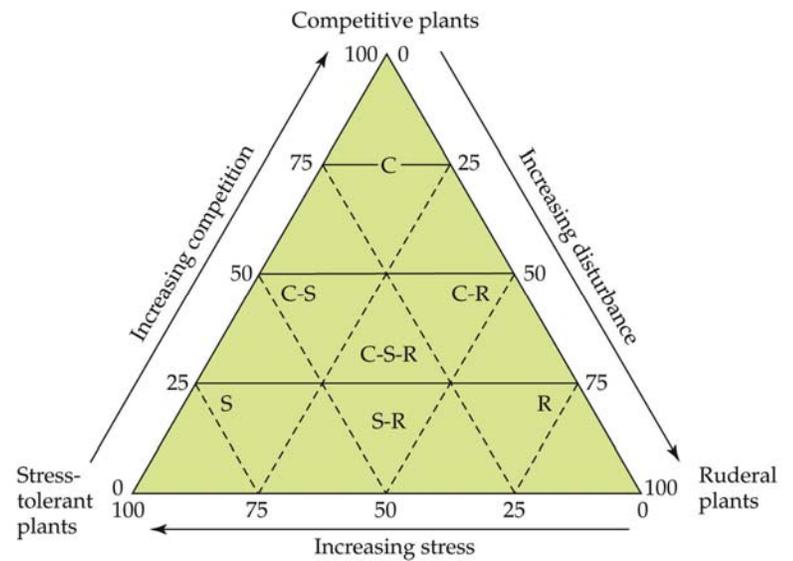


Multiple guess. Circle the letter of the best answer. [4 points each, 40 pts total]

1. The two hosts most responsible for the spread of West Nile virus to most of the states in the U.S. were _____ and _____. [TB Concept 1.1, p. 8]
 - a. mosquitoes; frogs
 - b. mosquitoes; rats
 - c. birds; rats
 - d. mosquitoes; birds
 - e. rats; frogs
2. Labord's chameleons (shown) complete their life cycle in one year. Cole's paradox suggests
 - a. natural selection should lead to iteroparous mutants replacing these chameleons.
 - b. natural selection should lead to semelparous mutants replacing these chameleons.
 - c. that these chameleons are to be expected by natural selection.
 - d. that these chameleons are not inconsistent with natural selection.
 - e. none of the above!
3. Seasonality on a planet like Earth (that already sustains life) depends on which of the following (circle all that are necessary)
 - a. Tilt of the rotational axis.
 - b. A moon.
 - c. Rotation \neq one prograde rotation per year.
 - d. all of the above.
 - e. none of the above.
4. The process of plate tectonics is driven primarily by
 - a. the rotation of the Earth
 - b. the revolution of the Earth
 - c. the effect of the moon on Earth, including tides and ocean currents
 - d. convection of heat from the Earth's core
 - e. none of the above.
5. During the summer, temperatures and plankton activity in lakes are highest at the _____. This is also the period of _____ lake stratification. [TB: Concept 2.5, p. 39]
 - a. epilimnion; highest
 - b. epilimnion; lowest
 - c. thermocline; highest
 - d. thermocline; lowest
 - e. hypolimnion; highest
6. Whittaker and Niering (1975) studied the dramatic changes in plant communities as they went from low to high elevations near Tucson AZ. Note that these patterns occur on most mountain ranges. They attributed the vegetational changes to the following environmental variables (as they went up this elevational gradient):
 - a. water availability increased and temperature increased
 - b. water availability increased and temperature decreased
 - c. water availability decreased and temperature increased
 - d. water availability decreased and temperature decreased
 - e. none of the above.



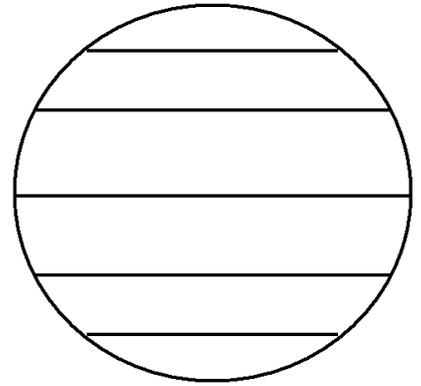
7. Which of the following organisms regulates its body temperature? [TB: Concept 4.2, p. 92]
- Lizard
 - Mouse
 - Tuna
 - All of the above
 - Only b and c
8. Which of the following is *not* a heterotroph? [TB: Concept 5.1, p. 108]
- Fungi feeding on soil detritus
 - Bacteria consuming dissolved organic compounds
 - Parasitic protozoa living in the gut of a pig
 - Chemosynthetic archaea synthesizing carbohydrates
 - Deer grazing on grass
9. In which of the following pathways are carbon dioxide uptake and the Calvin cycle separated in time, allowing stomates to be open at night? [TB: Concept 5.3, p. 117]
- C₃ photosynthetic pathway
 - C₄ photosynthetic pathway
 - CAM pathway
 - Both a and b
 - None of the above
10. The triangle to the right suggests that plants [TB: fig. 7.12]
- prefer either competitive, disturbed, or stressful environments.
 - are adapted evolutionarily to competitive, disturbed, or stressful environments.
 - evolve strategies that allow each species to compete well in all environments.
 - all of the above.
 - none of the above.



ECOLOGY, Figure 7.12

5. Use the circular diagram to the right of an idealized Earth for the following two requests. [TB: fig 2.9]

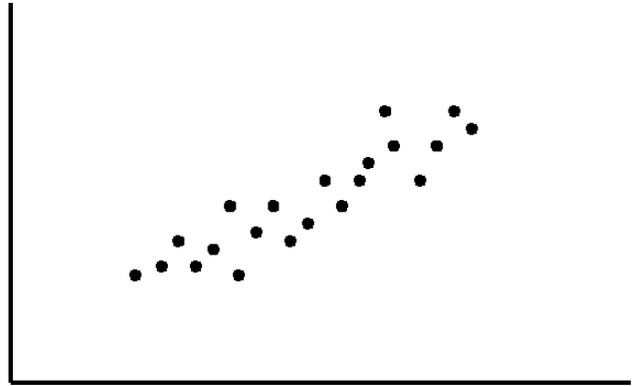
- a. Inside the circle draw the directions of the winds on the surface of the Earth.
- b. On the outside of the circle draw in the directions of rising and falling air masses around the Earth.



6. Draw the relationship between metabolic rate and body temperature for endothermic organisms. Label the regions of the graph. [TB: fig 4.16]

7. Draw the marginal value theorem for an animal foraging in many patches. Discuss (and show on your graph) when an animal should switch patches. [TB: fig 5.22]

8. The graph shows data that are consistent with two characteristics that are imperative for evolution to occur **by means of natural selection**. Label the axes *carefully* and provide these two characteristics by indicating how they are apparent in the data.



9. Provide three attributes each for r- and K-selected species. Provide two examples of each. [TB: p 162]

Attributes

r-selected

K-selected

- 1.
- 2.
- 3.

