Section II Problems and Sample Examination Questions

1. Calculate the doubling times for each of the following human populations:

Country	Per capita rate of change (*r*)
Algeria	0.033
Canada	0.019
United Kingdom	0.006
Kenya	0.042
Germany	-0.002

What assumptions are required to make these doubling time predictions?

2. Describe how birds and mammals differ from all other organisms in their responses to the thermal environment. In your answer, define the functional categories Endothermy and Ectothermy.

3. American crows, *Corvus brachyrynchos*, are large social birds that are found throughout the United States. Since the summer of 1999, crows (and many other bird species) have been hosts for West Nile Virus. The virus is particularly virulent in crows causing massive die-offs. To evaluate the status of West Nile Virus in Atlanta and to assess the level of potential risk to humans, you have been asked to determine the current size of crow populations in Atlanta at Piedmont Park. Estimate the Piedmont Park crow population if you live caught, tagged (using small leg bands) and released 30 crows, and captured repeated samples of 20 birds during the following week which included an average of 10 recaptures of tagged birds.

If you returned to Piedmont Park two months after the initial tag and release and captured repeated samples of 20 birds which

included an average of 7 recaptures of tagged birds, what is the estimated survival rate during that two month period?

Write a fully labeled equation (all variables defined) that shows how you will make the initial population estimation, then plug in the appropriate values and make your estimate. Do the same thing for the survival rate estimation.

4. Imagine a population of fleas were established on a large dog by two individuals (a male and a female) and the population grew until it reach equilibrium. Draw a fully labeled graph of population size as a function of time that would describe the growth of this flea population. Draw a fully labeled graph of per capita birth and death rates for this flea population assuming that the per capita birth rate was density independent.

5. What is a survivorship curve? Which type of survivorship curve best characterizes human populations in the United States? Name and describe your answer. How would you expect human survivorship curves to differ between the United States and sub-Saharan Africa?

Multiple Choice

6. In the logistic growth equation, the observed (actual) per capita rate of change:
   a. increases with population size
   b. is a theoretical fixed constant
   c. decreases with population size
   d. equals the intrinsic rate of increase

7. A simple estimate of population doubling time requires the assumption of:
   a. equilibrium conditions
   b. density at the level K
   c. a constant rate dN/dt
   d. exponential growth

8. If the birth rate in a population were density dependent, birth rate would:
   a. increase with mortality
   b. decrease with density
   c. increase with density
   d. not change with density

9. Mammals have higher energy intake requirements than do Reptiles of the same size because:
   a. mammalian torpor is a very expensive activity
   b. mammals maintain body temperature at rest
   c. reptiles cannot manipulate their body temperature
   d. mammals have very narrow thermal tolerances

10. When the phenotypes of reciprocal transplants remain the same as they would have been in their original environments this indicates that:
   a. phenotypic variation is ecotypic
   b. phenotypic variation is cryptic
   c. environmental variation occurs
   d. all of the above

11. Semelparous organisms can be characterized by:
   a. a very long life span
   b. repeated reproduction
   c. very small body sizes
   d. reproducing only once

12. Which of the following is **not** a characteristic of organisms that are functional ectotherms?
    a. Body temperature varies with ambient temperature
    b. Metabolic rate is low but increases with activity
    c. Heat is only produced by active muscle contraction
    d. Metabolic rate is high even when an animal is a rest

13. Age distributions are not the same in all human populations. In a rapidly growing population such as India or Iran, the age distribution would be:
    a. Pyramid shaped with a broad base
    b. Funnel shaped with a very narrow base
    c. Similar for all ages expect the very oldest
    d. None of the above

14. Behavioral and physiological responses to changes to multiple environmental conditions or resources are collectively called:
    a. acclimation
    b. acclimatization
    c. calcification
    d. amortization