 Biology 217: Ecology Second Exam Fall 2002 *Name:*_____

There should be 8 pages in this exam - take a moment and count them now. Put your name on the first page of the exam, and on each of the last 2 pages (those with short answer questions). Please fill in at least the first character or two of the sections on the front of the Bubble sheet, including SS #, name, and course information (3100-217-001).

The following equations and constants may be helpful:

$\lambda = N_{t+1} / N_t$

$R_o = \Sigma\, l_x\, m_x$

$N_t = N_o\, \lambda^t$

$N_t = N_o\, e^{rt}$

$T = \Sigma x\, l_x\, m_x / R_o$

$dN/dt = rN$

$dN/dt = rN(1-N/K)$

$dN_1/dt = r_1N_1(1-N_1/K_1 - a_{12}N_2/K_1)$

$dN_2/dt = r_2N_2(1-N_2/K_2 - a_{21}N_1/K_2)$

$dH/dt = rh - pHP$

$dP/dt = apHP - mP$

$PV = nRT$

$N = nM/x$

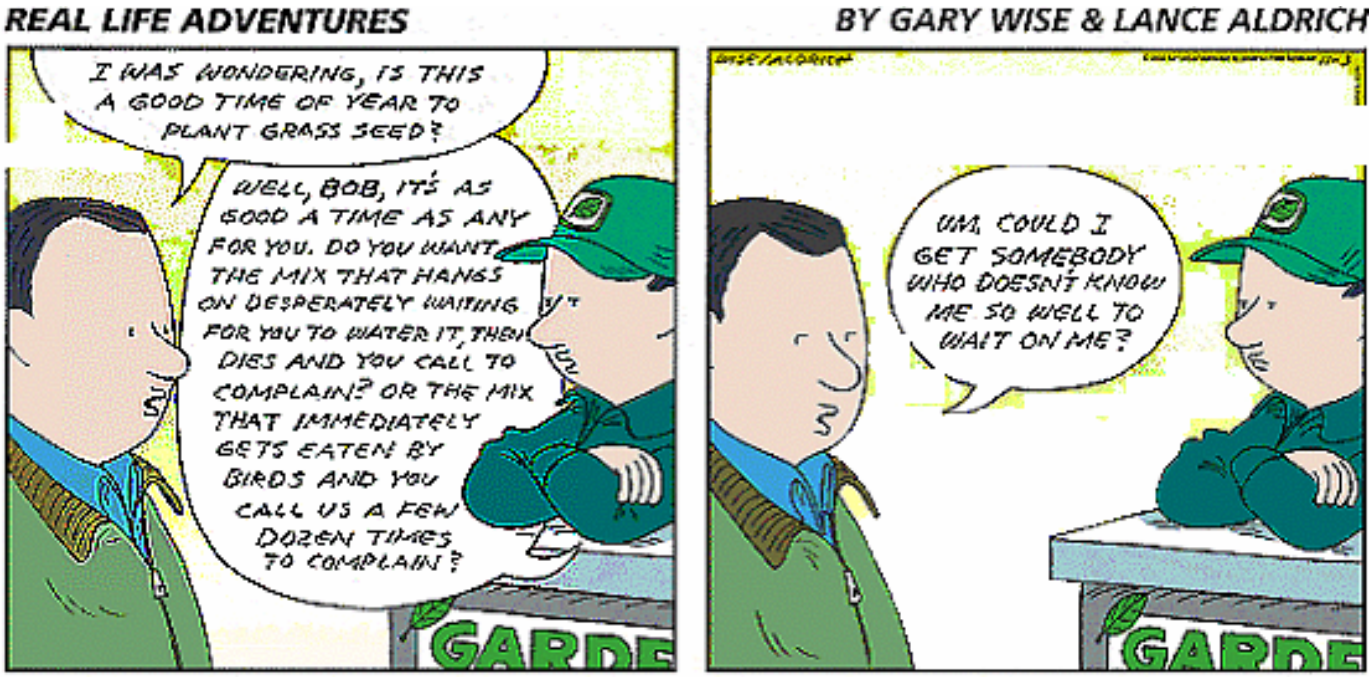
