

Chapter 01: Medical Gas Supply Equipment

1. Which of the following are assumptions regarding the kinetic theory of gases?

- I. Gases are composed of discrete molecules.
- II. Gas molecules are in random motion.
- III. All collisions between molecules are elastic in nature.
- IV. Temperature affects the molecular activity.

- a. I b. I and II
- c. I, II, and III d. I, II, III, and IV

ANSWER: d

2. If the temperature of a gas decreases:

- a. molecular activity increases b. molecular activity decreases
- c. molecular activity remains the same d. the concentration gradient increases

ANSWER: b

3. Elastic collisions between molecules implies that:

- I. there is no net energy transfer
- II. no energy is lost by the collision
- III. no energy is gained by the collision
- IV. net energy remains the same

- a. I b. I and II
- c. I, II, and III d. I, II, III, and IV

ANSWER: d

4. Gas pressure will increase with:

- I. an increase in temperature
- II. a decrease in temperature
- III. a decrease in volume
- IV. an increase in volume

- a. I and III b. I and IV
- c. II and III d. II and IV

ANSWER: a

5. Pressure of a fluid at any point in a closed container is the same as the pressure at another point in the same container. This best describes:

- a. Henry's law b. Fick's law
- c. Pascal's law d. Graham's law

ANSWER: c

6. The most accurate type of barometer is the:

- a. aneroid barometer b. mercury barometer
- c. mechanical manometer d. none of the above

ANSWER: b

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7. A type of pressure-measuring device used to measure the pressure in a compressed-gas cylinder is a(n):
- a. aneroid barometer
 - b. mechanical manometer
 - c. strain gauge transducer
 - d. Bourdon gauge

ANSWER: d

8. Gas flows from one point to another because:
- a. of a pressure gradient
 - b. of a concentration gradient
 - c. of a difference in partial pressure
 - d. none of the above

ANSWER: a

9. Under which of the following circumstances will gas flow be greater between two points?
- I. if the pressure difference is large
 - II. if the pressure difference is small
 - III. if the opening between the points is large
 - IV. if the opening between the points is small
- a. I and III
 - b. I and IV
 - c. II and III
 - d. II and IV

ANSWER: a

10. As gas velocity increases, lateral pressure decreases. This best describes:
- a. the kinetic theory of gases
 - b. Pascal's law
 - c. Reynold's equation
 - d. Bernoulli's principle

ANSWER: d

11. The principle of viscous shearing and vorticity may be applied to:
- a. gas pressure reduction valves
 - b. air/oxygen entrainment devices
 - c. measurement of gas flow
 - d. measurement of gas pressure

ANSWER: b

12. High air flow with oxygen enrichment (HAFOE) masks operate using:
- a. partial pressure differences
 - b. viscous shearing and vorticity
 - c. Bernoulli's principle
 - d. Pascal's law

ANSWER: b

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13. High air flow with oxygen enrichment (HAFOE) masks alter oxygen concentrations by:

- I. changing nozzle size
 - II. changing air entrainment port size
 - III. changing oxygen liter flow into the mask
 - IV. changing air liter flow into the mask
- a. I b. I and II
c. I, II, and III d. I, II, III, and IV

ANSWER: b

14. A venturi tube has an expanding radius that does not exceed:

- a. 5 degrees b. 10 degrees
c. 15 degrees d. 20 degrees

ANSWER: d

15. A constant area duct:

- a. has an increasing area as gas moves through the duct
b. has a decreasing area as gas moves through the duct
c. has an area that remains the same as gas moves through the duct
d. none of the above

ANSWER: c

16. A constant area duct:

- a. maintains forward velocity
b. decreases pressure for an increase in velocity
c. increases pressure for a decrease in velocity
d. none of the above

ANSWER: a

17. A converging duct:

- a. maintains forward velocity
b. decreases pressure for an increase in velocity
c. increases pressure for a decrease in velocity
d. none of the above

ANSWER: b

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18. Back pressure distal to the point of entrainment in a high air flow with oxygen enrichment (HAFOE) mask will:
- a. increase oxygen concentration
 - b. decrease oxygen concentration
 - c. have no effect on oxygen concentration
 - d. increase the total flow

ANSWER: b

19. An increase in pressure through a nozzle resulting in no increase in flow best describes:
- a. Bernoulli's principle
 - b. the venturi effect
 - c. choked flow
 - d. Reynold's number