 Example #1

 Example #2

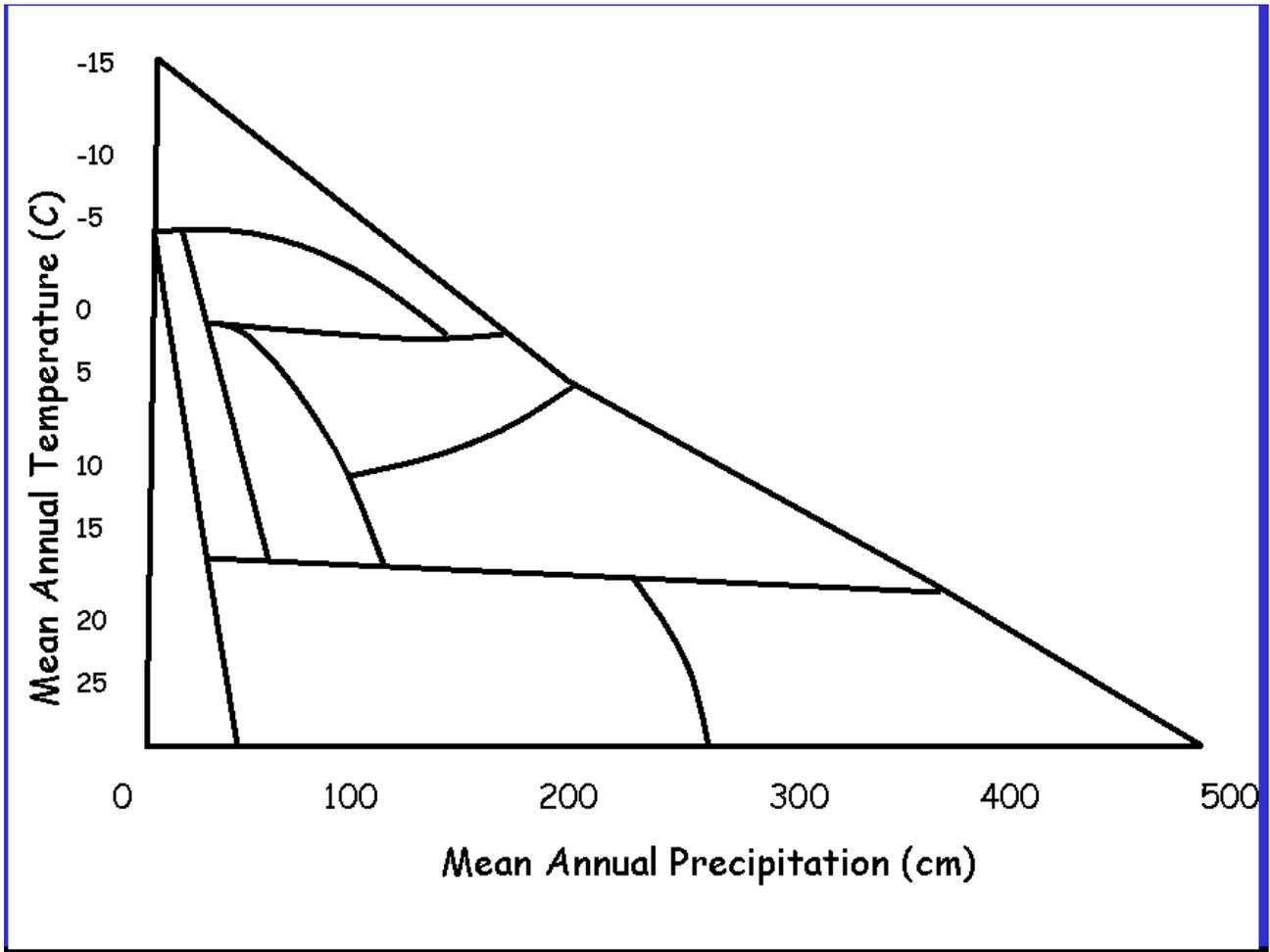
10. Provide a graph of seagull data portraying the percent of chicks fledged as function of the number of eggs laid (on the left). We discussed why this is a bad representation of these data that are so important to fitness and, ultimately, evolution. What's the problem with this graph from your text (why it's a bad graph!)? **Provide a better graph on the right.** Label your axes clearly. [TB: fig 7.14]

Mandatory Questions. Answer All. (10 pts ea., 30 pts)

1. Describe the four easily observed characteristics of natural selection? (2.5 pts per char.)
 - a.
 - b.
 - c.
 - d.

2. Draw the relationship between population growth rate and an environmental factor. Label axes and the different “zones” on the graph (6 pts). In a second graph draw this relationship for a real example from the Arboretum with **properly labeled axes.** (4 pts)

3. Biomes are strongly dependent on precipitation and average temperature. Provide the biomes in the figure. Identify where you are right now and where you'd find a gorilla and a polar bear. [TB: fig 3.4]



Extra Credit (1 pt each)

1. What percent of children 1.5 – 3 yrs old get some kind of vaccination in US?
2. What's the exact term for when unvaccinated individuals benefit when most the other individuals in a population are vaccinated?
3. Hurricanes are unpredictable because they are chaotic. What's the defining characteristic of systems that are technically "chaotic"? Hint: We say such systems exhibit _____.
4. Besides general attractiveness, what's the difference between hairy and hairless dogs?
5. Each Hartvigen lecture begins with what question? _____
6. According to lecture, biology is a subdiscipline of what field? _____