Objectives for Unit Twelve: Chapters 39 - 43 Animal Behavior & Ecology

You should be able to:

1. Provide examples of organisms interact at various levels:
    - Cells: Biofilms
    - Organisms: predators and prey
    - Community: Food web
2. Distinguish between proximate (how) and ultimate (evolutionary) explanations for why organisms behave the way they do.
3. Explain the concept: timing and coordination are regulated by various mechanisms are important in natural selection. Consider:
    - Innate behaviors that are inherited
    - Learning occurs through interactions with environment and other organisms.
    - Behaviors in animals are triggered by environmental cues and are vital to reproduction, natural selection and survival.
4. Compare innate and learned behavior -- provide examples of each.
5. Give examples of how animals use visual, audible, tactile, electrical and chemical signals to indicate dominance, find food, establish territory and ensure reproductive success.
    - Bird courtship dances
    - Predator warning in Belding's Squirrel
    - Coloration (warning)
6. Explain how natural selection can result in the evolution of cooperative behaviors that increase either the fitness of the individual or the survival of the population at the expense of the fitness of the individual (e.g. altruistic behavior). A couple of examples:
    - Belding's squirrel and warning calls
    - Bee society -- genetic relatedness
    - Naked mole rats
7. Recognize that cooperative behavior within or between populations contributes to the survival of the populations.
    a. Niches and resource partitioning
    b. Mutualistic relationships
    c. Pollination of flowers by bees and other insects
8. Describe the basic levels of ecological interactions.
    a. Populations
    b. Communities
    c. Ecosystems
9. Identify biotic and abiotic factors that impact ecosystems and the biosphere such as turbidity, pH, dissolved oxygen, temperature, slope, humidity, light intensity, wind, and the like.
10. Explain the concept of limiting nutrients; predict what will happen to growth of a population if a limited nutrient is increased.
11. Define/describe each of the following components of population ecology.
    a. Population Size (ways we measure it: mark and recapture, quadrant study)
    b. Population density - how do we **calculate** it as with mark & recapture (Drey Land crayfish).
    c. Dispersion patterns (uniform, clumped, random) – identify reasons for and examples of these patterns
12. Distinguish between B & D, and b & d. Use them to calculate r.
13. Describe the exponential population growth model (include examples and understanding of the equation).
14. Describe the logistic ("S" shaped) population growth model (include examples and understanding of the equation).
15. Explain why a "J" shaped population growth curve exists and why it appears to never reach K.
16. Define carrying capacity and identify it on a population growth curve.
17. Explain why a population may exceed it's carrying capacity and what effect this will have on the population size and growth.
18. Differentiate between density dependent limiting factors and density independent limiting factors regarding population growth.
19. Compare population strategies for population growth (r-selected species & K-selected species) in multiple categories.
20. Draw a survivorship curve for both r- and K-selected species. Identify examples that fit survivorship curves I, II and III. Explain how the principle of allocation of resources influences r- and K-selected species.
21. Describe the "boom and bust" population cycle as illustrated by predators and prey.

