____. In effect, they act as three-phase synchronous motors containing their own variable-frequency drive electronics.

- A. Brush(es)
- B. Rotating switch
- C. Stator
- D. Permanent magnet stator
- E. Hall effect sensors
- F. None of the Above

37. Which of the following terms - are commonly used where precise speed control is necessary, as in computer disk drives or in video cassette recorders, the spindles within CD, CD-ROM?

- A. Stepper motors
- B. AC power
- C. DC motor(s)
- D. Direct Current (DC)
- E. Brushless DC motors
- F. None of the Above

Components

A typical AC motor consists of two parts:

38. Which of the following terms - having coils supplied with AC current to produce a rotating magnetic field.

- A. Torque motor(s)
- B. An inside rotor
- C. Standard squirrel cage motor
- D. Slip ring or wound rotor motor
- E. An outside stationary stator
- F. None of the Above

39. Which of the following terms - attached to the output shaft that is given a torque by the rotating field?

- A. Torque motor(s)
- B. An inside rotor
- C. Standard squirrel cage motor
- D. Slip ring or wound rotor motor
- E. An outside stationary stator
- F. None of the Above

Torque motors

40. Which of the following terms - is a specialized form of induction motor which is capable of operating indefinitely at stall without damage. In this mode, the motor will apply a steady stall torque to the load?

- A. Torque motor(s)
- B. An inside rotor
- C. Standard squirrel cage motor
- D. Slip ring or wound rotor motor
- E. An outside stationary stator
- F. None of the Above

41. A common application of a _____ would be the supply- and take-up reel motors in a tape drive.

- A. Torque motor(s)
- B. An inside rotor
- C. Standard squirrel cage motor
- D. Slip ring or wound rotor motor
- E. An outside stationary stator
- F. None of the Above

42. In the computer world, _____ are used with force feedback steering wheels.

- A. Torque motor(s)
- B. An inside rotor
- C. Standard squirrel cage motor
- D. Slip ring or wound rotor motor
- E. An outside stationary stator
- F. None of the Above

Slip Ring

43. Which of the following terms - is an induction machine where the rotor comprises a set of coils that are terminated in slip rings to which external impedances can be connected?

- A. Torque motor(s)
- B. Inside rotor
- C. Standard squirrel cage motor
- D. Slip ring or wound rotor motor
- E. Outside stationary stator
- F. None of the Above

44. By changing the impedance connected to the _____, the speed/current and speed/torque curves can be altered.

- A. Rotor circuit
- B. Rotating switch
- C. Stator
- D. Permanent magnet stator
- E. Hall effect sensors
- F. None of the Above

45. Which of the following terms - is used primarily to start a high inertia load or a load that requires a very high starting torque across the full speed range?

- A. Torque motor(s)
- B. Inside rotor
- C. Standard squirrel cage motor
- D. Slip ring motor
- E. Outside stationary stator
- F. None of the Above

46. By correctly selecting the resistors used in the secondary resistance or _____ starter, the motor is able to produce maximum torque at a relatively low current from zero speed to full speed.

- A. Torque motor(s)
- B. Inside rotor
- C. Standard squirrel cage motor
- D. Slip ring
- E. Outside stationary stator
- F. None of the Above

47. A secondary use of the _____ is to provide a means of speed control.

- A. Torque motor(s)
- B. Inside rotor
- C. Standard squirrel cage motor
- D. Slip ring motor
- E. Outside stationary stator
- F. None of the Above

48. Increasing the value of resistance on the _____ will move the speed of maximum torque down.

- A. Rotor circuit
- B. Rotating switch
- C. Stator
- D. Permanent magnet stator
- E. Hall effect sensors
- F. None of the Above

49. If the resistance connected to the _____ is increased beyond the point where the maximum torque occurs at zero speed, the torque will be further reduced.

- A. Rotor
- B. Rotating switch
- C. Stator
- D. Permanent magnet stator
- E. Hall effect sensors
- F. None of the Above

50. When used with a load that has a torque curve that increases with speed, the motor will operate at the speed where the torque developed by the motor is equal to the?

- A. Torque motor(s)
- B. An inside rotor
- C. Standard squirrel cage motor
- D. Load torque
- E. An outside stationary stator
- F. None of the Above

51. Reducing the load will cause the motor to speed up, and increasing the _____ will cause the motor to slow down until the load and motor torque are equal.

- A. Rotor circuit
- B. Rotating switch
- C. Stator
- D. Permanent magnet stator
- E. Hall effect sensors
- F. None of the Above

52. Operated in this manner, the _____ are dissipated in the secondary resistors and can be very significant. The speed regulation is also very poor.

- A. Torque motor(s)
- B. Slip losses
- C. Standard squirrel cage motor
- D. Slip ring or wound rotor motor
- E. Stationary stator
- F. None of the Above

Stepper Motors

53. Closely related in design to _____ are stepper motors, where an internal rotor containing permanent magnets or a large iron core with salient poles is controlled by a set of external magnets that are switched electronically.

- A. Stepper motor(s)
- B. AC power
- C. DC motor(s)
- D. Three-phase AC synchronous motor(s)
- E. Brushless DC motor(s)
- F. None of the Above

54. Which of the following terms - may also be thought of as a cross between a DC electric motor and a solenoid?

- A. Stepper motor(s)
- B. AC power
- C. DC motor(s)
- D. Three-phase AC synchronous motor(s)
- E. Brushless DC motor(s)
- F. None of the Above

55. Unlike a synchronous motor, in its application, the motor may not rotate continuously; instead, it "steps" from one position to the next as _____ are energized and de-energized in sequence.

- A. Rotor circuit
- B. Rotating switch
- C. Stator
- D. Permanent magnet stator
- E. Field windings
- F. None of the Above

56. Simple stepper motor drivers entirely energize or entirely de-energize the field windings, leading the rotor to "cog" to a limited number of positions; _____ can proportionally control the power to the field windings, allowing the rotors to position between the cog points and thereby rotate extremely smoothly.