$e = 2.72$

$\pi = 3.14159$

$\ln(2) = 0.69$

$\ln(1) = 0$

$E = mc^2$



Multiple choice (17, @ 2 pts each): _____ x 2 = _____/ 34 points

17) Essay (pre-prepared) _____/ 15 points

18) Short Answer: _____/ 5 points

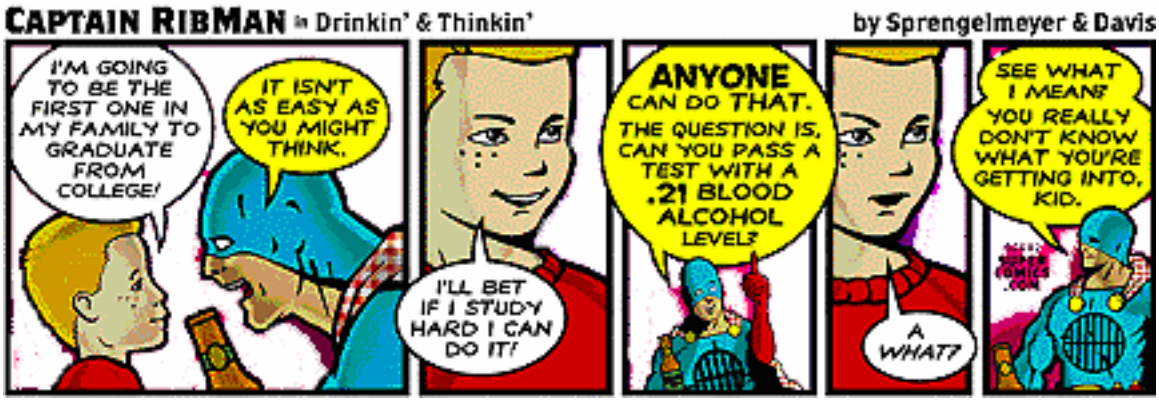
19) Short Answer _____/ 4 points

20) Short Answer _____/ 4 points

21) Short Answer _____/ 3 points

_____

TOTAL: _____**/ 65 points**

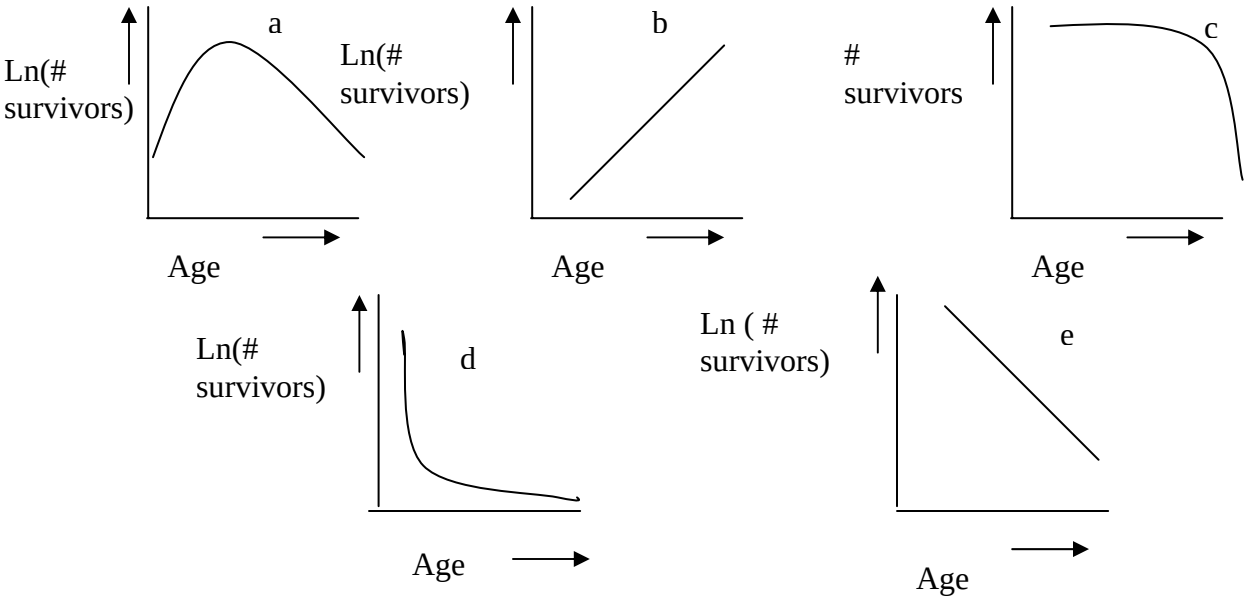


Multiple Choice questions: 2 points each. Please put your answers to this section on the Bubble Sheet. Feel free to use the question sheet for scratch work. Each question has only one correct answer. You will not be penalized for guessing on this section. Fill in your Bubble Sheet carefully. Make sure that the number of the question matches the number whose bubble you're filling in!

