EXAM IV NAME:\_\_\_\_\_\_\_\_\_KEY\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Wildlife Physiological Ecology, Fall 2017; 50 pts possible

**I: True/False**

--If the phrase is false, correct it. Just putting a ‘not’ into the sentence does not adequately fix it.

--each question is worth 2 points, partial credit possible

**T/F** Osmosis is the movement of water from low osmotic pressure to high osmotic pressure

**T/F** Freshwater frog urine is hypoosmotic to frog plasma

**T/F** Osmotic pressure ~~depends on~~ is independent of the type of solute present

**T/F** Marine ~~reptiles~~ mammals have a loop of henle in their nephrons

**T/F** The Marine mammal diet is primarily hypoosmotic to seawater

**T/F** body condition index is body mass/body size

T/F radiotransmitters can detect presence/absence and movement. THIS QUESTION REMOVED from GRADING

**T/F** The acute stress response contains both the resistance and ~~exhaustion~~ alarm phases

**T/F** ~~cortisol~~ epinephrine (or norepinephrine, or catecholamines) increases heart rate

**T/F** Norepinephrine is delivered to tissues through the ~~para~~sympathetic nervous system.

**T/F** bird species breeding in riparian habitat are more sensitive to stressors than birds breeding in open desert.

Extra Credit (+3 for a clear answer): Explain how the loop of henle and the collecting duct work to concentrate the urine.

The loop of henle (+1/2) establishes a solute gradient (+1/2) in the extracellular fluid (+1/2) so that concentrations increase as one moves to the center of the kidney. As filtrate passes down the collecting duct(+1/2), water will leave the filtrate (+1/2) until the filtrate is isoosmotic with the ECF. Hence, the filtrate (urine) can become (+1/2) as concentrated as the extracellular fluid.

**II: short answer**

1. What is the difference in osmotic pressure between plasma and the surrounding environment in a marine fish? What problems does this cause? What adaptations exist in marine fish to solve these problems?

Osmotic Pressure Difference (+1): fish plasma is hypo-osmotic to freshwater

Problems (+2): they lose water by osmosis, they gain salts by diffusion (just say ‘lose water, gain salts, ok)

Solutions (+2): drink salt water, and pump salts out of plasma with chloride cells (‘chloride cells’ is necessary for the correct answer).

1.  A. On this graph, identify the ionoconformers and the ionoregulators, the osmoconformers and the osmoregulators (+2).
2. Define what is meant by an osmoconforming ionoregulator (+3).

An osmoconforming ionoregulator regulates ion composition in the plasma (sodium and chloride are significantly reduced (or different) than the surrounding water. However, their total solute concentration is the same as the surrounding water.

1. give an example of an animal that represents A, B and C from the graph in question 2 (doesn’t have to be the exact species from the graph) (+1 each)

A. jawless fish (lamprey or hagfish) slime hag fine

B. any shark or ray (chondrichtheyes), or coelocanth

C. any teleost (or really any marine mammal, bird or reptile)

1. Fill in the primary type of nitrogenous waste for the three turtles below. Explain why the difference exists.

Primary type of Nitrogenous waste (+1 each)

Red eared Slider (freshwater aquatic): AMMONIA

Forest hinge-back tortoise (moist terrestrial): UREA

Texas tortoise (desert): URIC ACID

Why? (+2): with less water available animals can process nitrogen wastes to require less water to excrete.

1. Glucocorticoids can be measured in several different biological materials. Name three biological materials that can be assayed to measure glucocorticoids, and the time frame of hormone secretion they represent (1 pt each for material and time frame, +3 total):

Biological Material Time Frame

a. blood (plasma) immediate

b. feces hours

c. feathers or hair over the time it was grown (days to weeks fine)

1. Is the stress response beneficial for animals? Why? (+2)

Yes. It redirects energy and behavior away from non-essential processes towards survival when stressors are present. (if answer included some explanation of how animals can downregulate their stress response to ensure reproduction, that’s fine, but answer needs the core information above).

**III. Long answer or graphing**



1. **Describe** the results in this graph.

The elevation of CORT in response to stress varies with the level of parental care.

In the pectoral sandpiper, only females take care of the young, and females have a lower CORT response as compared to males;

In the semipalmated sandpiper, both adults care for young, and so have similar responses;

in the red phalarope males take care of the young, and have lower CORT responses as compared to female

1. **Explain** why the results shown may be adaptive.

Include in your answer: parental care strategy, CORT response and reproductive success.

When one sex is primarily responsible for parental care, there is evolutionary pressure to maintain presence at the nest for optimal reproductive success. Elevated CORT leads to nest abandonment. Hence, the sex responsible for raising young should be less responsive to stress, secrete less CORT, and be less likely to abandon.