- A. Rotor circuit
- B. Rotating switch
- C. More sophisticated drivers
- D. Permanent magnet stator
- E. Field windings
- F. None of the Above

57. Computer controlled _____ are one of the most versatile forms of positioning systems, particularly when part of a digital servo-controlled system.

- A. Stepper motor(s)
- B. AC power
- C. DC motor(s)
- D. Three-phase AC synchronous motor(s)
- E. Brushless DC motor(s)
- F. None of the Above

Motor Review Section

Reviewing D-C Motors

58. An electric motor can be configured as a _____, a stepper motor or a rotational machine.

- A. DC electric motor
- B. AC electric motor
- C. Solenoid
- D. Three-phase AC synchronous motors
- E. Computer controlled stepper motors
- F. None of the Above

59. In Faraday's experiment, the DC motor works with _____ and electrical current.

- A. Force
- B. Magnetic field(s)
- C. Electric charges
- D. DC motor
- E. Permanent magnet
- F. None of the Above

60. Centuries ago it was discovered that a stone found in Asia, referred to as a lodestone, and had an unusual property that would transfer _____ to an iron object when the stone was rubbed against it.

- A. Force
- B. Magnetic field(s)
- C. Electric charges
- D. An invisible force
- E. Permanent magnet
- F. None of the Above

61. These lodestones were found to align with the _____ when freely hanging on a string or floated on water, and this property aided early explorers in navigating around the earth.

- A. Force
- B. Magnetic field(s)
- C. Electric charges
- D. Earth's north-south axis
- E. Permanent magnet
- F. None of the Above

62. It was understood later that this stone was a _____ with a field that had two poles of opposite effect, referred to as north and south.

- A. Force
- B. Magnetic field(s)
- C. Electric charges
- D. Motor
- E. Permanent magnet
- F. None of the Above

63. The magnetic fields, just like electric charges, have _____ that are opposite in their effects.

- A. Force(s)
- B. Magnetic field(s)
- C. Electric charges
- D. DC motors
- E. Permanent magnets
- F. None of the Above

64. Which of the following terms - are aligned at opposite or dissimilar poles, they'll exert considerable forces of attraction with one another?

- A. Forces
- B. Magnetic field(s)
- C. Electric charges
- D. Similar poles
- E. Permanent magnet
- F. None of the Above

65. If iron particles are sprinkled on a paper sheet over a permanent magnet, the alignment of the iron particles maps the magnetic field, which shows that this field leaves one pole and enters the other pole with the _____ field being unbroken.

- A. Force
- B. Magnetic field(s)
- C. Electric charges
- D. DC motor
- E. Permanent magnet
- F. None of the Above

66. As with any kind of field, the total quantity, or effect, of the field is referred to as the flux, while the push causing the flux to form in space is called a force. This _____ field is comprised of many lines of flux, all starting at one pole and returning to the other pole.

- A. Force
- B. Magnetic field(s)
- C. Electric charges
- D. Magnetic force
- E. Permanent magnet
- F. None of the Above

Modern Theory of Magnetism

67. The modern theory of magnetism states that a _____ is produced by an electric charge in motion.

- A. Force
- B. Magnetic field(s)
- C. Electric charges
- D. Magnetic force
- E. Permanent magnet
- F. None of the Above

68. The more atoms uniformly spinning in the same direction, the stronger the force of the?

- A. Force
- B. Magnetic field(s)
- C. Electric charges
- D. Magnetic force
- E. Permanent magnet
- F. None of the Above

69. When billions of atoms have orbits spinning in the same direction and the material is capable of holding the atoms' orbits, a _____ is created.

- A. Force
- B. Magnetic field(s)
- C. Electric charges
- D. DC motor
- E. Permanent magnet
- F. None of the Above

70. When two powerful permanent magnets are moved in close proximity to one another, it's evident that a very real force is exerted that can provide the potential for work to be done. For work to be accomplished, the relationship between the _____ must be controlled properly.

- A. Force
- B. Magnetic field(s)
- C. Electric charges
- D. Magnetic force
- E. Permanent magnet
- F. None of the Above

Magnetic Principles and Motor Theory

71. A brief review of magnetic principles and motor theory is always a convenient starting point for any discussion of?

- A. DC electric motor
- B. AC electric motor
- C. DC motor applications
- D. Three-phase AC synchronous motors
- E. Computer controlled stepper motors
- F. None of the Above

72. In essence, _____, permanent or electromagnetic, produce fields of magnetic flux.

- A. Rotating equipment
- B. DC motor applications
- C. Faraday's Law
- D. Foundation of motor theory
- E. Rotational or mechanical energy
- F. None of the Above

73. These magnetic fields can produce an induced EMF through a coil of wire when relative movement between the field and a current carrying conductor occurs; and if this movement is reversed, so is the direction of the magnetic field, according to?

- A. Rotating equipment
- B. DC motor applications
- C. Faraday's Law
- D. Foundation of motor theory
- E. Rotational or mechanical energy
- F. None of the Above

74. Thus, in theory, motor action or torque is produced when electrical energy is applied to conductor in a changing magnetic field, causing current flow in the conductor, generating both an induced EMF and a CEMF (_____) resulting in rotational or mechanical energy.

- A. Rotating equipment
- B. DC motor applications
- C. Faraday's Law
- D. Foundation of motor theory
- E. Lenz's Law
- F. None of the Above

Synchronous Electric Motor

75. A synchronous electric motor is an _____ distinguished by a rotor spinning with coils passing magnets at the same rate as the alternating current and resulting magnetic field which drives it.

