

Frownfelter: Cardiovascular and Pulmonary Physical Therapy, 5th Edition

Chapter 2: Oxygen Transport: The Basis of Cardiovascular and Pulmonary Physical Therapy

Test Bank

1. Concerning the process of oxygen transport, all of the following are essential to the process except:

- a. cellular uptake of oxygen.
- b. utilization of oxygen in the tissue.
- c. delivery of fully oxygenated blood to the peripheral tissue.
- d. return of oxygenated blood to the lungs for exchange.

Answer: d

Cellular uptake of oxygen, utilization of oxygen in the tissue, and delivery of fully oxygenated blood to the peripheral tissue are all important in the process of oxygen transport.

2. Cellular ATP and creatine phosphate are used first for energy as the patient or client initiates exercise activities; food substances are necessary to maintain energy stores. The process by which energy is created within the body is:

- a. an anaerobic process.
- b. an aerobic process.
- c. a glycolysis process.
- d. a glycolytic process.

Answer: c

The specific process identified as responsible for the metabolism of food substance is glycolysis.

3. The movement of oxygen from the capillaries to the mitochondria is known as _____ and is regulated in part by metabolic rate, vascular resistance, and capillary recruitment.

- a. oxygen transport
- b. oxygen diffusion
- c. oxygen convection
- d. oxygen degradation

Answer: b

4. The majority of oxygen that is carried in the bloodstream is bound (combined) with hemoglobin, although not every molecule of oxygen is bound. What is the approximate percentage of oxygen that is dissolved in blood?

- a. 98%
- b. 90%
- c. 99%
- d. 2%

Answer: d

Roughly 2% of the oxygen we use is dissolved in blood. The remaining oxygen is bound to the hemoglobin molecule.

5. Considering the following equation, $CO = SV \times HR$, a change in preload would translate into an initial modification in which variable?

- a. Cardiac output
- b. Heart rate
- c. Stroke volume
- d. Myocardial contractility

Answer: c

The components that affect stroke volume are preload, myocardial dispensability and contractility, and afterload. A change to any of the above would affect the stroke volume immediately and subsequently affect cardiac output.

6. Oxygen transport can be affected by fluid balance. All of the following conditions would create a disturbance in fluid balance and ultimately affect oxygen transport except:

- a. blood plasma excess.
- b. sodium excess.
- c. water deficit.
- d. sodium deficit.

Answer: a

Blood plasma plays no role in the regulation of fluid levels, the composition of which has minimal water.

7. Nitrogen is the largest component of atmospheric (room) air. This concentration of nitrogen gas in the air is physiologically important to the mechanics of respiration for which of the following reasons?

- a. Nitrogen is the gas that drives our respiration.
- b. Nitrogen maintains the patency of the alveoli.
- c. Nitrogen is a substitute for oxygen at higher elevations.
- d. Nitrogen is the gas responsible for the ozone layer.

Answer: b

Nitrogen is an inert gas that is not absorbed by the lungs or body tissues; therefore, it maintains the alveoli in an open state

8. A patient is seen in the hospital with a long-standing history of work in the automobile industry as a painter. During the history, the patient reveals that he rarely, if ever, used a respirator during the execution of his job. This factor may lead you to believe the presence of what condition in the lung tissue that might be a predisposing factor to his respiratory compromise?

- a. Bronchial edema
- b. Space-occupying lesions
- c. Particulate matter
- d. Hyperactivity of bronchial muscle

Answer: c

All of these conditions may be present; however, the particulate matter that would have been inhaled from the spray paint by not wearing a respirator would be the most appropriate response because it is the root of the problem.

9. A patient is seen with a complaint of an inability to breathe. The patient describes episodes whereby he is unable to “catch [his] breath.” After completing an examination, it is determined that the left chest wall is incongruent with the right during inspiration. This physical change could be precipitated by what physiologic change?

- a. Impaired bronchial smooth muscle
- b. Ineffective cilia coupled with thick mucus
- c. Airway obstruction
- d. Disruption of the intrapleural pressure gradient

Answer: d

A change in the intrapleural pressure gradient is a physiologic change that could have resulted from any of the other physical changes.

