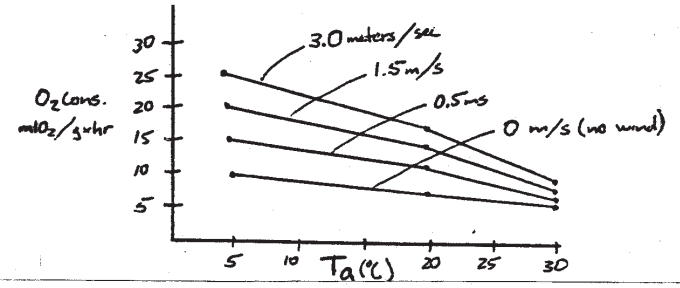
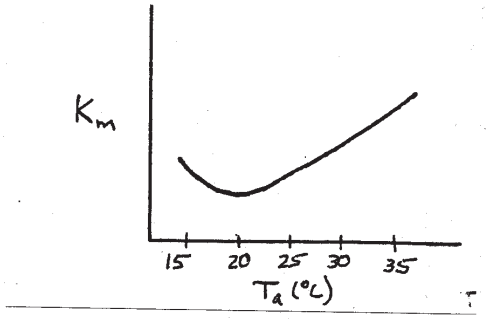
BIOL 798 - ENVIRONMENTAL PHYSIOLOGY
STUDY QUESTIONS FOR FINAL EXAM

1. The following graph represents the effect of ambient temperature on oxygen consumption at varying wind speeds in a small bird.



Plot heat loss via convection against wind speed at 5°C and 30°C. Label axes with absolute values. Assume that T_b remains constant over the entire range of temperatures. Bird mass = 12g, RQ = 0.85.

2. This plot gives K_m vs. temperature for the enzyme citrate synthase (a rate-limiting enzyme for aerobic metabolism) in a frog. Plot <u>total</u> <u>metabolic</u> <u>scope</u> for the animal over the range of temperatures given. Assume that physiological substrate concentrations remain constant with temperature (at K_m at 20°C) and that V_{max} also remains constant with temperature.



3. a) Diagram metabolic rate vs. ambient temperature from -10°C to 30°C for an animal going into torpor (good at torpor) and the same animal remaining normothermic.

b) Diagram respiratory water loss over the same range of temperatures, assuming constant relative humidity, in both cases.

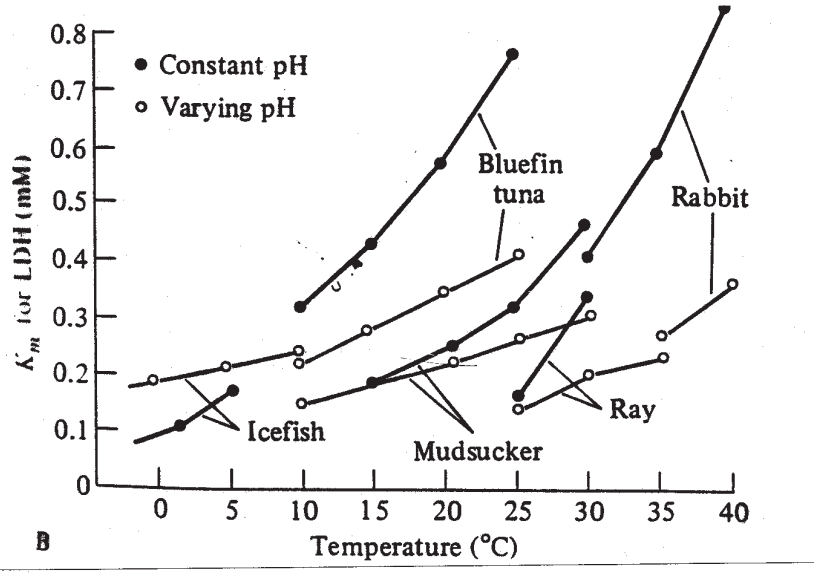
4. Graphically depict the relationship of relative respiratory evaporative water loss (EWL/ml O_2 consumed) from T_a 37°C to 45°C in a dehydrated man and a dehydrated camel. Assume constant relative humidity in both cases.

5. Given the following data, plot MR vs. T_a for this animal. What is the lower critical temperature for this animal? What kind of an animal is it and how can you tell?

T_a (°C)	Oxygen consumption ($mlO_2\ g^{-1}\ h^{-1}$)
40	3.40
38	3.25
33	3.25
20	3.60
10	5.55
0	7.50

6. For ectotherms, an increase or a decrease in body temperature can result in tissue hypoxia depending on the organism. Explain this statement by graphing rates of metabolism and oxygen transport against temperature for both situations.

7. Given the following graph:



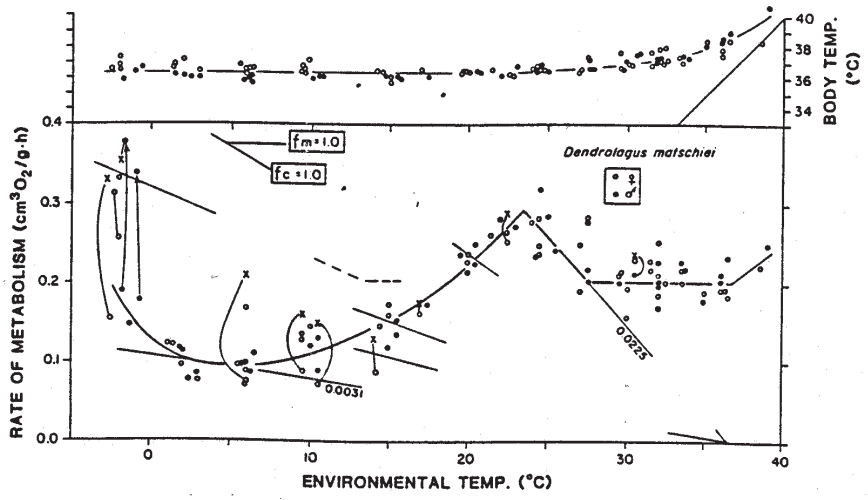
a) Plot Q_{10} (using 5°C increments) for anaerobic metabolism over the range of temperatures given for each species at constant pH. Assume that V_{max} and physiological substrate concentrations remain constant at all temperatures.

b) On the same graph, plot Q_{10} for anaerobic metabolism is physiological substrate concentrations increase with temperature. What if physiological substrate concentrations decrease with temperature?

c) Plot Q_{10} for anaerobic metabolism is physiological substrate concentrations remain constant at all temps. and Q_{10} for V_{max} = 2 between 10°C and 40°C.

8. Answer both a (~~4 pts~~.) and b (~~2 pts~~).

a) The graph below depicts resting oxygen consumption and body temperature as a function of ambient temperature in a tree kangaroo (a large marsupial mammal). Plot thermal conductance against T_a (from 0°C-35°C) for this animal. On the same graph, plot what would happen to conductance if the animal were soaked in water.



b) What factors might account for the metabolic pattern in the graph in part a?

9. The following graph depicts body temperature as a function of ambient temperature in a torpid ground squirrel. "Delta T" represents the difference between body temperature and ambient temperature in the same animal. Plot oxygen consumption as a function of air temperature in this animal (~~2 pts~~.).