- A. DC electric motor
- B. AC motor
- C. DC motor applications
- D. Three-phase AC synchronous motors
- E. Computer controlled stepper motors
- F. None of the Above

76. One type of _____ is like an induction motor except the rotor is excited by a DC field.

- A. DC electric motor
- B. AC electric motor
- C. DC motor applications
- D. Three-phase AC synchronous motors
- E. Synchronous motor
- F. None of the Above

77. Which of the following terms - connect to each other and move at the same speed hence the name synchronous motor.

- A. AC motor
- B. Slip rings and brushes
- C. Induction motor
- D. Rotor poles
- E. Rotor magnetic field
- F. None of the Above

Induction Motor

78. An induction motor is _____ where power is transferred to the rotor by electromagnetic induction, much like transformer action.

- A. An asynchronous AC motor
- B. AC electric motor
- C. DC motor applications
- D. Three-phase AC synchronous motors
- E. Synchronous motor
- F. None of the Above

79. An induction motor resembles a rotating transformer, because the stator is essentially the primary side of the transformer and the rotor is the secondary side. _____ are widely used in industry.

- A. AC motors
- B. Slip rings and brushes
- C. Induction motors
- D. Squirrel-cage motors
- E. Polyphase induction motors
- F. None of the Above

80. Induction motors may be further divided into squirrel-cage motors and?

- A. AC motors
- B. Wound-rotor motors
- C. Induction motors
- D. Squirrel-cage motors
- E. Polyphase induction motors
- F. None of the Above

81. Which of the following terms - have a heavy winding made up of solid bars, usually aluminum or copper, joined by rings at the ends of the rotor.

- A. AC motors
- B. Wound-rotor motors
- C. Induction motors
- D. Squirrel-cage motors
- E. Polyphase induction motors
- F. None of the Above

82. When one considers only the _____, they are much like an animal's rotating exercise cage, hence the name.

- A. Rotor and stators
- B. Magnetic field(s)
- C. Electric charges
- D. Magnetic force
- E. Permanent magnet
- F. None of the Above

83. Currents induced into this winding provide the _____ magnetic field.

- A. Rotor
- B. Motor's
- C. Electric charges
- D. Electrical
- E. Permanent magnet
- F. None of the Above

84. The shape of the rotor bars determines the?

- A. Speed-torque characteristics
- B. Magnetic field(s)
- C. Electric charges
- D. Magnetic force
- E. Permanent magnet
- F. None of the Above

85. At low speeds, the current induced in the _____ is nearly at line frequency and tends to be in the outer parts of the rotor cage.
- A. AC motors D. Squirrel-cage
 B. Wound-rotor motors E. Polyphase induction motors
 C. Induction motors F. None of the Above
86. By shaping the bars to change the resistance of the winding portions in the interior and outer parts of the cage, effectively a variable resistance is inserted in the _____. However, the majority of such motors have uniform bars.
- A. Load torque D. Higher efficiency electric motors
 B. Rotor circuit E. Inverter or separate motor-generator
 C. Rotor winding F. None of the Above
87. In a _____, the rotor winding is made of many turns of insulated wire and is connected to slip rings on the motor shaft.
- A. AC motors D. Squirrel-cage
 B. Wound-rotor motor(s) E. Polyphase induction motor(s)
 C. Induction motors F. None of the Above
88. An external resistor or other control devices can be connected in the?
- A. Load torque D. Higher efficiency electric motors
 B. Rotor circuit E. Inverter or separate motor-generator
 C. Rotor winding F. None of the Above
89. A converter can be fed from the _____ and return the slip-frequency power that would otherwise be wasted back into the power system through an inverter or separate motor-generator.
- A. Load torque D. Higher efficiency electric motors
 B. Rotor circuit E. Inverter or separate motor-generator
 C. Rotor winding F. None of the Above
90. Which of the following terms - motor is used primarily to start a high inertia load or a load that requires a very high starting torque across the full speed range?
- A. AC motor(s) D. Squirrel-cage
 B. Wound-rotor induction E. Polyphase induction
 C. Induction F. None of the Above
91. By correctly selecting the resistors used in the secondary resistance or _____, the motor is able to produce maximum torque at a relatively low supply current from zero speed to full speed.
- A. Slip motor D. Two independent multiphase winding sets
 B. Rotor E. Wound-rotor motor
 C. Slip ring starter F. None of the Above
92. Motor speed can be changed because the torque curve of the motor is effectively modified by the amount of resistance connected to the?
- A. Load torque D. Higher efficiency electric motors
 B. Rotor circuit E. Inverter or separate motor-generator
 C. Rotor winding F. None of the Above

93. Increasing the value of resistance will move the speed of maximum torque down. If the resistance connected to the _____ is increased beyond the point where the maximum torque occurs at zero speed, the torque will be further reduced.

- A. Slip tie
- B. Rotor
- C. Slip ring starter
- D. Two independent multiphase winding sets
- E. Wound-rotor motor
- F. None of the Above

94. When used with a load that has a torque curve that increases with speed, the motor will operate at the speed where the torque developed by the motor is equal to the?

- A. Load torque
- B. Rotor circuit
- C. Rotor winding
- D. Higher efficiency electric motors
- E. Wound-rotor motor
- F. None of the Above

95. The slip losses are dissipated in the _____ and can be very significant.

- A. Slip losses
- B. Rotor
- C. Slip ring starter
- D. Two independent multiphase winding sets
- E. Secondary resistors
- F. None of the Above

96. The speed regulation and net efficiency is also very poor. Various regulatory authorities in many countries have introduced and implemented legislation to encourage the manufacture and use of?

- A. Load torque
- B. Rotor circuit
- C. Rotor winding
- D. Higher efficiency electric motors
- E. An inverter or separate motor-generator
- F. None of the Above

Doubly Fed Electric Motor

97. Doubly fed electric motors have _____, which contribute active power to the energy conversion process, with at least one of the winding sets electronically controlled for variable speed operation.