10. The diaphragm is the primary muscle of respiration. All of the following factors or conditions have the potential to impede diaphragmatic excursion except:

- a. size of the diaphragm muscle.
- b. space-occupying lesion.
- c. gastrointestinal obstruction.
- d. increased abdominal pressure.

Answer: a

The size of the diaphragm has no bearing on the ability of the muscle to move during contraction. The other options either physically or through pressure gradients make diaphragmatic excursion difficult.

11. In peripheral circulation, the vessels have a layer of smooth muscle. This is used to assist in the movement of blood through the system. Large vessels with greater amounts of muscle respond to all of the following forms of stimulation except:

- a. tissue perfusion.
- b. neural stimulation.
- c. humoral stimulation.
- d. endogenous stimulation.

Answer: a

The rate at which or the degree to which peripheral tissues are perfused is of no consequence to the composition of a blood vessel.

12. What is the minimum intracellular oxygen pressure needed to support metabolism?

- a. 5 mm Hg
- b. 3 mm Hg
- c. 23 mm Hg
- d. 15 mm Hg

Answer: b

The minimum intracellular oxygen pressure needed to support metabolism is 3 mm Hg.

13. The effects of recumbency (bed rest) on patients have been described as detrimental and leading to a state of general deconditioning. This negative condition can be affected through the interventions of physical therapy by simply:

- a. providing progressive resistive exercise to patients.
- b. providing instruction in the most appropriate form of diaphragmatic breathing.
- c. restoration of upright positioning.
- d. providing supplemental oxygenation during activities.

Answer: c

This condition can be affected by restoration of upright positioning.

14. When considering the implementation of a wellness program for individuals with oxygen transportation conditions, it is important to minimize the other factors that can perturb the system in healthy individuals. All of the following are such perturbations except:

- a. decreased mobility.
- b. gravitational stress.

- c. exercise stress.
- d. emotional stress.

Answer: a

Gravitational stress, exercise stress, and emotional stress are perturbations for healthy individuals. Decreased mobility is the exception for healthy individuals.

15. Basal metabolic rate (BMR) is a measure of an individual's resting metabolic rate; this rate is said to be constant among individuals under similar circumstances. The BMR takes into account the resting function of all but which of the following?

- a. Breathing
- b. Brain function
- c. Thermoregulation
- d. Digestion

Answer: d

BMR is a measure of the resting state; therefore, there is no food intake within several hours for the person to be considered resting. Digestion is an act of breaking down food substances for the purpose of providing energy.

16. A physical therapist places a patient in a deep water environment to assist in training after an Achilles tendon repair. The therapist notices that the patient's heart rate increase quicker than in the shallow water performing the same activities. What is a likely cause?

- a. Preload
- b. Afterload
- c. Oxygen debt
- d. None of the above

Answer: b

The water exerts a pressure against the patient's lower extremities, thus increasing the peripheral resistance and increasing afterload.

17. Plasma is an extracellular fluid found in the bloodstream. This fluid is composed of protein and fibrinogen. How much protein is in plasma?

- a. 17% albumin
- b. 7% albumin
- c. 10% albumin
- d. 35% albumin

Answer: c

Depending on the source used, plasma contains 7% albumin (protein); 90% water; 1% inorganic salts; and 2% a mixture of antibiotics, vitamins, and minerals.

18. Red blood cells (RBCs) are also called erythrocytes and are the most abundant cells in the body. They account for 40% to 45% of the blood. The percent of blood made up of RBCs is measured by a laboratory is known as:

- a. hemoglobin.
- b. erythrocyte sedimentation rate (ESR).
- c. hematocrit.
- d. none of the above.

Answer: c

Hematocrit is the measure of the number of RBCs in the blood.

19. What is the normal hematocrit value for women?

- a. 38%
- b. 40%
- c. 42%
- d. 44%

Answer: a

The normal hematocrit value for women is 38%.

20. What is the normal hematocrit value for men?

- a. 38%
- b. 40%
- c. 42%
- d. 44%

Answer: c

The normal hematocrit value for men is 42%.