1) According to your book, which of the following is most true when comparing small organisms and large organisms?
   a) Small organisms have lower rates of per capita increase (r) and more variable population size
   b) Small organisms have higher rates of per capita increase (r) and less variable population size
   c) Small organisms have lower rates of per capita increase (r) and less variable population size
   d) Small organisms have higher rates of per capita increase (r) and more variable population size
   e) None of the above – there are no reliable generalizations about this comparison.

2) Lab experiments of one-predator one-prey systems demonstrated the importance of _____ and _____ in allowing coexistence.
   a) Dispersion and efficiency
   b) Prudent predation and functional response
   c) Refuges and immigration
   d) Search image and prey defense
   e) Resource partitioning and exploitation

3) Which of these curves indicates that survivorship rates stay constant with time?



4) A population, such as Sweden's, with a low birth rate and a low death rate,
   a) would have a relatively even distribution of individuals in different ages.
   b) would have a population dominated by young individuals.
   c) would have a population dominated by old individuals.
   d) would have a population dominated by individuals of intermediate age, with relatively few young or old individuals.
   e) could have almost any age distribution. Birth and death rates do not affect the age distribution.

5) What pattern of survivorship is most likely for sea urchins, which produce large numbers of very small offspring and provide no parental care?
   a) Survivorship is high early in life and declines slowly.
   b) Probability of death is equally high throughout the potential life span.
   c) Young individuals have high probability of dying but older individuals have relatively low probability of dying.
   d) Most individuals survive for most of their potential life span and then die simultaneously.
   e) The probability of death is low throughout the life span.

6) A population with discrete generations is growing with $\lambda = 1$. If the population size now is 3 individuals, what will the population size be in 3 generations?
   a) 81
   b) 27
   c) 9
   d) 6
   e) 3

7) Red foxes mature after their first year of life, and may live for 5-10 years. Foxes often reproduce many times over their lifespans. The technical term to describe this aspect of their life history is:
   a) Age Distribution
   b) Iteroparous
   c) Semelparous
   d) Trade-off
   e) Ruderal

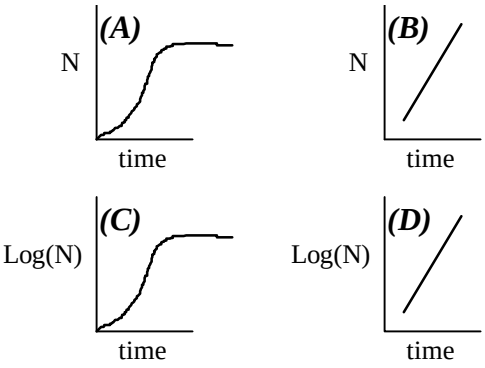
8) Which of the following did Joseph Connell observe and study?
   a) Galapagos finches
   b) Salt Marsh grass
   c) Barnacles
   d) *Paramecium*
   e) Diatoms

9) Which of the following equations would be most appropriate to use in predicting the size of the global human population (assuming no density dependent factors were at work)?
   a) $R_o = \Sigma\, l_x\, m_x$
   b) $N_t = N_o\, \lambda^t$
   c) $N_t = N_o\, e^{rt}$
   d) $dN/dt = rN(1-N/K)$
   e) $dN_1/dt = r_1N_1(1-N_1/K_1 - a_{12}N_2/K_1)$

10) In a comparison among several human populations of equal size and net reproductive rate, the one that is likely to grow the most during the next 30 years is the one with the greatest fraction of people in which age-class?
   a) 20 to 30 years
   b) 40 to 50 years
   c) 60 to 70 years
   d) 80 to 90 years
   e) none of the above – this factor is not important in population growth

11) Which of these graphs best demonstrates purely exponential growth?

(E) None of the above



12) Assuming these values stayed constant, which one of the following countries would grow <u>fastest</u>?