- A. Higher efficiency electric motors
- B. Rotor
- C. Slip ring starter
- D. Two independent multiphase winding sets
- E. Only one active winding set
- F. None of the Above

98. Which of the following terms - are the maximum provided in a single package without topology duplication?

- A. Load torque
- B. Rotor circuit
- C. Rotor winding
- D. Only one active winding set
- E. Two independent multiphase winding sets
- F. None of the Above

99. Doubly fed electric motors are machines with an effective constant torque speed range that is twice synchronous speed for a given frequency of excitation. This is twice the constant torque speed range as singly fed electric machines, which have?

- A. Slip losses
- B. Rotor
- C. Slip ring starter
- D. Two independent multiphase winding sets
- E. Only one active winding set
- F. None of the Above

100. Which of the following terms - allows for a smaller electronic converter but the cost of the rotor winding and slip rings may offset the saving in the power electronics components?

- A. A doubly fed motor
- B. AC electric motor
- C. Solenoid
- D. Three-phase AC synchronous motors
- E. Computer controlled stepper motors
- F. None of the Above

Torque Motors

101. A torque motor is a _____ which is capable of operating indefinitely while stalled, that is, with the rotor blocked from turning, without incurring damage.

- A. Stepper motor
- B. Limited torque motor
- C. Rotor
- D. Specialized form of induction motor
- E. Servomotor
- F. None of the Above

102. Driven from a higher voltage, the torque motors can also achieve fast-forward and rewind operation without requiring any additional mechanics such as gears or clutches. In the computer gaming world, _____ are used in force feedback steering wheels.

- A. Servomotor(s)
- B. Synchronous motor
- C. Torque motor(s)
- D. Three-phase AC synchronous motors
- E. Coreless motors
- F. None of the Above

103. Another common application is the control of the throttle of an internal combustion engine in conjunction with an electronic governor. In this usage, the motor works against a return spring to move the throttle in accordance with the?

- A. Stepper motor
- B. Limited torque motor
- C. Rotor
- D. Output of the governor
- E. Servomotor
- F. None of the Above

Stepper Motors

104. Closely related in design to three-phase AC synchronous motors are stepper motors, where an internal rotor containing permanent magnets or a _____ is controlled by a set of external magnets that are switched electronically.

- A. Servomotor(s)
- B. Synchronous motor
- C. Torque motor(s)
- D. Three-phase AC synchronous motors
- E. Magnetically soft rotor with salient poles
- F. None of the Above

105. A stepper motor may also be thought of as a cross between a _____ and a rotary solenoid. As each coil is energized in turn, the rotor aligns itself with the magnetic field produced by the energized field winding.

- A. Stepper motor
- B. Limited torque motor
- C. Rotor
- D. DC electric motor
- E. Servomotor
- F. None of the Above

106. Unlike a synchronous motor, in its application, the _____ may not rotate continuously; instead, it "steps"—starts and then quickly stops again—from one position to the next as field windings are energized and de-energized in sequence.

- A. Stepper motor
- B. Synchronous motor
- C. Torque motor(s)
- D. Three-phase AC synchronous motors
- E. Coreless motors
- F. None of the Above

107. Depending on the sequence, the _____ may turn forwards or backwards, and it may change direction, stop, speed up or slow down arbitrarily at any time.

- A. Stepper motor
- B. Limited torque motor
- C. Rotor
- D. DC electric motor
- E. Servomotor
- F. None of the Above

Rotary

108. In many vibrating or oscillating machines, _____ spins an unbalanced mass, causing the motor to vibrate.

- A. Servomotor(s)
- B. An electric motor
- C. Torque motor(s)
- D. Three-phase AC synchronous motors
- E. Coreless motors
- F. None of the Above

Servo Motor

109. Which of the following terms - is a motor, very often sold as a complete module, which is used within a position-control or speed-control feedback control system mainly control valves, such as motor operated control valves?

- A. Stepper motor
- B. Limited torque motor
- C. Rotor
- D. Three-phase AC synchronous motor
- E. Servomotor
- F. None of the Above

110. The speed vs. torque curve is quite important and is high ratio for a?

- A. Servo motor(s)
- B. Synchronous motor
- C. Torque motor(s)
- D. Three-phase AC synchronous motors
- E. Coreless motors
- F. None of the Above

111. Dynamic response characteristics such as winding inductance and rotor inertia are also important; these factors limit the overall performance of the?

- A. Stepper motor
- B. Limited torque motor
- C. Rotor
- D. Servomechanism loop
- E. Servomotor
- F. None of the Above

112. As dynamic response requirements increase, more specialized motor designs such as _____ are used.

- A. Servomotor(s)
- B. Synchronous motor
- C. Torque motor(s)
- D. Three-phase AC synchronous motors
- E. Coreless motors
- F. None of the Above

Linear Motor

113. Which of the following terms - are most commonly induction motors or stepper motors?

- A. Servomotor(s)
- B. Linear motors
- C. Torque motor(s)
- D. Three-phase AC synchronous motors
- E. Coreless motors
- F. None of the Above

Torque Capability of Motor Types

114. When optimally designed within a given core saturation constraint and for a given active current, voltage, pole-pair number, excitation frequency, and air-gap flux density, all categories of electric motors or generators will exhibit virtually the same maximum continuous shaft torque within a given air-gap area with winding slots and back-iron depth, which determines the physical size of?

- A. Peak torque density
- B. PM electric machines
- C. Electromagnetic core
- D. Conventional electric machines
- E. Safe operating temperature rise and voltage
- F. None of the Above

115. Some applications require bursts of torque beyond the _____, such as short bursts of torque to accelerate an electric vehicle from standstill.

- A. Peak torque density
- B. PM electric machines
- C. Maximum operating torque
- D. Conventional electric machine
- E. Safe operating temperature rise and voltage
- F. None of the Above

116. Always limited by _____ or safe operating temperature rise and voltage, the capacity for torque bursts beyond the maximum operating torque differs significantly between categories of electric motors or generators.

- A. Peak torque density
- B. PM electric machines
- C. Electromagnetic core
- D. Magnetic core saturation
- E. Safe operating temperature rise and voltage
- F. None of the Above

117. Field weakening, which is not available with _____, allows an electric machine to operate beyond the designed frequency of excitation.

