

Exercise 10: acid base balance

Sport & Tourism, Fitness



Student instructions:

Follow the step-by-step instructions for this exercise found in your lab manual and record your answers in the spaces below. Submit this completed document by the assignment due date found in the Syllabus. Rename this document to include your first and last name prior to submitting, e. g.

Exercise 10_JohnSmith. oc. Please make sure that your answers are typed in RED. (You may delete these instructions before submission.) Grading: True/False, Multiple-Choice, and Fill-in-the-blank type questions will be worth 1 point each whereas Short-answer type questions will be worth 2 points each. This lab will be worth a total of 45 points but will be converted to a percentage grade when registered in your “ Gradebook”.

ACTIVITY**1: Hyperventilation and Answers**

A substance that dissolves in water to release hydrogen (H^+) ions is a(n) _____. (Acid)

Which of the following is not a regulatory mechanism for acid/base balance in the body? D – Digestive System

- the kidneys
- the respiratory system
- protein buffers
- the digestive system

The maximum pH measured during hyperventilation was _____. (7. 58)

The tidal volume (TV) when breathing at rest was about ____ ml. The TV with hyperventilation was (3) about ____ ml.

Describe the normal ranges for pH and PCO₂ in the blood.

- Min Pco₂ – 40 Max Pco₂ – 40
- Min pH – 7. 41 Max pH – 7. 41

Describe what happened to the pH and the carbon dioxide in the blood with hyperventilation.

- Min Pco₂ lowered to 25. 94 (well below normal)
- Min pH stayed around normal at 7.

Explain how returning to normal breathing after hyperventilation differed from hyperventilation

- With straight hyperventilation, the pH stayed within average.
- without returning to normal breathing.
- the carbon dioxide lowered tremendously.

With the

- Hyperventilation then back to normal breathing the carbon
- dioxide levels did not lower as much and the pH stayed around
- the normal zone as well.

Describe some possible causes of respiratory alkalosis. serious cardiac disorder (ACTIVITY)

2. Rebreathing In cases of acidosis, the pH of the blood is

- C – Less than

- Between and 7. 55
- Between 7. 35 and 7. 45
- Less than 7. 35
- Greater than 7. 5

In this lab simulation, the minimum pH during rebreathing was _____.

- If a person is “ treated” in a hospital emergency department by breathing in and out of a paper

Rebreathing

- sack, this is a classic example of _____ to lower the blood pH.
- Hypoventilation results in
- C – An accumulation of CO₂ in the blood
- lightheadedness.
- numbness around the lips.

Answer: _____

- accumulation of CO₂ in the blood.
- a good treatment for respiratory acidosis.
- Describe what happened to the pH and the PCO₂ levels in the blood during rebreathing. | Min pH lowered
- to Max pH raised
- to Min Pco₂ stayed the same at 40 Max Pco₂ raised
- to Describe several possible causes of respiratory acidosis. airway obstructions or inadequate ventilation, also possible
- from an overproduction of Pco₂
- Explain how the renal system can compensate for respiratory acidosis.

- the renal system compensates by retaining HCO_3^- and excreting
- hydrogen ions

ACTIVITY

3. Renal Responses to Respiratory Acidosis and Respiratory Alkalosis

When carbon dioxide (CO_2) mixes with water in the bloodstream, carbonic acid is formed. This

- Hydrogen
- carbonic acid can then dissociate into the _____ ion and the _____ ion.
- Bicarbonate

When more CO_2 is produced by the body than can be expired from the lungs, the pH of the blood might

- C - Decrease
- increase
- stay normal
- decrease
- either stay in the normal range or decrease.

True or False:

The renal system is able to fully compensate for acidosis or alkalosis.

- True
- Describe what happened to the concentration of ions in the urine when the blood PCO_2 was lowered. H Decreased

- HCO_3^- Increased

What condition was simulated when the blood PCO_2 was lowered?

- Alkalosis

Describe what happened to the concentration of ions in the urine when the blood PCO_2 was raised.

- H^+ Increased
- HCO_3^- Decreased

What condition was stimulated when the blood PCO_2 was raised?

- Acidosis

ACTIVITY

4. Respiratory Responses to Metabolic Acidosis and Metabolic Alkalosis

The cellular gaseous waste product that can accumulate in the bloodstream is _____.

- Carbon Dioxide

In this lab simulation, when the metabolic rate was increased to 80 kcal/hour, the pH of the blood

_____ lowered to _____ because of an accumulation of _____ $[\text{H}^+]$ in the blood.

When the metabolism was decreased, the number of breaths/minute _____

- increased, decreased
- decreased
- remained the same

True or False:

In a hospital, the treatments for respiratory acidosis and metabolic acidosis are

- False
- Usually the same because these conditions are so similar.
- Describe what happened to the blood pH when the metabolic rate was increased to 80 kcal/hr.

The blood pH decreased to 7.26, BPM increased tremendously, P_{CO2} body system was compensating?

- Also, H increased as well. The HCO₃ decreased.
- List and describe some possible causes of metabolic acidosis, i. e. how the acidosis is caused. Keto Acidosis – A buildup of keto acids that result from
- Diabetes Mellitus

Salicylate Poisoning – a toxic condition resulting from

- the ingestion of too much aspirin or oil of wintergreen, alcohol
- strenuous exercise
- Describe what happened to the blood pH when the metabolic rate was decreased to 20 kcal/hr.

What body system was compensating?

- List and describe some possible causes of metabolic alkalosis, i. e. how the alkalosis is caused.
- Ingestion of alkali, vomiting, constipation.