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EXAM 3

EN 585.405 - Physiology for Applied Biomedical Engineering

Material Covered: Weeks 11 – 14

Administered During: Week 14

Questions 17 – 20 are worth 4 points each – answer all of them

17. What is the driving force for oxygen to move from tissue capillary blood into tissue?

18. Explain/describe/discuss the purpose of the cilia that are found in (some of) the conducting airways.

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19. With reference to the respiratory system, define the term *physiological dead space*.

20. In the context of respiratory physiology explain/discuss/describe the difference(s) between an anatomic shunt and a physiologic shunt.

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Questions 21 and 22 are worth 10 points each – answer both of them

21. What would be the short term (within 15 minutes or less) effect(s) on the initially at-rest breathing of a "normal" adult if their nose was clamped closed and they were required to mouth-only breathe through a cylindrical tube[1] 5 centimeters in diameter and 25 centimeters long? Explain briefly. You might find some calculations to be helpful; if so, show them.

[1] Assume that (1) the walls of the tube are impermeable to air and (2) the tube is open at both ends and (3) the tube is straight; no kinks or bends.

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22. Imagine a blood substitute[2] in which the binding of O_2 to its carrier protein is not altered by pH. How would the use of such a blood substitute affect breathing? Describe/discuss/explain briefly.

By submitting this examination for grading you attest that your answers are your own work and that you did not solicit or receive assistance or advice from any person or persons in writing your responses to these examination questions.

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[2] For the purposes of this question a blood substitute is an engineered fluid intended (only) to transport oxygen and carbon dioxide between the lungs and body tissues; such a fluid must be non-toxic. Such a blood substitute is intended for use in emergency situations when whole blood for transfusion is not available.