- A. Peak torque density
- B. PM electric machines
- C. Electromagnetic core
- D. Conventional electric machines
- E. Safe operating temperature rise and voltage
- F. None of the Above

Continuous Torque Density

118. The continuous torque density of conventional electric machines is determined by the size of the air-gap area and the back-iron depth, which are determined by the power rating of the armature winding set, the speed of the machine, and the achievable air-gap flux density before?

- A. Peak torque density
- B. PM electric machines
- C. Electromagnetic core
- D. Core saturation
- E. Safe operating temperature rise and voltage
- F. None of the Above

119. Despite the high coercivity of _____ or samarium-cobalt permanent magnets, continuous torque density is virtually the same amongst electric machines with optimally designed armature winding sets.

- A. Peak torque density
- B. PM electric machines
- C. Electromagnetic core
- D. Conventional electric machines
- E. Safe operating temperature rise and voltage
- F. None of the Above

120. Continuous torque density should never be confused with peak torque density, which comes with the manufacturer's chosen method of cooling, which is available to all, or period of operation before destruction by overheating of windings or?

- A. Peak torque density
- B. PM electric machines
- C. Electromagnetic core
- D. Even permanent magnet damage
- E. Safe operating temperature rise and voltage
- F. None of the Above

Understanding Three Phase

121. Three-phase electric power is a common method of _____, transmission, and distribution.

- A. Three-phase system(s)
- B. Linear balanced load
- C. Polyphase system
- D. Lower-voltage single-phase
- E. Alternating-current electric power generation
- F. None of the Above

122. It is a type of _____ and is the most common method used by electrical grids worldwide to transfer power. It is also used to power large motors and other heavy loads.

- A. Neutral wire
- B. Three-phase system
- C. Polyphase system
- D. Phase-phase connection
- E. Linear balanced load
- F. None of the Above

123. Which of the following terms - is generally more economical than others because it uses less conductor material to transmit electric power than equivalent single-phase or two-phase systems at the same voltage?

- A. Three-phase system(s)
- B. Linear balanced load
- C. Polyphase system
- D. Lower-voltage single-phase
- E. Cycle of the electric current
- F. None of the Above

124. In a _____, three circuit conductors carry three alternating currents (of the same frequency) which reach their instantaneous peak values at different times.

- A. Neutral wire
- B. Three-phase system
- C. Polyphase system
- D. Phase-phase connection
- E. Linear balanced load
- F. None of the Above

125. Taking one conductor as the reference, the other two currents are delayed in time by one-third and two-thirds of?

- A. One phase system(s)
- B. Linear balanced load
- C. Polyphase system
- D. Lower-voltage single-phase
- E. One cycle of the electric current
- F. None of the Above

126. Three-phase systems may have a?

- A. Neutral wire
- B. Red wire
- C. Polyphase system
- D. Phase-phase connection
- E. Linear balanced load
- F. None of the Above

127. A neutral wire allows the three-phase system to use a higher voltage while still supporting _____ appliances.

- A. Three-phase system(s)
- B. Linear balanced load
- C. Polyphase system
- D. Lower-voltage single-phase
- E. Three-phase cycle of electric current
- F. None of the Above

128. In high-voltage distribution situations, it is common not to have a _____ as the loads can simply be connected between phases.

- A. Neutral wire
- B. Three-phase system
- C. Polyphase system
- D. Phase-phase connection
- E. Linear balanced load
- F. None of the Above

Three-phase has properties that make it very desirable in electric power systems:

129. The phase currents tend to cancel out one another, summing to zero in the case of a linear balanced load, this makes it possible to eliminate or reduce the size of the neutral conductor; all the _____ carry the same current and so can be the same size, for a balanced load.

- A. Three-phase conductors
- B. Linear conductors
- C. Polyphase system
- D. Lower-voltage single-phase conductors
- E. Phase conductors
- F. None of the Above

130. Power transfer into a _____ is constant, which helps to reduce generator and motor vibrations.

- A. Neutral wire
- B. Three-phase system
- C. Polyphase system
- D. Phase-phase connection
- E. Linear balanced load
- F. None of the Above

131. _____ can produce a magnetic field that rotates in a specified direction, which simplifies the design of electric motors. Three is the lowest phase order to exhibit all of these properties.

- A. Three-phase system(s)
- B. Linear balanced load
- C. Polyphase system
- D. Lower-voltage single-phase
- E. One cycle of the electric current
- F. None of the Above

132. Most household loads are single-phase. In North America and a few other places, three-phase power generally does not enter homes. Even in areas where it does, it is typically split out at the main distribution board and the individual loads are fed from a?

- A. Neutral wire
- B. Three-phase system
- C. Polyphase system
- D. Phase-phase connection
- E. Single phase
- F. None of the Above

Hydraulic Review

133. Which of the following terms - is a branch of engineering concerned mainly with moving liquids?

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

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

- A. Pressure
- B. Head, static
- C. Hydrokinetics
- D. Pressure, Atmospheric
- E. Hydrostatics
- F. None of the Above

Hydraulics: The Engineering science pertaining to liquid pressure and flow.

135. Which of the following terms - is based on the Greek word for water, and originally covered the study of the physical behavior of water at rest and in motion?

- A. Head
- B. Head, static
- C. Hydrokinetics
- D. Hydrostatics
- E. Pressure, Static
- F. None of the Above

136. 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. Head
- B. Hydraulics
- C. Hydrokinetics
- D. Pressure, Atmospheric
- E. Pressure, Static
- F. None of the Above

137. _____, the consideration of liquids at rest, involves problems of buoyancy and flotation, pressure on dams and submerged devices, and hydraulic presses.

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

138. The relative incompressibility of liquids is one of its basic principles. _____, the study of liquids in motion, is concerned with such matters as friction and turbulence generated in pipes by flowing liquids.

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

Hydrostatics

139. Research and careful study on water yields many useful results of its own, however, such as forces on dams, buoyancy and _____, and is well worth studying for such practical reasons.

- A. Head
- B. Hydraulic actuation
- C. Hydrokinetics
- D. Hydrodynamics
- E. Hydrostatics
- F. None of the Above

140. Which of the following terms - is an excellent example of deductive mathematical physics, one that can be understood easily and completely from a very few fundamentals?

- A. Head
- B. Hydraulic actuation
- C. Hydrokinetics
- D. Hydrodynamics
- E. Hydrostatics
- F. None of the Above

141. The definition of a fluid deserves careful consideration. Although time is not a factor in hydrostatics, it enters in the approach to?

- A. Pressure
- B. Head, static
- C. Hydrokinetics
- D. Pressure, Atmospheric
- E. Hydrostatic equilibrium
- F. None of the Above

Atmospheric Pressure

142. The atmospheric pressure does not vary uniformly with altitude. It changes very rapidly. _____ is defined as the force per unit area exerted against a surface by the weight of the air above that surface.

- A. Head
- B. Head, static
- C. Hydrokinetics
- D. Atmospheric pressure
- E. Pressure, Static
- F. None of the Above

Barometric Loop

143. The barometric loop consists of a continuous section of supply piping that abruptly rises to a height of approximately 35 feet and then returns back down to the originating level. It is a loop in the piping system that effectively protects against backsiphonage. It may not be used to protect against?

- A. The originating level
- B. Backsiphonage
- C. Absolute pressure
- D. A height of approximately 35 feet
- E. Back-pressure
- F. None of the Above

144. Its operation, in the protection against _____, is based upon the principle that a water column, at sea level pressure, will not rise above 33.9 feet. In general, barometric loops are locally fabricated, and are 35 feet high.

- A. The originating level
- B. Backsiphonage
- C. Absolute pressure
- D. A height of approximately 35 feet
- E. Back-pressure
- F. None of the Above

145. At _____, the atmospheric pressure is 14.7 psai.
- A. The originating level
 - B. Gauge pressure
 - C. Absolute pressure
 - D. A height of approximately 35 feet
 - E. Sea level
 - F. None of the Above

146. Absolute pressure is the total pressure. Gauge pressure is simply the pressure read on the gauge. If there is no pressure on the gauge other than atmospheric, the gauge will read zero. Then the _____ would be equal to 14.7 psi, which is the atmospheric pressure.
- A. The originating level
 - B. Gauge pressure
 - C. Absolute pressure
 - D. A height of approximately 35 feet
 - E. Sea level
 - F. None of the Above

Pressure

147. Water is incompressible, while _____ is very compressible, but both are fluids.
- A. Atmosphere
 - B. Mercury column
 - C. Total pressure
 - D. Gauge pressure
 - E. Absolute pressure
 - F. None of the Above

148. Water and air have _____; that is, layers of them slide very easily on one another, and they quickly assume their permanent shapes when disturbed by rapid flows.
- A. Atmosphere
 - B. Mercury column
 - C. Total pressure
 - D. Gauge pressure
 - E. Absolute pressure
 - F. None of the Above

149. Other fluids, such as molasses, may have _____ and take a long time to come to equilibrium, but they are no less fluids.
- A. Atmosphere
 - B. Low viscosity
 - C. Total pressure
 - D. High viscosity
 - E. Coefficient of viscosity
 - F. None of the Above

150. Which of the following terms - is the ratio of the shearing force to the velocity gradient?
- A. Atmosphere
 - B. Low viscosity
 - C. Total pressure
 - D. High viscosity
 - E. Coefficient of viscosity
 - F. None of the Above

151. _____ deals with permanent, time-independent states of fluids, so viscosity does not appear, except as discussed in the Introduction.
- A. Pressure
 - B. Head, static
 - C. Hydrokinetics
 - D. Pressure, Atmospheric
 - E. Hydrostatics
 - F. None of the Above

152. A fluid, therefore, is a substance that cannot exert any permanent forces tangential to a boundary. Any force that it exerts on a boundary must be normal to the boundary. Such a force is proportional to the area on which it is exerted, and is called?
- A. Atmosphere
 - B. A pressure
 - C. Total pressure
 - D. Gauge pressure
 - E. Absolute pressure
 - F. None of the Above

153. In order for any small element of the fluid to be in equilibrium, the pressure must be the same in all directions, and if no other forces are acting on the body of the fluid, the _____ must be the same at all neighboring points.

- A. Atmosphere
- B. Pressure
- C. Total pressure
- D. Gauge pressure
- E. Absolute pressure
- F. None of the Above

Liquids at Rest

154. In studying fluids at rest, we are concerned with the transmission of _____ which affect the forces in liquids.

- A. Velocity head
- B. Gravity
- C. A liquid
- D. Dynamic factors of fluid power
- E. Pressure in a liquid
- F. None of the Above

Pressure and Force

155. Which of the following terms - is the force that pushes water through pipes?

- A. Atmosphere
- B. Pressure
- C. Total pressure
- D. Gauge pressure
- E. Absolute pressure
- F. None of the Above

156. The terms **force** and _____ are used extensively in the study of fluid power. It is essential that we distinguish between the terms.

- A. Atmosphere
- B. Pressure
- C. Total pressure
- D. Gauge pressure
- E. Absolute pressure
- F. None of the Above

157. Which of the following terms - means the amount of push or pull applied to each unit area of the surface and is expressed in pounds per square inch or grams per square centimeter?

- A. Atmosphere
- B. Pressure
- C. Total pressure
- D. Gauge pressure
- E. Absolute pressure
- F. None of the Above

Pascal's Law

158. Which of the following terms - acts at right angles to the containing surfaces?

- A. Atmosphere
- B. Pressure
- C. Total pressure
- D. Gauge pressure
- E. Absolute pressure
- F. None of the Above

159. If some type of 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, thus, we can say that _____ in a liquid is independent of direction.

