Exam Answer Assessment Rubric

Criteria for a Grade of:

"A" Your response **consists of clear concise and insightful points that are substantiated by details of both content and context**. ALL essential terms relevant to the answer are presented and correctly used. No extraneous material is included. The sequence of phrases and/or sentences flows effortlessly and indicates a high level of organization, preparation, and effort. All words are legible.

"B" Your response **consists of clear concise and insightful points that are mostly substantiated by details of both content and context**. However, you will receive a "B" if essential terms or ideas relevant to the answer are vaguely or incompletely presented, or omitted. Or, if extraneous material or digressions are included, or if the answer is mostly complete, but clearly lacks organization, you will receive a "B." Lastly, if there are illegible words within an otherwise mostly complete answer, you will receive a "B," since I cannot tell if these illegible words contain material that is relevant.

"C" Your response **includes most of the major points to answer the question, however, critical supportive details, terms, explanations, etc. are incomplete or lacking**. You will also receive a "C" if the flow of information is choppy and lacks a rigor of focus and/or contains irrelevant information as filler. You will also receive a "C" if basic information is presented accurately but with little synthesis or insight. For example, simply listing terms without explanation when a question asks you to "List AND briefly explain..." will earn you a "C" for that response. As another example, omitting a figure when one is asked for will earn you a "C."

"D and below" Your response **contains major content, contextural and/or logical flaws, and/or critical components of the answer are omitted**. Key terms, if present, are imbedded in glaring misconceptions. Few points are made beyond the obvious, and/or for essay responses, the flow of information is very choppy, poorly connected, and suggests a lack of preparation for that question.

"0" You left a question blank.

SECRET ID # _____ **DO ALL QUESTIONS, PLEASE**

Consider the data set at right on the metabolic rates for a group of mammals (from Kleiber, Max. 1961. The Fire of Life: An Introduction to Animal Energetics. John Wiley, NY).

1a. Briefly list the steps that are involved in deriving the allometric relationship between metabolism and body mass for these data. 5 pts

1b. Goto a computer and log onto

http://www.science.widener.edu/~grant/courses/bio401/assignments/bio401assign10a.html

… where you will see these data. Use excel to derive and display the allometric relationship between metabolism and body mass for these data. Print it out and submit it as your answer to this part of the question. Make sure your secret ID # is on the page.

Table 10.3, Metabolic rate versus body weight.

group	animal	body weight (kg)	metabolic rate kcals/day
1	mouse	0.021	3.6
2	rat	0.282	28.1
3	guinea pig	0.41	35.1
4	rabbit	2.98	167
5	rabbit	1.52	83
6	rabbit	2.46	119
7	rabbit	3.57	164
8	rabbit	4.33	191
9	rabbit	5.33	233
10	cat	3.0	152
11	macaque	4.2	207
12	dog	6.6	288
13	dog	14.1	534
14	dog	24.8	875
15	dog	23.6	872
16	goat	36.0	800
17	chimp	38.0	1090
18	sheep	46.4	1254
19	sheep	46.8	1330
20	cow	300	4221
21	cow	435	8166
22	beef heifers	482	7754
23	cow	600	7877

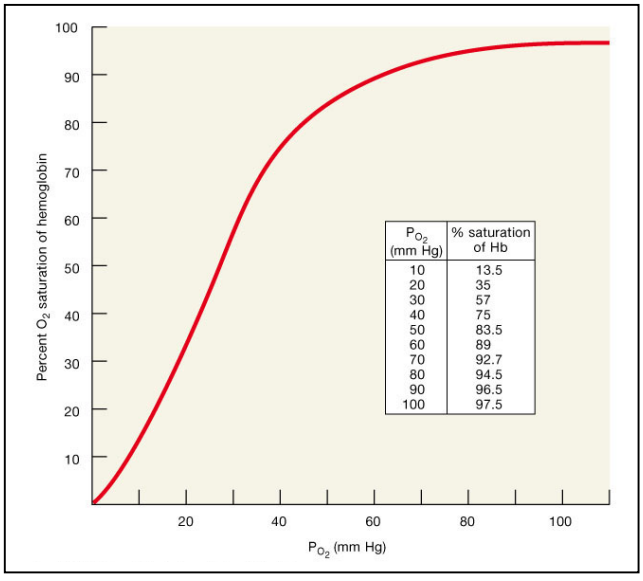
12 pts

2. Below is the oxygen dissociation curve of an adult human at 37°C and pH 7.4. On this graph draw and clearly label 4 additional curves:

A) dissociation curve for myoglobin
B) dissociation curve for a fetus
C) dissociation curve at 37°C but pH 7.2
D) dissociation curve for pH 7.4 at 39°C.

For each (A)-(D), in the spaces provided on the next page, explain your justifications for the shapes and locations on the graph for each of these curves

