



University of Warmia and Mazury in Olsztyn  
School of Medicine

**Medical School Admission Test sample:**

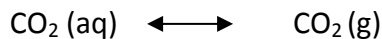
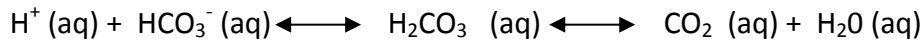
**CHEMISTRY**



**Questions 1 through 4 refer to the reading passage below**

Physiological consequences of blood buffering

The process of respiration plays an important role in the buffering of blood. In particular, an increase in  $H^+$  concentration can be dealt with by increasing the rate of respiration. The added hydrogen ion binds to bicarbonate ion, forming carbonic acid. Carbonic acid is then broken down to carbon dioxide and water; according to the equations shown below.



An increased rate of respiration removes more carbon dioxide from the system, creating a shift in the equilibrium positions.

**1. The medical treatment for hyperventilation is to have the patient breathe into a paper bag. Why is this helpful?**

- More  $CO_2$  will be shifted into the gaseous phase, eventually causing an increase in hydrogen ion concentration
- More  $CO_2$  will be shifted into the aqueous phase, eventually causing an increase in hydrogen ion concentration
- The paper bag will stabilize the  $CO_2$  concentration and thereby eventually stabilize the carbonic acid concentration
- The paper bag will stabilize the  $CO_2$  concentration and thereby eventually stabilize the hydrogen ion concentrations
- Breathing into a paper bag is only a placebo cure

**2. Short bursts of strenuous exercise produce high levels of lactic acid to build up in the blood. Why do Olympic sprinters hyperventilate for 30 seconds just moments before a race?**

- The extra oxygen will give them more energy
- The increased respiration will cause the blood pH to drop
- The lactic acid build up can be counteracted by decreasing the amount of carbonic acid in the blood
- The lactic acid build up can be counteracted by increasing the amount of hydrogen ion in the blood
- The extra oxygen shifts the equilibrium



**3. When a person who lives at sea-level is suddenly placed at a high elevation they experience weakness and fatigue. Why?**

- a. A placebo effect
- b. Increased CO<sub>2</sub> levels at high elevation cause an increase in hydrogen ion
- c. Decreased CO<sub>2</sub> levels at high elevation cause an increase in hydrogen ion
- d. There is a temporary decrease in the blood pH until the person becomes acclimated.
- e. **There is a temporary increase in the blood pH until the person becomes acclimated.**

**4. The buffering system in blood is based on the disassociation of:**

- a. Carbon dioxide
- b. Bicarbonate
- c. Hydrogen ion
- d. **Carbonic acid**
- e. Dihydrogen monoxide

The following questions do NOT refer to any reading passage

**5. Which statement best describes a buffer?**

- a. **Buffers accept hydrogen when they are in excess and donate hydrogen when they have been depleted**
- b. Buffers cause acidic solutions to become alkaline, and alkaline solutions to become acidic
- c. Buffers prevent the pH of a solution from changing when an acid or base is added.
- d. Buffered solutions are always neutral, with a pH of 7
- e. Buffers are not useful in biological systems

**6. A common feature of starch and glycogen is that molecules of both:**

- a. are important structural components of plant cell walls.
- b. **are polymers of glucose.**
- c. form microfibrils that give support to connective tissue fibers.
- d. contain repeated monomers of glucose and galactose.
- e. are water-soluble disaccharides.



7. The substance  $C_{10}H_8$  is:

- a. An alkane
- b. An alkene
- c. An alkyne
- d. An aromatic
- e. An aliphatic hydrocarbon

8. The hydrogenation of an alkene gives a(n):

- a) Isomer
- b) Alkane
- c) Alkyne
- d) Aromatic hydrocarbon
- e) Dimer

9. Which of the following is an impossible electron configuration?

- a)  $1s^2 2s^2 2p^6 3s^2 3p^5$
- b)  $1s^2 2s^2 2p^6 3s^2 3p^6$
- c)  $1s^2 2s^2 2p^6 2d^{10} 3s^2 3p^6$
- d)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$
- e)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$

10. A gaseous mixture containing 7.0 moles of nitrogen, 2.5 moles of Argon and 0.5 moles of neon exerts a total pressure of 0.9 atm. What is the partial pressure of nitrogen?

- a) 0.9
- b) 0.63
- c) 0.27
- d) 0.14
- e) 0.21

11. What will be the proportional change in the pressure of an ideal gas if its volume is doubled while at the same time the number of moles of gas are tripled at a constant temperature of 25 degrees Celsius?

- a) 0.5
- b) 1.0
- c) 1.5
- d) 2.0
- e) 3.0



12. What is the IUPAC name for  $\text{Co}(\text{OH})_2$  ?

- a) Cobalt hydroxide
- b) Cobalt (II) hydroxide
- c) Hydroxyl Cobalt
- d) Hydroxyl (II) Cobalt
- e) Copper hydroxide

13. How many moles of carbon 12 are contained in exactly 6 grams of carbon-12?

- a) 0.5 moles
- b) 2.0 moles
- c) 3.0 moles
- d)  $3.01 \times 10^{23}$  moles
- e)  $6.02 \times 10^{23}$  moles

14. Which physical property makes it possible to separate the components of crude oil by means of distillation?

- a) Melting point
- b) Conductivity
- c) Boiling point
- d) Solubility
- e) Malleability

15. one atomic mass unit (amu) is closest to the mass of:

- a) One electron
- b) The carbon-12 nucleus
- c) One proton
- d)  $6.02 \times 10^{23}$  atoms of hydrogen
- e) The Helium nucleus