- A. Atmosphere
- B. Pressure
- C. Total pressure
- D. Gauge pressure
- E. Absolute pressure
- F. None of the Above

160. Pressure due to the weight of a liquid, at any level, depends on the?

- A. Atmosphere
- B. Mercury column
- C. Total pressure
- D. Gauge pressure
- E. Absolute pressure
- F. None of the Above

161. When the depth is doubled, the indicated pressure is doubled. Thus the pressure in a liquid is directly proportional to the?

- A. Atmosphere
- B. Mercury column
- C. Total pressure
- D. Depth
- E. Absolute pressure
- F. None of the Above

162. Thus, the _____ at any depth in a liquid is equal to the weight of the column of liquid at that depth divided by the cross-sectional area of the column at that depth.

- A. Atmosphere
- B. Pressure
- C. Total pressure
- D. Gauge pressure
- E. Absolute pressure
- F. None of the Above

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

- A. Atmosphere
- B. Pressure
- C. Total pressure
- D. Volume of a liquid
- E. Absolute pressure
- F. None of the Above

Gravity

164. Gravity is one of the four forces of nature. The strength of the gravitational force between two objects depends on their masses. The more massive the objects are, the stronger the?

- A. Velocity head
- B. Gravity
- C. Gravitational attraction
- D. Dynamic factors
- E. Directly proportional
- F. None of the Above

165. When you pour water out of a container, the earth's gravity pulls the water towards the ground. The same thing happens when you put two buckets of water, with a tube between them, at two different heights. You must work to start the flow of water from one bucket to the other, but then _____ takes over and the process will continue on its own.

- A. Gravitational attraction
- B. Gravity
- C. Static factors
- D. Dynamic factors
- E. Directly proportional
- F. None of the Above

166. Gravity, applied forces, and atmospheric pressure are static factors that apply equally to fluids at rest or in motion, while _____ apply only to fluids in motion.

- A. Gravitational attraction
- B. Gravity
- C. Static factors
- D. Inertia and friction are dynamic factors that
- E. Directly proportional
- F. None of the Above

Well Section

Selecting an Optimum Pumping Rate

167. Before a well can be completed with the necessary pumping equipment, it should be tested for?

- A. Capacity and proper operation
- B. Specific capacities
- C. Drawdown
- D. Wells production rate
- E. Variable rate pumping test
- F. None of the Above

168. When the well was drilled, the driller and geologist kept close watch of the amount of _____ that had been obtained.

- A. Water production
- B. Specific capacities
- C. Drawdown
- D. Wells production rate
- E. Variable rate pumping rate
- F. None of the Above

169. The driller will normally know what to expect based on his experience, and the geologist or hydrologist will also obtain information on other nearby wells to bracket the?

- A. Expected production rate
- B. Specific capacities
- C. Drawdown
- D. Wells production rate
- E. Variable rate pumping rate
- F. None of the Above

170. If the well was drilled with air rotary, the _____ at the time of drilling also can serve as a baseline to estimate the well's production rate.

- A. Airlift
- B. Specific capacities
- C. Drawdown
- D. Wells production rate
- E. Variable rate pumping test
- F. None of the Above

171. Which of the following terms - is normally conducted for at least eight hours in order to estimate a well's maximum production rate?

- A. Expected production rate
- B. Specific capacities
- C. Drawdown
- D. Wells production rate
- E. A pumping test
- F. None of the Above

172. Which of the following terms - is a variable rate pumping test, typically conducted for 24 hours at up to six different pumping rates?

- A. A step test
- B. Specific capacities
- C. Drawdown
- D. Wells production rate
- E. Variable rate pumping test
- F. None of the Above

173. Which of the following terms - is then adjusted upwards in equal amounts every four hours until 24 hours of pumping have been completed?

- A. Expected production rate
- B. The pumping rate
- C. Drawdown
- D. Optimum pumping rate
- E. Variable rate pumping rate
- F. None of the Above

174. In the end, the _____ is selected following a careful review and comparison of the water level data for each rate.

- A. Expected production rate
- B. Specific capacities
- C. Drawdown
- D. Optimum pumping rate
- E. Variable rate pumping rate
- F. None of the Above

175. The well's specific capacity (S_c) is then determined. _____ is the gallons per minute the well can produce per foot of drawdown.

- A. Expected production rate
- B. Specific capacity
- C. Drawdown
- D. Optimum pumping rate
- E. Variable rate pumping rate
- F. None of the Above

176. Which of the following terms - for each of the pumping steps are compared. The highest S_c observed is normally associated with the optimum pumping rate.

- A. Expected production rate
- B. Specific capacities
- C. Drawdown
- D. Optimum pumping rate
- E. Variable rate pumping rate
- F. None of the Above

177. That rate should also have resulted in stabilized pumping levels or?

- A. Air rotary
- B. Specific capacities
- C. Drawdown
- D. Wells production rate
- E. Variable rate pumping test
- F. None of the Above

Selection of Pumping Equipment

178. The proper selection of pumping equipment for a well is of great importance. The primary factors that must be considered before selecting the well pump are: flow rate, line pressure, _____, power requirements, and size of piping.

- A. Fluid's vapor pressure
- B. Fluid density
- C. Kinematic viscosity
- D. Pumping lift (total dynamic head)
- E. Risk of cavitation
- F. None of the Above

Pumping Lift and Total Dynamic or Discharge Head

179. The most important components in selecting the correct pump for your application are: total pumping lift and total dynamic or?

- A. Discharge head
- B. Static Suction Lift
- C. Static Discharge Head
- D. Dynamic Suction Head
- E. Dynamic Discharge Head
- F. None of the Above

180. Which of the following terms - refers to the total equivalent feet of lift that the pump must overcome in order to deliver water to its destination, including frictional losses in the delivery system?

