EXAM III Version A NAME \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

T/**F** Camel ~~brain~~ liver can function at 41°C –OR—Camel brain needs cooler blood to function when camel bodytemp increases above 37.

T/**F**  hotter objects emit radiation of ~~longe~~r shorter wavelengths

T/**F** In the camel, countercurrent exchange occurs in the ~~nasal turbinate~~ rete mirabile.

**T**/F Increased convection causes greater heat loss through conduction

**T**/F More heat is transferred when the temperature difference between objects is greater.

**T**/F Poikilotherms are more likely to have multiple isozymes for an enzyme than Homeotherms.

**T**/F Non-shivering thermogenesis helps hibernating animals warm up.

T/**F** a hairless dog has a smaller ~~larger~~ boundary layer than a shitzu

T/**F** Heat shock proteins ~~block protein denaturation~~ protect denatured proteins during heat –OR—

Heat shock proteins block protein ~~denaturation~~ folding or clumping during heat

**T**/F A thermal specialist has a narrower thermal performance curve than a generalist

Extra Credit: (2 pts) **Explain how the rete mirabile allows a camel to save up to 5L of water a day.**

The camel’s body temperature can be elevated up to 41C, but the brain can’t function at this temperature. The rete mirabile allows blood going to the brain to be cooled by blood coming from the nose (evaporative cooling). With the brain cooling, the rest of the body can reach 41C. That elevation in temperature saves the camel 5L of water in evaporative cooling (not having to cool the body to 37C during the day).

**Short answer:**

1. What similarity between snow-shoe hares and pied flycatchers makes them both vulnerable to climate change? (2 pts)

Both species base seasonal changes on daylength (+1), (not actual changes in the environment)

1. Define the two terms: (1 pt each)

Heat = the amount of energy present (kJ or Cal)

Temperature = a measure of the intensity of the heat present (F or C or K)

(units not necessary for correct answer)

1. Name the 3 rules of heat transfer (3 points total)

--heat flows down thermal gradient

--the larger the gradient, the greater the heat transfer

--physical properties matter

1. Why do camels store fat in their hump? (2 pts)

To allow for greater heat loss through conduction (+1) across the skin at night when the air cools down (+1).

1. PUFA = (write out what it stands for, 1 pt)

**PolyUnsaturated Fatty Acids**

**6.** Would a polar animal choose a diet higher or lower in PUFA? Why? (2 pts)

Polar animals live in cold environments. PUFA have double bonds in the fatty acid chains, making the membrane more fluid at colder temperatures. Therefore polar animals would want MORE PUFA in their membranes to keep them more fluid at colder temperatures.

1. Name an animal that is a (exact species not necessary, but try to be specific, 1/2 pt each)

-A poikilothermic ectotherm: fresh-water fish, or any reptile, or amphibian

-A homeothermic ectotherm: marine fish, or behaviorally thermoregulating reptile, tuna, brooding python

-A poikilothermic endotherm: hibernating bear, bird that enters torpor (chickadee), any hibernating mammal, bats that enter torpor

-A homeothermic endotherm: humans, lots of possible answers

1. Explain why tropical ectotherms are likely more vulnerable than temperate ectotherms to climate change. (3 pts)

Tropical ectotherms generally have a more narrow range of thermal tolerance (+2) (they have evolved to be more homeothermic). Hence, smaller changes in temperatures near the equator could still change temperature enough to be outside the range of the tropical ectotherms (something along these lines: +1).

1. Define colligative and non-colligative antifreezes (1 pt each):

Colligative: an antifreeze dependent on the number of solutes present. An increase in the # of solutes decreases the freezing point. (+2)

Non-colligative: an antifreeze not dependent just on solute concentration. Non-colligative anti-freezes block ice-crystals from growing, and so lower the temperature at which the solution freezes. (+2)

**1**0. which graph represents date of egg lay of pied flycatchers at their breeding grounds? (1 pt)

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| **III. Long answer or graphing**  This question is worth 10 points; partial credit is possible    A. Draw a graph depicting environmental temperature, heat loss by duck feet, and metabolic heat production of the whole duck. Be sure environmental temperature goes below and above 0C.  B. Explain your graph. Be sure to include a description of what role counter current exchange plays in this example (you may need to draw a diagram to make your point)    **For the graph you need to have the axes labeled, foot heat loss constant until it comes down to 0C, and then increasing after that (to the left). You need to have body heat generated increasing, but with a steeper slope after (to the left) of 0C.**  Explanation: Above 0C the duck shunts blood so it doesn’t enter the feet. Instead, it is shunted away from the foot and travels back toward the body next to the artery carrying hot blood out. This enables the cool blood to pick up heat from the warm blood and bring it back to the body, limiting heat loss from the foot.  At 0C, the foot begins to freeze, and so the shunt must be stopped, and blood allowed to travel to the foot sporadically to keep the tissue from freezing. This increases heat loss from the blood (lower line), requiring greater metabolic heat production from the duck as a whole (upper line).  **For full credit here you needed to explain the slope of both lines, while also explaining (or showing a drawing) the counter current exchange in the leg.** |