ANSWER: c

20. When flow is choked, gas velocity is:
- a. sonic
 - b. laminar
 - c. well behaved
 - d. none of the above

ANSWER: a

21. A gas's velocity is said to be choked when:
- a. velocity can no longer increase
 - b. a maximum temperature is reached
 - c. pressure is at a maximum
 - d. the gas concentration is at a maximum

ANSWER: a

22. A Reynold's number calculation is performed, and the Reynold's number is 5,000. How would this flow be described?
- a. laminar
 - b. transitional
 - c. turbulent
 - d. none of the above

ANSWER: c

23. A Reynold's number calculation is performed, and the Reynold's number is 1,500. How would this flow be described?
- a. laminar
 - b. transitional
 - c. turbulent
 - d. none of the above

ANSWER: a

24. A Reynold's number calculation is performed, and the Reynold's number is 2,500. How would this flow be described?
- a. laminar
 - b. transitional
 - c. turbulent
 - d. none of the above

ANSWER: b

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25. A 12-mm endotracheal tube is removed and replaced with a 6-mm endotracheal tube. What is the effect on resistance?

- a. Resistance remains the same.
- b. Resistance doubles.
- c. Resistance decreases.
- d. Resistance increases 16 times.

ANSWER: d

26. You double the length of an oxygen tube by adding 5 feet of connecting tubing. Adding the additional tubing has what effect on resistance to flow?

- a. Resistance remains the same.
- b. Resistance decreases.
- c. Resistance increases.
- d. none of the above

ANSWER: c

27. Which of the following are factors in Poiseuille's law?

- I. length
- II. radius
- III. pressure
- IV. viscosity

- a. I
- b. I and II
- c. I, II, and III
- d. I, II, III, and IV

ANSWER: d

28. Given the following, calculate the new volume:

Initial pressure	645 mmHg
Initial volume	3 L
New pressure	720 mmHg

- a. 1.69 L
- b. 2.69 L
- c. 3.35 L
- d. 4.69 L

ANSWER: b

29. Given the following, solve for the new volume:

Initial pressure	645 mmHg
Initial volume	2 L
New pressure	800 mmHg

- a. 0.61 L
- b. 1.61 L
- c. 2.41 L
- d. 4.61 L

ANSWER: b

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30. Given the following, solve for the new volume:

- | | |
|---------------------|---------------------|
| Initial volume | 10 L |
| Initial temperature | 30 degrees Celsius |
| New temperature | 100 degrees Celsius |
- a. 12.31 L b. 10.38 L
c. 13.33 L d. 15.0 L

ANSWER: a

31. Given the following, solve for the new temperature:

- | | |
|---------------------|--------------------|
| Initial volume | 9 L |
| Initial temperature | 24 degrees Celsius |
| New volume | 3 L |
- a. 174 degrees Celsius b. 0 degrees Celsius
c. -50 degrees Celsius d. -174 degrees Celsius

ANSWER: d

32. Given the following gas mixture and total pressure, calculate the partial pressure for carbon dioxide:

- | | |
|----------------|----------|
| Oxygen | 10% |
| Carbon dioxide | 20% |
| Nitrogen | 70% |
| Total pressure | 760 mmHg |
- a. 76.0 mmHg b. 152.0 mmHg
c. 532 mmHg d. none of the above

ANSWER: b

33. Given the following gas mixture and total pressure, calculate the partial pressure for oxygen:

- | | |
|----------------|----------|
| Oxygen | 10% |
| Carbon dioxide | 20% |
| Nitrogen | 70% |
| Total pressure | 760 mmHg |
- a. 76.0 mmHg b. 152.0 mmHg
c. 532 mmHg d. none of the above

ANSWER: a

34. The atmospheric pressure is 740 mmHg (Salt Lake City, UT). What is the partial pressure for oxygen?

- a. 159 mmHg b. 134 mmHg
c. 94 mmHg d. none of the above

ANSWER: b

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35. You are at sea level working in the NBRC Hospital. What is the partial pressure for oxygen?
- a. 159 mmHg b. 134 mmHg
 - c. 94 mmHg d. none of the above

ANSWER: a

36. Given the following, solve for the new temperature:

Initial pressure 760 mmHg
Initial temperature 10 degrees Celsius
New pressure 435 mmHg

- a. 111 degrees Celsius b. 11 degrees Celsius
- c. -75 degrees Celsius d. -111 degrees Celsius

ANSWER: d

37. Given the following, calculate the initial temperature:

Initial pressure 700 mmHg
Initial volume 10 L
New pressure 650 mmHg
New volume 40 L
New temperature 32 degrees C

- a. 66 degrees Celsius b. 0 degrees Celsius
- c. -173 degrees Celsius d. -273 degrees Celsius

ANSWER: d

38. Given the following, calculate the initial temperature:

Initial pressure 500 mmHg
Initial volume 9 L
New pressure 9,000 mmHg
New volume 32 L
New temperature 35 degrees Celsius

- a. 134 degrees Celsius b. 13 degrees Celsius
- c. -229 degrees Celsius d. 273 degrees Celsius

ANSWER: c

39. According to Graham's law, carbon dioxide when compared with oxygen is:

- a. more soluble in blood
- b. less soluble in blood
- c. has the same solubility at the same pressures
- d. none of the above

ANSWER: a

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40. The rate of diffusion of a gas into or out of a liquid is directly proportional to the partial pressure of that gas. This best describes:

- a. Fick's law b. Henry's law
- c. Dalton's law d. Graham's law

ANSWER: b

41. The rate of diffusion of a gas in a gaseous medium is directly proportional to the concentration gradient. This best describes:

- a. Fick's law b. Henry's law
- c. Dalton's law d. Graham's law

ANSWER: a

42. A common type of compressor used to power home nebulizers is a:

- a. piston compressor b. centrifugal compressor
- c. diaphragm compressor d. two-stage compressor

ANSWER: c

43. A type of compressor used to supply a hospital or large clinic with compressed air is the:

- a. piston compressor b. centrifugal compressor
- c. diaphragm compressor d. two-stage compressor

ANSWER: b

44. An oxygen concentrator works using the principle of:

- a. absorption b. chemical reaction to form oxygen
- c. compression d. adsorption

ANSWER: d

45. As a general rule, you should not add more than how many feet of extension tube to an oxygen concentrator?

- a. 10 feet b. 20 feet
- c. 30 feet d. 50 feet

ANSWER: d

46. What factors should you consider when placing an oxygen concentrator into a patient's home?

- I. Know how large of an electrical load is allowed on the circuit you wish to use.
 - II. Keep the concentrator away from loose draperies.
 - III. Keep the concentrator away from heat vents, registers, or baseboard heaters.
 - IV. Place the concentrator centrally within the home if possible.
- a. I b. I and II
 - c. I, II, and III d. I, II, III, and IV

ANSWER: d

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47. Which of the following oxygen concentrators has an attachment that can fill portable oxygen cylinders?

- a. AirSep VisionAire3TM
- b. Invacare Perfecto₂ V
- c. AirSep NewLife Intensity
- d. Invacare Platinum 10

ANSWER: b

48. What precautions must you use when using the HomeFill II compressor with the Invacare Perfecto₂ V concentrator?

- a. A separate power source (outlet) must be available.
- b. It must be kept away from any heat source.
- c. Only 3,500 psi cylinders may be filled.
- d. none of the above

ANSWER: a

49. When filling a portable reservoir from a liquid reservoir for home use, you should be cautious because:

- a. it will spontaneously ignite
- b. it will not last as long as compressed oxygen in a cylinder
- c. it is at a -183 degrees Celsius
- d. it is under very high pressure

ANSWER: c

50. When making the decision to use a liquid system for a patient's home, it is important to:

- a. ensure that gas usage exceeds the rate of evaporation
- b. ensure that the patient doesn't need more than 2 L/min flow
- c. ensure that the liquid reservoir is located away from draperies
- d. ensure that only high-pressure liquid reservoirs are installed

ANSWER: a

51. Which of the following oxygen concentrators are portable?

- I. AirSep VisionAire3TM
 - II. AirSep FreeStyleTM
 - III. Invacare Perfecto₂ V
 - IV. Invacare SOLO2
- a. I and III
 - b. I and IV
 - c. II and III
 - d. II and IV

ANSWER: a

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52. Which of the following portable liquid reservoirs incorporates a pneumatic conserving device?