- A. Fluid's vapor pressure
- B. Fluid density
- C. Kinematic viscosity
- D. Pressure head
- E. Total dynamic head
- F. None of the Above

Basic Pump Operating Characteristics

181. "Head" is a term commonly used with pumps. _____ refers to the height of a vertical column of water.

- A. Total Dynamic Head
- B. Static Suction Lift
- C. Static Discharge Head
- D. Dynamic Suction Head
- E. Dynamic Discharge Head
- F. None of the Above

182. Which of the following terms - of a pump is composed of several types of head that help define the pump's operating characteristics.

- A. Total Dynamic Head
- B. Static Suction Lift
- C. Static Discharge Head
- D. Total head
- E. Dynamic Discharge Head
- F. None of the Above

Total Dynamic Head

183. The total dynamic head of a pump is the sum of the _____, the pressure head, the friction head, and the velocity head.

- A. Total static head
- B. Static Suction Lift
- C. Static Discharge Head
- D. Dynamic Suction Head
- E. Dynamic Discharge Head
- F. None of the Above

184. The Total Dynamic Head is the sum of the total static head, the _____ and the pressure head.

- A. Fluid's vapor pressure
- B. Fluid density
- C. Kinematic viscosity
- D. Pressure head
- E. Total friction head
- F. None of the Above

Total Static Head

185. Which of the following terms - is the total vertical distance the pump must lift the water?

- A. Total Dynamic Head
- B. Static Suction Lift
- C. Static Discharge Head
- D. Total static head
- E. Dynamic Discharge Head
- F. None of the Above

186. When pumping from an open water surface, it would be the _____ from the water surface to the discharge point.

- A. Fluid's vapor pressure
- B. Fluid density
- C. Kinematic viscosity
- D. Pressure head
- E. Risk of cavitation
- F. None of the Above

Friction Head

187. The velocity of the water has a significant effect on?

- A. Total Dynamic Head
- B. Friction loss
- C. Static Discharge Head
- D. Dynamic Suction Head
- E. Dynamic Discharge Head
- F. None of the Above

188. Which of the following terms - occurs when water flows through straight pipe sections, fittings, valves, around corners, and where pipes increase or decrease in size?

- A. Fluid's vapor pressure
- B. Loss of head due to friction
- C. Kinematic viscosity
- D. Pressure head
- E. Risk of cavitation
- F. None of the Above

189. Values for these losses can be calculated or obtained from friction loss tables. The friction head for a piping system is the?

- A. Total Dynamic Head
- B. Static Suction Lift
- C. Static Discharge Head
- D. Dynamic Suction Head
- E. Dynamic Discharge Head
- F. None of the Above

Velocity Head

190. Which of the following terms - is the energy of the water due to its velocity?

- A. Fluid's vapor pressure
- B. Fluid density
- C. Kinematic viscosity
- D. Pressure head
- E. Velocity head
- F. None of the Above

Pressure Head

191. Which of the following terms - at any point where a pressure gauge is located can be converted from pounds per square inch to feet of head by multiplying by 2.31?

- A. Total Dynamic Head
- B. Static Suction Lift
- C. Pressure head
- D. Dynamic Suction Head
- E. Dynamic Discharge Head
- F. None of the Above

Suction Head

192. Which of the following terms - includes not only the vertical suction lift, but also the friction losses through the pipe, elbows, foot valves, and other fittings on the suction side of the pump?

- A. Fluid's vapor pressure
- B. Fluid density
- C. Kinematic viscosity
- D. Pressure head
- E. Suction head
- F. None of the Above

193. There is an allowable limit to the suction head on a pump and the _____ of a pump sets that limit.

- A. Total Dynamic Head
- B. Static Suction Lift
- C. Static Discharge Head
- D. Dynamic Suction Head
- E. Dynamic Discharge Head
- F. None of the Above

194. The theoretical maximum height that water can be lifted using suction is 33 feet. Through controlled laboratory tests, manufacturers determine the _____ curve for their pumps.

- A. Total Dynamic Head
- B. NPSH
- C. Static Discharge Head
- D. Dynamic Suction Head
- E. Dynamic Discharge Head
- F. None of the Above

195. At a certain flow rate, the _____ is subtracted from 33 feet to determine the maximum suction head at which that pump will operate.

- A. Fluid's vapor pressure
- B. Fluid density
- C. Kinematic viscosity
- D. Pressure head
- E. NPSH
- F. None of the Above

196. To minimize the _____, the suction pipe should have a larger diameter than the discharge pipe.

- A. Total Dynamic Head friction losses
- B. Static Suction Lift friction losses
- C. Static Discharge Head friction losses
- D. Suction pipeline friction losses
- E. Dynamic Discharge Head friction losses
- F. None of the Above

197. Operating a pump with suction lift greater than it was designed for, or under conditions with excessive vacuum at some point in the impeller, may cause?

- A. Fluid's vapor pressure
- B. Fluid density
- C. Kinematic viscosity
- D. Pressure head
- E. Cavitation
- F. None of the Above

198. Which of the following terms - is the implosion of bubbles of air and water vapor and makes a very distinct noise like gravel in the pump?

- A. Fluid's vapor pressure
- B. Fluid density
- C. Kinematic viscosity
- D. Cavitation
- E. Risk of cavitation
- F. None of the Above

Pump Efficiency

199. NPSH is the Net Positive Suction Head required by the pump and TDSL is the _____ available.

- A. Total Dynamic Head
- B. Static Suction Lift
- C. Static Discharge Head
- D. Total Dynamic Suction Lift
- E. Dynamic Discharge Head
- F. None of the Above

200. All pump curves are plotted with the flow rate on the horizontal axis and the _____ on the vertical axis.

- A. Total Dynamic Head
- B. Static Suction Lift
- C. Static Discharge Head
- D. TDH
- E. Dynamic Discharge Head
- F. None of the Above

You are finished with your assignment. Please fax or email your answer key and registration page to TLC. Please telephone us later to confirm you have sent the answer key.