20 pts

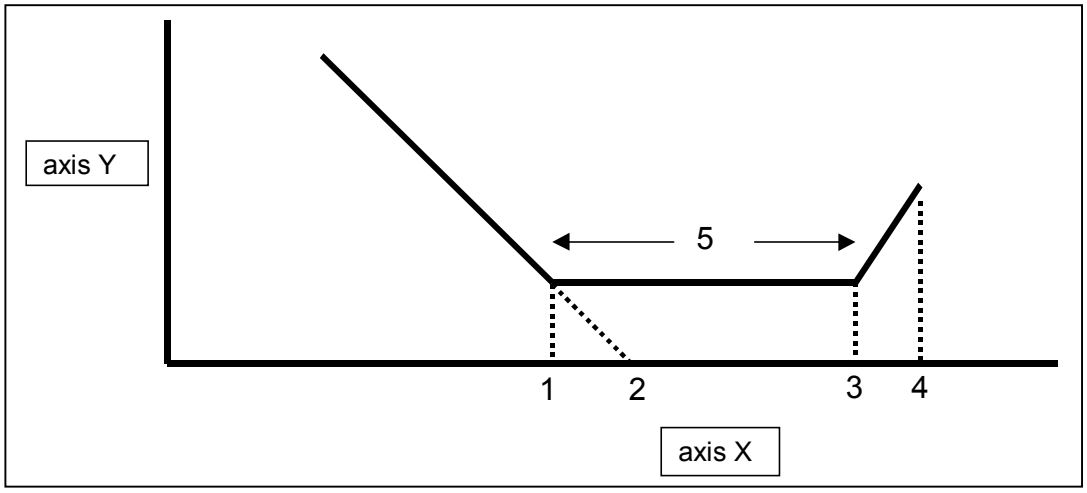


3. While walking on the treadmill, a person is consuming 1.4 liters of oxygen per minute and produced 1.08 liters of CO_2 per minute. What is the energy expenditure per minute and the RQ? Please, show all work.

12 pts

Extra Credit BONUS: What are the percentage contributions of carbohydrate and lipids to the person's energy expenditure? Please, show all work.

5 pts



Take a moment and examine the figure above that depicts the relationship between animal metabolism and a well known environmental variable.

4a. Does this figure depict the relationship between X and Y for an ectotherm or endotherm? Please explain exactly how you can you tell which?

5 pts

4b. Please, label the X and Y axes including the units.

2 pts

4c. What does each the numbered section/point on the graph indicate?

1 – 2 pts
2 – 2 pts
3 – 2 pts
4 – 2 pts
5 – 2 pts

5a. Draw a graph, using the axes below, that illustrates the Q_{10} effect. Label the axes.

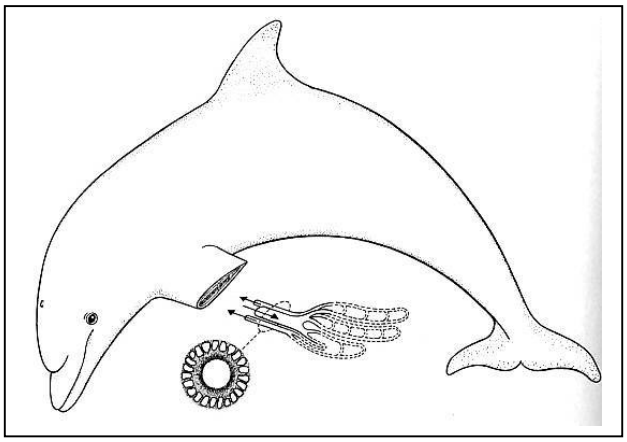
5 pts

5b. If at $T_1 = 10^oC$, the metabolic rate is $MR_1 = 81\ \mu\ gm^{-1}hr^{-1}$ and at if $T_2 = 20^oC$, the metabolic rate is $MR_2 = 126\ \mu\ gm^{-1}hr^{-1}$ and since the formula for Q_{10} is found from $MR_1 = MR_2 * Q_{10}^{[(T2 - T1)/10]}$ find the Q_{10}: {please show all work}

5 pts

6a. At right is a illustration from Knut Schmidt-Nielsen. 1997. Animal Physiology: Adaptation and Environment. Cambridge University Press. of counter-current heat flow in the flipper of a dolphin. Please briefly explain what is happening here? Why is this adaptive?

6 pts



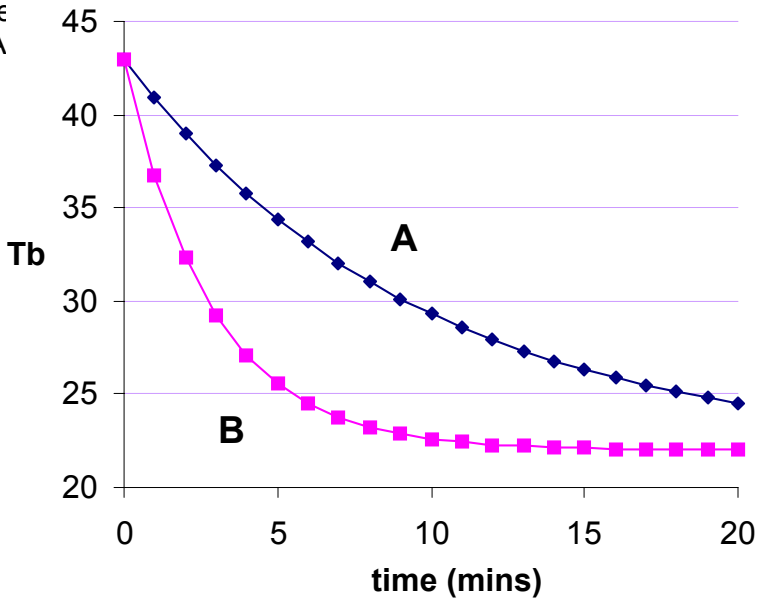
6a. Please offer a reasonable biological scenario by which this adaptation could have evolved in dolphins by natural selection.

6 pts

7. Consider the graph at right, which shows the cooling curves for two identical lizards (A and B). Both started at 43°C and are cooling toward 22°C.

Lizard A moved from a sunny hot place to a cool crevice with still air, whereas lizard B moved from the same sunny hot place to a windy shady place exposed to the deep blue desert sky.

Use your knowledge of biophysical ecology (and all of the terms in the box at right below) to explain why Lizard B cools faster than Lizard A.



12 pts

body temperature, Tb
boundary layer
conductance or insulation
conduction
convection
evaporation
heat transfer
operative environmental temperature, Te
radiation, visible and thermal infrared
spectral absorptivity