

CLINIQUIZ

Anesthesia machine and gas cylinders

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The original concept of Boyle's machine was invented by British anesthetist Henry Boyle in 1917. Apart from containing gas supply device, anesthesia ventilator, monitoring devices and protection devices, present day machines encompass numerous safety features and monitoring aids. It is important for us to understand the structure and function of anesthesia delivery system for safe practice of anesthesia. (Please choose one best answer)

Q1. Which of the following is incorrect regarding color coding of anesthesia gas cylinders?

- Cyclopropane – Orange
- Carbon dioxide – Grey
- Helium – yellow
- Air – Grey body with white & black quartered shoulder

Q2. At increased altitude the flowmeter will record:

- Lesser reading than actual flow rate
- Greater reading than actual flow rate
- Not affected by change in altitude
- None of the above

Q3. At laminar flows the flowmeters follow which of the following laws?

- Poiseuille's law
- Graham's law
- Henry's law
- Marey's law

Q4. Which of the following is/are the safest configuration(s) for the flow meter sequence?

- N₂O- Air- O₂-gas outlet
- Air – N₂O- O₂-gas outlet
- O₂-Air- N₂O-gas outlet
- Air- O₂-N₂O-gas outlet

Q5. All of the following are part of the intermittent pressure system except:

- Oxygen pressure failure devices
- Flow control valves
- Oxygen flush
- Flowmeters

Q6. In the mechanical linkage between nitrous oxide (N₂O) and oxygen (O₂) on flow control valves to prevent delivery of hypoxic mixture in Datex-Ohmeda proportional linkage system, the flow control sprocket for nitrous oxide and oxygen consists of:

- 24 and 12 tooth respectively
- 75 and 25 tooth respectively
- 14 and 29 tooth respectively
- 12 and 24 tooth respectively

Q7. Which of the following is true about pressure gauge mounted on anesthesia machine?

- It forms part of flowmeter
- It is used to regulate the gas flow
- It converts gas at high pressure to low pressures
- It works on Bourdon's principle

Q8. Which of the following is incorrectly matched?

- Central pipeline pressure: 50 psi
- Oxygen cylinder pressure: 2000 psi
- Air: 200 psi
- Nitrous oxide Cylinder: 745 psi

Q9. Which of the following is the pin index of nitrous oxide cylinder?

- 1,5
- 2,5
- 3,5
- 1,6

Q10. Which of the following is the use of 'Bodok seal' in regard to anesthesia machine and gas cylinders?

- To provide a seal between central gas pipeline and Anesthesia machine gas inlet.

- b. To provide a seal between gas cylinder and yoke assembly
- c. To provide a seal between machine pressure gauge and yoke assembly
- d. To act as a safety valve that gives off when cylinder is overfilled with gas and exceeds recommended pressures.

ANSWERS

A1 c. The color of helium cylinder is brown.

A2 a. Flowmeters are calibrated at atmospheric pressure (760 torr. and room temperature (20°). With decreased barometric pressure, the actual flow rate will be greater than that indicated and more gases would be delivered than indicated by flowmeters.

A3 a. The pressure drop across a constricted tube depends on the viscosity of gas at low laminar flows (Poiseulli's law). At high gas flows, the rate of diffusion of gas is turbulent and inversely proportional with the square root of its density (Graham's Law).

A4 b. In the presence of a flow meter leak, a hypoxic mixture is less likely to occur if the O₂ flowmeter is located downstream from all other flowmeters. In this setting, a hypoxic mixture is less likely if the leak in flow meters is proximal to O₂ as it would cause portions of air and/or nitrous oxide flow to escape through the leak and the remainder gas would advance the O₂ flow towards the common outlet.

A5 d. Flowmeters are a part of low pressure

system. Low pressure system is downstream of the flow control devices and is calibrated provide a continuous flow of anesthetic gases.

A6 c. The link-25 proportion limiting system on Datex-Ohmeda machines consists of 14- tooth sprocket for nitrous oxide flow control valve and 29- tooth sprocket on oxygen flow control valve. This arrangement allows independent arrangement of each valve, but maintains a minimum of 25% concentration with a maximum nitrous-oxide to oxygen ratio of 3:1.

A7 d. A hollow metal tube is bent into a curve. Increase in gas pressure inside the tube causes it to straighten, as the pressure falls the tube resumes its curved shape.

A8 c. The hospital pipeline is the primary source of all gases and the pressure within the pipelines is 50 psi. Cylinder oxygen is supplied at around 2000 psi (regulated to approximately 45 psi after it enters the machine). Nitrous oxide cylinders hold a pressure of 745 psi when full. Air cylinder pressures are similar to oxygen.

A9 c. The pin index of O₂ is 2,5; N₂O:3,5; O₂ with CO₂ (CO₂>7.5%):1,6; Cyclopropane:3,6 and Entonox:7.

A10 b. The Bodok seal is a specialized washer that ensures a gas-tight seal between the cylinder yoke or regulator of an anesthetic machine and a gas cylinder. The rupture (frangible) disc is a non-reclosing device present in cylinder valve and is held against an orifice. If a pre-determined pressure is reached, the disc ruptures to release the cylinder contents in air.