- a. Invacare Perfecto₂ V b. AirSep VisionAire3TM
- c. Caire HELiOS[®] d. none of the above

ANSWER: c

53. You are determining the weight of a portable reservoir, and you determine that it contains 10 lbs of liquid oxygen. This is equivalent to:

- a. 100 L gaseous oxygen b. 1,000 L of gaseous oxygen
- c. 3,428 L of gaseous oxygen d. 5,430 L of gaseous oxygen

ANSWER: c

54. When using the weight of a portable reservoir to determine its duration, you should apply a “safety factor” of:

- a. 5% b. 10%
- c. 15% d. 20%

ANSWER: d

55. The standards for construction of a bulk supply piping system is regulated by:

- a. the Food and Drug Administration (FDA)
- b. the Department of Transportation (DOT)
- c. the Compressed Gas Association (CGA)
- d. the National Fire Protection Association (NFPA)

ANSWER: d

56. Types of bulk supply systems include:

- I. liquid main supply with a liquid reserve
 - II. liquid main supply with a cylinder manifold reserve
 - III. cylinder manifold main supply with a cylinder manifold reserve
- a. I b. I and II
 - c. II and III d. I, II, and III

ANSWER: d

57. A bulk oxygen supply system’s tubing is made from:

- a. polyvinyl chloride (PVC) b. galvanized steel
- c. stainless steel d. copper

ANSWER: d

58. Once a bulk supply system’s piping has passed the pressure test, it is important to check the oxygen outlets for:

- a. a pressure less than 25 psi b. purity
- c. a pressure greater than 200 psi d. none of the above

ANSWER: b

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59. A zone valve controls oxygen flow:
- a. to a ward or wing of a building
 - b. between floors
 - c. from the main reservoir to the building
 - d. none of the above

ANSWER: a

60. A riser valve controls oxygen flow:
- a. to a ward or wing of a building
 - b. between floors
 - c. from the main reservoir to the building
 - d. none of the above

ANSWER: a

61. Most oxygen alarm panels are located:
- a. at the main entrance to the facility
 - b. where the oxygen enters the building
 - c. at the respiratory care department
 - d. at the switchboard

ANSWER: d

62. Station outlets may consist of:
- I. Diameter Index Safety System (DISS) fittings
 - II. American Standard Safety System (ASSS) fittings
 - III. quick connect fittings
- a. I only
 - b. I and II only
 - c. II and III only
 - d. I and III only

ANSWER: d

63. The diameter index safety system (DISS):
- I. uses different pitches and threads per inch
 - II. uses internal and external threads
 - III. is intended for low pressure (< 200 psi)
 - IV. is intended for high pressure (> 200 psi)
- a. I
 - b. I and II
 - c. I, II, and III
 - d. I, II, III, and IV

ANSWER: c

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64. Upon inspection you note the letter and number combination of 3AA stamped into an oxygen cylinder's shoulder. This means:
- a. the cylinder may be used for 3 hours
 - b. the cylinder is made of chrome molybdenum steel
 - c. the cylinder is made of aluminum
 - d. the cylinder is of a fiber-wrapped aluminum construction

ANSWER: b

65. Upon inspection you do not see the letter and number combination of 3AL stamped into an oxygen cylinder's shoulder. This means:
- a. the cylinder may be used for 3 hours
 - b. the cylinder is made of chrome molybdenum steel
 - c. the cylinder is made of aluminum
 - d. the cylinder is of a fiber-wrapped aluminum construction

ANSWER: c

66. A fiber-wrapped aluminum oxygen cylinder may be filled to:
- a. 2,200 psi b. 2,500 psi
 - c. 3,000 psi d. 3,500 psi

ANSWER: c

67. During hydrostatic testing, a cylinder is filled to:
- a. 1/3 the service pressure b. 4/3 the service pressure
 - c. 5/3 the service pressure d. 9/5 the service pressure

ANSWER: c

68. If a hydrostatic test date has a "+" sign following it:
- a. the cylinder must be tested in 5 years
 - b. the cylinder must be tested in 10 years
 - c. the cylinder must be tested in 15 years
 - d. the cylinder must be tested in 17 years

ANSWER: b

69. Which of the following are true regarding a 3AA "E" size oxygen cylinder?
- I. The cylinder contains 22 cubic feet when full.
 - II. The cylinder contains 244 cubic feet when full.
 - III. The cylinder may be filled to 2,200 psi.
 - IV. The cylinder may be filled to 3,000 psi.
- a. I and III b. I and IV
 - c. II and III d. II and IV

ANSWER: a

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70. Which of the following are true regarding a 3AA “H” size oxygen cylinder?

- I. The cylinder contains 22 cubic feet when full.
 - II. The cylinder contains 244 cubic feet when full.
 - III. The cylinder may be filled to 2,200 psi.
 - IV. The cylinder may be filled to 3,000 psi.
- a. I and III b. I and IV
c. II and III d. II and IV

ANSWER: c

71. The international color code for oxygen is:

- a. gray b. brown
c. green d. white

ANSWER: d

72. Which of the following should be observed when moving an “H” cylinder of oxygen?

- I. Leave the valve cap on.
 - II. Don’t lift the cylinder by its cap.
 - III. Don’t slide or drag the cylinder.
 - IV. Don’t drop the cylinder.
- a. I b. I and II
c. I, II, and III d. I, II, III, and IV

ANSWER: d

73. Which of the following should be observed when storing cylinders?

- I. Post the names of gases being stored.
 - II. Keep empty and full cylinders separate.
 - III. Use chains to secure the cylinders to the wall.
 - IV. Do not store flammable substances with the cylinders.
- a. I b. I and II
c. I, II, and III d. I, II, III, and IV

ANSWER: d

74. Which of the following should be observed when withdrawing cylinder contents?

- I. Leave the cylinder cap in place until you attach a regulator or reducing valve.
 - II. Follow all safety precautions.
 - III. Do not force any threaded connections.
 - IV. Open cylinder valves slowly.
- a. I b. I and II
c. I, II, and III d. I, II, III, and IV

ANSWER: d

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75. You are setting a patient up on a non-rebreathing mask at a liter flow of 10 L/min. The “H” cylinder you are using reads 1,700 psi. How long will the cylinder last until you need to change it at 500 psi?
- a. 3 hours b. 4 hours
 - c. 5 hours d. 6 hours

ANSWER: d

76. You are about to transport a patient from computerized tomography (CT) to the intensive care unit who is being bagged with a bag-mask. You set the liter flow at 15 L/min. The cylinder reads 1,000 psi. How long do you have before the cylinder is empty?
- a. 14 minutes b. 16 minutes
 - c. 18 minutes d. 20 minutes

ANSWER: c

77. You are working with an outpatient who needs to go home on an “E” cylinder. She is wearing a nasal cannula at 2 L/min, and her cylinder has 1,500 psi remaining. She needs to travel by car one and one-half hours to reach her home and her concentrator. Can she make it?
- a. yes b. no

ANSWER: a

78. You need to transport a patient by helicopter to your home base one and one-half hours away. You are using a bag-mask at a liter flow of 15 L/min. How many full “E” cylinders do you need for the transport?
- a. one b. two
 - c. three d. four

ANSWER: c

79. Which of the following are true regarding a direct-acting cylinder valve?
- I. It acts directly on the valve seat.
 - II. Turning the valve stem moves a diaphragm.
 - III. It is used on large cylinders (H or K).
 - IV. It is used on small cylinders (E).
- a. I and III b. I and IV
 - c. II and III d. II and IV

ANSWER: b

80. Which of the following are true regarding a direct-acting cylinder valve?
- I. It acts directly on the valve seat.
 - II. Turning the valve stem moves a diaphragm.
 - III. It is used on large cylinders (H or K).
 - IV. It is used on small cylinders (E).
- a. I and III b. I and IV
 - c. II and III d. II and IV

ANSWER: c

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81. Which of the following are safety features of cylinder valves?

- I. American Standard Safety System threading
- II. pin index safety system connections
- III. fusible plugs
- IV. frangible disks

- a. I
- b. I and II
- c. I, II, and III
- d. I, II, III, and IV

ANSWER: d

82. Which of the following safety features may be incorporated into a reducing valve?

- I. American standard safety system threads
- II. pin index safety system connections
- III. diameter index safety system threads
- IV. a pressure relief for each stage of pressure reduction

- a. I
- b. I and II
- c. I, II, and III
- d. I, II, III and IV

ANSWER: d

83. A modified single-stage reducing valve is similar to a single-stage reducing valve with the exception of:

- a. It can deliver higher pressures.
- b. It has a larger outlet.
- c. It has a larger inlet.
- d. It has a poppet closing spring.

ANSWER: d

84. Which of the following are advantages of a two-stage reducing valve compared with a single-stage reducing valve?

- I. Higher flows may be provided.
- II. More accurate pressure regulation is possible.
- III. Stable high flow rates are possible.
- IV. It is more compact than a single-stage reducing valve.

- a. I
- b. I and II
- c. I, II, and III
- d. I, II, III, and IV

ANSWER: c

85. A flowmeter attached to a reducing valve is known as a:

- a. complex reducing valve
- b. two-stage reducing valve
- c. regulator
- d. none of the above

ANSWER: c

86. Air-oxygen blenders operate using:

- a. viscous shearing and vorticity
- b. Bernoulli's principle
- c. proportioning valves
- d. two-stage reducing valves

ANSWER: c

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87. Prior to gas entering the proportioning valve of an air-oxygen blender, it is important that:
- air and oxygen pressure are equal
 - a two-stage reducing valve is connected to the blender's inlet
 - a single-stage reducing valve is connected to the blender's inlet
 - that both gas inlets are connected to oxygen

ANSWER: a

88. Advantages of a Bourdon gauge flowmeter include which of the following?
- It is very compact.
 - It works in any position.
 - It is accurate in the presence of back pressure.
 - It is back-pressure compensated.
- I
 - I and II
 - I, II, and III
 - I, II, III, and IV

ANSWER: b

89. In the presence of back pressure, a Bourdon gauge flowmeter will:
- not be affected
 - read higher than the actual flow delivered
 - read lower than the actual flow delivered
 - none of the above

ANSWER: b

90. When using a Bourdon gauge flowmeter, it is important to:
- only operate it in the upright position
 - only operate it when you can see the gauge
 - be certain all tubing is free of kinks or obstructions
 - adjust the inlet pressure to 50 psi prior to the single-stage reducing valve entrance

ANSWER: c

91. Fixed orifice flowmeters operate by:
- the orifice size determining gas flow
 - the pressure set proximal to the orifice determining gas flow
 - the venturi principle
 - balancing pressures across a proportioning valve

ANSWER: a

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92. Which of the following are true regarding an uncompensated Thorpe tube flowmeter?

- I. The needle valve is proximal to the Thorpe tube.
 - II. The needle valve is distal to the Thorpe tube.
 - III. The flowmeter reads accurately in the presence of back pressure.
 - IV. The flowmeter reads higher in the presence of back pressure.
- a. I and III b. I and IV
c. II and III d. II and IV

ANSWER: b

93. Which of the following are true regarding a compensated Thorpe tube flowmeter?

- I. The needle valve is proximal to the Thorpe tube.
 - II. The needle valve is distal to the Thorpe tube.
 - III. The flowmeter reads accurately in the presence of back pressure.
 - IV. The flowmeter reads higher in the presence of back pressure.
- a. I and III b. I and IV
c. II and III d. II and IV

ANSWER: c

94. How can you determine if you have a compensated Thorpe tube flowmeter?

- I. The needle valve is proximal to the Thorpe tube.
 - II. The needle valve is distal to the Thorpe tube.
 - III. The ball “jumps” in the Thorpe tube when connected to 50 psi.
 - IV. The label states “calibrated 760 mmHg, 70 degrees F, 50 psi inlet and outlet pressure.”
- a. I and III b. I, III, and IV
c. II and III d. II, III, and IV

ANSWER: d

95. A pediatric flowmeter is calibrated from:

- a. 0 to 3 L/min b. 0 to 15 L/min
c. 0 to 75 L/min d. none of the above

ANSWER: a

96. Pulse demand delivery devices are advantageous because:

- I. they only deliver oxygen during inspiration
 - II. they can conserve large amounts of oxygen
 - III. they work well with ambulatory patients
- a. I b. I and II
c. II and III d. I, II, and III

ANSWER: d

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97. When troubleshooting a pulse demand oxygen device, you should check:

- I. the oxygen cylinder for sufficient pressure
 - II. the battery for proper voltage (charge)
 - III. the battery for proper installation
 - IV. the cannula for kinks or obstructions
- a. I b. I and II
c. I, II, and III d. I, II, III, and IV

ANSWER: d

98. Which of the following liquid systems do not need to be refilled?

- a. Caire HELiOS[®]
- b. Caire Liberator[®]
- c. Caire Stroller[®]
- d. Respironics HomeLox

ANSWER: d