22. Compare the expected growth of countries with different age structure diagrams.
23. Describe the current trend of Human Population
    a. current human population growth curve
    b. given rate of growth **CALCULATE** doubling time
    c. expected growth of countries with different age structure diagrams (population pyramids) and fecundity (# of children/female) rates
24. Be able to solve problems and **DO CALCULATIONS** as in the problems on your population practice sheet.
25. Describe and give specific examples of the following types of interactions within a community:
    a. Parasitism
    b. Mutualism
    c. Commensalism
    d. Ecological niche & resource partitioning
    e. Interspecific competition (different from Intraspecific competition)
    f. Predation (coevolution of predators and prey – lots of possible examples)
    g. Mimicry (Batesian and Mullerian)
    h. Keystone species (like a beaver or sea otter)
26. Discuss the competitive exclusion principle, using a real life example.
27. Distinguish between a fundamental niche and a realized niche.
28. Describe adaptations that predators and prey have evolved to maximize predation or avoidance of predation.
29. Explain how/why keystone species keep a community from deteriorating.
30. Summarize the sequence of ecological succession in a community like the Drey Land forest. Explain how each community both promotes the next community and inhibits the current one.
31. Compare characteristics of species that are "pioneers" to those that inhabit a "climax" community.
32. Compare primary succession and secondary succession using examples.
33. Explain why an area subject to moderate disturbances may have higher biodiversity than one without disturbance.
34. Describe the impact of an exotic species on a community. Why can such a species often do so well? Know one example well.
35. Identify trophic relationships demonstrated by food chains (and food webs)
    a. primary producers
    b. consumers (first order, second order)
    c. decomposers
36. Compare the flow of matter with the flow of free energy in an ecosystem.
37. Explain what would happen to the size of various tropic levels if:
    a. primary productivity of an ecosystem were cut in half
    b. the amount of light shining on an ecosystem were increased or decreased
38. Identify biomes with very high and very low primary productivity levels.
39. An important concept in biology is: All biological systems from cells and organisms to populations, communities and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy. Illustrate this concept with such examples as:
    a. Predatory prey interactions
    b. Symbiotic relationships (parasitism, mutualism, commensulism)
    c. Water and nutrient availability, temperature, salinity, pH
    d. Availability of nesting mateials land sites
    e. Food chains and webs
    f. Species diversity
    g. Population density
    h. Algal blooms and eutrophication
40. Explain why pyramids of numbers, pyramids of free energy, and pyramids of biomass exist in ecosystems (Use the 10% rule).
41. Given a diagram of water, carbon and nitrogen cycles,
    a. Describe how water moves through the biosphere in a global cycle.
    b. Identify how the carbon cycle depends on photosynthesis and respiration.
    c. Describe the conversions bacteria make
    d. Describe nitrogen fixation.
    e. Explain how fertilizers can disrupt the nitrogen cycle and lead to cultural eutrophication.
    f. Identify ways in which human activities have impacted each of the biogeochemical cycles.
42. Identify several types and sources of greenhouse gases.
43. Relate the greenhouse effect to global climate change.
44. Natural forces and humans disrupt the homeostasis of communities and ecosystems. Describe how the following impact this homeostasis and biodiversity:
    a. Habitat destruction & fragmentation (how are they different?)

     b.   Introduction of new species (alien, invasive, exotic species) or a disease species; know one example well -- why can they often gain such a foothold?

     c.   Overexploitation (know one example well: hunting, food resources, pet trade)

     d.   Biomagnification (know one example well: DDT, PCBs, Mercury)

     e.   Hurricanes, floods, fires

     f.   Loss of genetic/species diversity → Why are species with little genetic diversity at an increase risk of extinction? (Examples might be: California Condors, ferrets, prairie chickens) How do keystone speices help maintain species diversity?

45. Describe the effect of each of the following types of pollution/disruptions:

     a.   DDT

     b.   Acid Rain

     c.   Ozone Depletion

     d.   Greenhouse gases (carbon dioxide, Methane) and their relationship to Global Warming

46. LAB AP #12: Fruit Fly or Rolly Polly Behavior: Designing an experiment to evaluation the influence of an abiotic factor on the taxis behavior of *Drosophila* or Rolly Pollies From your lab manual:

     a.   To investigate the relationship between a model organism and its response to different environmental conditions

     b.   To design a controlled experiment to explore environmental factors that either attract or repel *Drosophila* or Rolly Pollies in the laboratory setting

     c.   To analyze data collected in an experiment in order to identify possible patterns and relationships between environmental factors and a living organism

     d.   To work collaboratively with others in the design and analysis of a controlled experiment

     e.   To connect and apply concepts (With the fruit fly as the focal organism, your investigation could pull together many topics, such as genetics, animal behavior, development, plant and animal structures from cells to organs, cell communication, fruit ripening, fermentation, and evolution.)

47. LAB: Measure GPP and NPP in an aquatic ecosystem using the light and dark bottle method. Be able to do the **CALCULATIONS**.

48. <u>Dry</u> LAB AP #10: Energy Dynamics: Measuring primary and secondary productivity using fast plants and white cabbage larvae. Be able to do the **CALCULATIONS**. From our lab manual:

     a.   To design and conduct an experiment to investigate a question about energy capture and flow in an ecosystem

     b.   To explain community/ecosystem energy dynamics, including energy flow, NPP, and primary and secondary producers/consumers

     c.   To predict interspecific ecological interactions and their effects

     d.   To use mathematical analyses in energy accounting and community modeling

     e.   To make the explicit connection between biological content and the investigative experience

49. Each chapter has some multiple choice questions and a few other additional questions at its end. Give these a try. You might see them again!

<u>Any of the above objectives could be turned into a short free response question.</u>

<u>This is your last test.   I will not be identifying likely essays. You are on your own.</u>