

**NROSCI/BIOSC 1070 and MSNBIO 2070**

**Exam # 2**

**October 24, 2014**

<b>Total POINTS: 100</b>	<b>20% of grade in class</b>
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- 1) A soldier is injured on the battlefield, and it is suspected that he has brain edema. The only treatments available to the medic are isotonic, hypertonic, and hypotonic saline.
- a) Would intravenous injection of any of these saline solutions aid in reducing brain edema? Provide a brief explanation for your answer **(5 points)**.
- b) Would intravenous administration of a saline solution to the soldier change his oncotic pressure? Provide a brief explanation of your answer. **(5 points)**.

- 2) Mean blood pressure increases modestly during exercise, but the increase in systolic and diastolic blood pressure are not proportional. How do systolic and diastolic pressure change during exercise? Provide the physiological rationale why one pressure changes more than the other during exercise. **(10 points)**.

- 3) What is mean blood pressure over a 48-hour period in an animal a week following the transection of the IX<sup>th</sup> and X<sup>th</sup> cranial nerves? What physiological mechanism is responsible for maintaining mean blood pressure at this level? **(5 points)**.
- 4) Patients with allergies to bee stings can suffer a life-threatening drop in blood pressure following an insect sting. Discuss the physiological mechanisms that result in profound hypotension following bee stings in sensitive individuals. **(5 points)**.

- 5) An artery is removed from an experimental animal and the ends are attached to tubing to push fluid through the vessel. The vessel is maintained in a medium with similar ionic concentrations and osmolarity as plasma. How does blood flow through the isolated vessel change as perfusion pressure increases from 90 to 120 mmHg? Briefly describe the physiological basis for your answer. **(5 points)**.
- 6) A potentially serious side effect in patients taking Angiotensin Converting Enzyme (ACE) inhibitors is hyperkalemia, or too much potassium in the blood. Briefly describe how taking an ACE inhibitor can produce hyperkalemia. **(5 points)**.

- 7) A number of physiological changes occur while astronauts reside aboard the International Space Station. Does blood volume in astronauts increase, decrease, or remain the same during a prolonged period in space? Provide a rationale for your answer. **(10 points)**.

- 8) A person quickly drinks 2 liters of water. Describe the effect this will have on GFR. Provide a rationale for your answer. **(10 points)**.

- 9) High levels of plasma protein can interfere with filtration across the basal lamina (e.g., picture that the filter at this level gets clogged). What impact would that have on renal function? **(10 points)**.

- 10) PAH clearance in a patient is measured at 500 ml/min, which is clearly abnormal.
- a) What factors could contribute to this high PAH clearance, and what measurements could you make to determine the cause of this abnormal clearance rate? (**8 points**).

***Question continues on the next page***



- b)** What do you think filtration fraction would be in this patient? Provide a justification for your answer. **(7 points)**.

- 11)** During initial clinical tests of a new drug it was noted that patients urinate more and drink more. Describe the actions of the drug that might result in these physiological effects (describe all the possible mechanisms that have been discussed in class). What tests might you perform to distinguish between the possible actions of the drug? **(15 points)**.