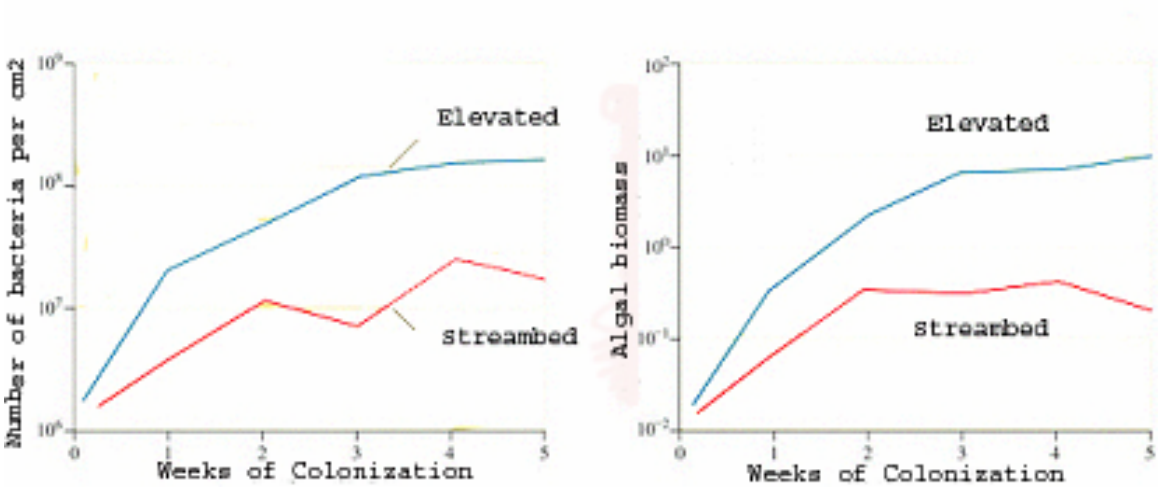
	Births/1000 population	Deaths / 1000 Population
a) Monaco	20	17
b) Iran	18	6
c) Kazakhstan	15	10
d) Croatia	10	11
e) Armenia	9	6

13) Which of the following pieces of information would you need if you wanted to calculate the net reproductive rate (R_0)?
   a) The survivorship schedule
   b) The carrying capacity.
   c) The birth schedule
   d) The population size
   e) Both a and c

14) Which of the following is an example of interference competition?
   a) Bumblebees drink the nectar from flowers and reduce the availability of nectar to other animals.
   b) Male damselfish patrol and defend their mating territories against other fish.
   c) A rust fungus causes mustard plants in the rocky mountains to produce "pseudoflowers" that attract pollinators and spread the fungus.
   d) Drought in the Galapagos islands reduces the availability of seeds to finches.
   e) Kangaroo rats and Desert Ants both feed on seeds, but at different times of day.

15) The difference between populations belonging to an r-selected species and those from a K-selected species is that
   a) Populations from an r-selected species tend to increase in size exponentially in the absence of environmental restraints
   b) Populations from a K-selected species tend to inhabit unstable environments
   c) Populations from r-selected species have an equilibrium density at or near the carrying capacity of the environment
   d) Populations from an r-selected species are better adapted to colonize and exploit new or disturbed habitats
   e) Populations from a k-selected species are better adapted to colonize a new environment

16) Your book presents results of a study of *Helicopsyche* caddisflies, in which the following results were presented:



You should be familiar with this example. Remember that the tiles on the streambed were available to the caddsflies, while they could not reach those in the "elevated" treatment. The results in this figure (Figure 14.9) most clearly indicate that:
   a) *Helicopsyche* reduces the abundance of its prey
   b) *Helicopsyche* is limited by competitors
   c) *Helicopsyche* requires the presence of mutualistic bacteria
   d) *Helicopsyche* uses refuges to avoid its predators
   e) *Helicopsyche* shows a classic predator-prey cycle

17) If two species eat similar diets, the types of food which they both consume is said to represent a region of:
   a) Niche overlap
   b) Logistic growth
   c) Age structure
   d) Competitive exclusion
   e) Character displacement

18) 15 **points.** *YOUR REVIEW SHEET HAD 3 QUESTIONS YOU WERE TO PREPARE FOR. OF THOSE, THIS IS THE ONE YOU MUST ANSWER. REMEMBER: your answer should be well reasoned and well written -- outline format is not acceptable (though you may outline the answer for your own benefit on the back of another page).*

Discuss the factors that are likely to help set the carrying capacity for white-tailed deer in the Cuyahoga Valley, and how one might determine what that carrying capacity is.

19) 5 points. What information would be useful for predicting whether two competitors will coexist? What leads you to believe that information be important?

20) 4 points. In class we discussed some factors that determine whether a disease will spread or not. LIST TWO of those factors. Choose ONE of them and in ONE SENTENCE, explain why it is important.

21) 4 points. Draw a properly labeled graph depicting behavior of the Lotka-Volterra predator-prey model. Explain in a sentence or two.

22) 3 points. Explain your answer to any ONE of the multiple-choice questions. Question: _____. Answer: _____ Explanation: