Eco Test

By: Me

Instructions:

The scoring rubric is highly segmented with various points of partial credit given for different portions of the answer, so be specific and a partial answer is definitely better than no answer.

Imma just say 5 minutes per station (station Q you can take as much time as you like).

It can be done as stations or all as one test - your choice.

1) In the Unified Neutral Theory of Biodiversity, explain what a neutral theory of ecology means. (3pt)

2) The UNTB is based on the theory of island biogeography. Explain this theory and give 3 natural settings in which it could be applied (3pt + 0.5pt per setting)

3) Explain the buffer zone concept of natural preserves (2pt) and describe each of its 3 zones (0.2pt each)

4) _____ are agreements between landowners and conservation agencies not to develop their land any further (1pt)

5) In the time you have remaining, describe the Unified neutral theory of biodiversity, and if you don't know what it is, read about it because it's an interesting perspective on ecology (8pt)

Station 2: Diversity Maths

Ceanothus spinosus	0.5
Arctostaphylos glandulosa	0.36
Dudleya lanceolata	0.03
Romneya coulteri	0.11

1. Calculate the shannon-wiener evenness index (1.5pt)

2. What does the second column represent? (0.5pt)

3. Which index, simpson or shannon-wiener, puts greater emphasis on rarer species? Why? (1pt)

4. Explain how the Brillouin index differs from the shannon-wiener index (2pt)

5. Which of the plants listed has (objectively) the best flowers? (0pt)

Station 3: Selection and Speciation

1. What term best describes speciation from the isolation of a species of insect from the mainland on a small, far off island? (0.5pt)

2. Name the type of selection most likely to occur in each of the following scenarios (0.25pt each)
   a. A pair of similar species undergo exploitative competition

   b. A species lives by eating either figs or durian and does best when it has the fewest number of individuals competing against it

3. A penguin undergoes a mutation that turns its arm into a biological analog of a Glock 29 making it far more fit than other individuals. Explain fitness (0.5pt) and name the term that describes the rapid spread of this trait through the population (0.5pt).

4. A lichen growing high on a mountain near Yellowknife is undergoing outbreeding depression. Explain outbreeding depression (1.5pt) and the most common way species avoid this (0.75pt).

1. What are grasslands called in South Africa? (0.1pt)

2. Describe the key difference between bunchgrass prairies and typical North American temperate grasslands (0.75pt)

3. Give a brief description of the each of the following types of savanna (0.25 each)
    a. Edaphic -

    b. Derived -

    c. Temperate -

4. Describe temperate grassland soil characteristics (1.5pt)

5. Contrast aridification with desertification (1.2pt)

6. Draw an approximate curve of stem water potentials for a perennial bunchgrass in California's central valley over the course of a year labelling the highest and lowest points with a reason (2pt)

1. Describe each of the following types of deserts and give an example of each in the US (1.3pt)
    a. Cold desert -

    b. Semi-arid desert -

    c. Paleodesert -

2. Answer the following
    a. Define PET (0.5pt) -

    b. Define the aridity index (1pt) -

    c. Why are many cold deserts not hyperarid by the aridity index definition? (1pt) -

3. Earth-sci time!
    a. How does desert pavement form? (0.75pt) -

    b. Why are deserts common around 30 degrees N/S latitude? (0.5pt) -

    c. Give the 2 primary reasons deserts are so much warmer than other areas at similar latitudes (1.7pt) -

4. Living stuff
    a. _____ are desert animals (0.25pt)
    b. What unique mode of photosynthesis do many species of cacti employ? (0.5pt)
       Describe its primary advantages (1pt) -

    c. Name all the continents where cacti are found (0.25pt)

Station Q: Chaparral

What's that? Chaparral isn't on the biomes list?!?! Sucks for you; it's my favorite biome so deal with it.

1. Name each location in the world where chaparral is found (0.15pt each, -0.15pt for each incorrect guess)

2. Describe the 3 major fire survival mechanisms of chaparral (1.5pt)

3. Give 3 common characteristics of chaparral shrub leaves (0.6pt)

4. Describe the type and timing of fires that chaparral is adapted to (1.25pt)

5. Aside from increasing frequency, give the two main ways in which people are changing chaparral fire regimens (2pt)

JK, don't actually count this station in score except as a tiebreak.

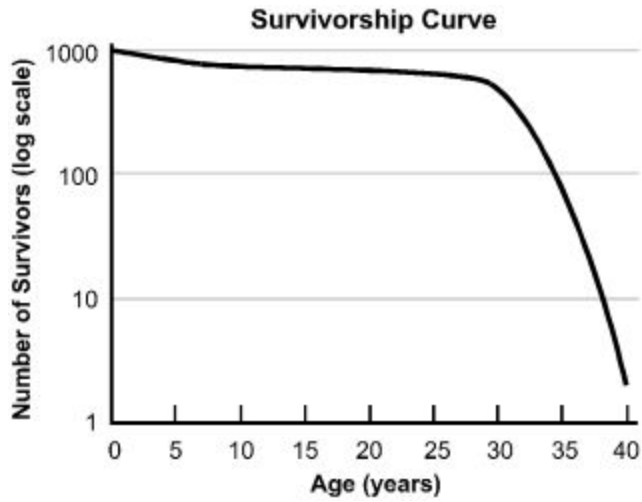1. The above image is an example of what? (0.25pt)

2. How is the above image similar to a tall mountain? (0.5pt)

3. Answer the following
    a. What is the term for the ecotone between city areas and the mountains? (0.25pt)

    b. Name 3 major impacts that humans have particularly in this zone (1pt)

4. Describe a metapopulation (1.5pt)

5. Does the image above promote speciation or extinction? Explain your answer as in depth as possible (1.5pt)

1. Rank the following 4 cycles in increasing speed of cycling: carbon, sulfur, water, nitrogen (0.5pt)

2. How do algal blooms cause fish die-offs? (0.75pt)

3. Describe the differences between HFCs and CFCs and what they do (1.4pt)

4. Acid rain is bad[Citation Needed]. What are its 2 primary detrimental effects on terrestrial plants? (1.5pt)

5. Describe each of the following and how they help reduce the effects of agricultural chemical runoff (0.5pt each)
    a. Contour plowing -

b. Mitigation banking -

c. Secondary wastewater treatment -

6. In contrast to the Gaia Hypothesis which describes earth as a self-regulating stable system, the Vengeful Earth hypothesis describes earth a system which, once brought out of balance by anthropogenic forces, will only shift more and more towards catastrophic climatic changes. Describe how each of the following support the gaia hypothesis, vengeful earth, or both. (4.25pt)
    a. Melting permafrost

    b. Melting sea ice

    c. Oceanic carbon dioxide absorption

1. Which trophic pyramid is most likely to be inverted? Why? (1.5pt)

2. The lengths of foodchains are often limited by the amount of energy available at successive trophic levels. What is the other reason that trophic levels rarely reach past 6 or so in most ecosystems? What is the name of this theory (2pt)?

3. The lotka volterra equations are used to model changes in predator and prey populations over time. The lotka volterra equation for a predator species is $dP/dt = cnP - qP$ where P is predator population.
   a. What do c, x, and q represent? (1.25pt)

   b. The lotka volterra equation for a given prey species is $dX/dt = rX - zX$ where X (prey population) is initially 100 and r and z are constants. What is the percent change in prey population in 3 years (where time is measure in years) in terms of r and z? (1pt)

   $e^{3(r-z)}$

Survivorship Curve

4. The above image is a survivorship curve of the endangered pacific northwest tree octopus (Octopus paxarbolis). The animal reaches maturity around 15 years of age. How would this curve change in response to the introduction of a predatory sasquatch? Draw the new curve and explain the major changes in the shape of the graph. (2pt)

Station 9: Energy and Demographics

1. Draw a graph of birth rate and death rate over time during a demographic transition (0.5pt)

2. Define replacement fertility and give its approximate value for the US (0.5pt)

3. Name the types of renewable energy depicted below (1pt)

Left:
Middle:
Right:

4. What country has the most oil? (0.25)

5. Explain how each of the following renewable energy sources damage the environment (1.5pt)
    a. Solar

    b. Hydro

6. Answer the following about biofuels
    a. Bioethanol is produced by what process? (0.25pt)

    b. Explain the primary differences between bioethanol and biodiesel (1.5pt)
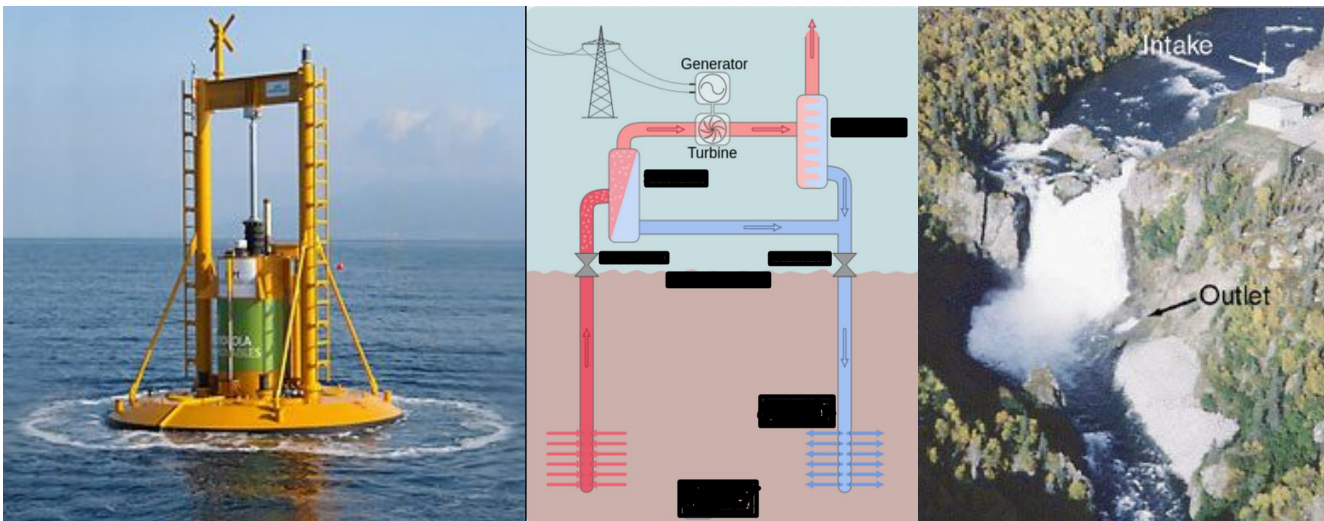
    c. Compare the emissions of bioethanol to that of standard gasoline (0.75pt)

7. Answer each of the following
   a. Advantages of vertical axis wind turbines (0.65pt)

   b. Describe passive solar and what trombe walls are (1pt)

   c. Name the major advantage and disadvantage of cadmium telluride photovoltaic cells (0.75pt)

1. Explain Dollo's law (0.5pt)

2. What is specific metabolic rate? If a 4kg cat has a specific metabolic rate of 10, what is the approximate specific metabolic rate of a 40kg deer? (1pt)

3. Identify each of the invasive species below by either common or scientific name (Sorry to all who have not done Invasive. Y'all have led sad lives.) (1.5pt)

Top left:
Top right:
Bottom right:
Bottom left:

4. The california raccoon feeds primarily on acorns in its natural state. However, with the introduction of many easy garbage cans to prey upon, some raccoons now survive on discarded cans of Arizona Tea. What type of speciation does this promote? (0.25pt)

5. A population of peppered moths has established itself on some magnolia trees in LA. When an area is polluted, some trees darken and subsequently have greater concentrations of dark colored moths. When an area is near a high school, some trees are covered in bright blue graphitti, but no blue moths are found. Why is this? (0.75pt)

6. The agribusiness firm KimBer buys some land in alaska which, until the implementation of Scott Pruitt's environmental regulations, had been covered by glaciers. They plant their rice chex plantation and notice that chex plants growing on areas which previously had lichen faired poorly. What model of succession does this support? (0.75pt)

7. An oly alum with a grudge against Troy threatens to sneaks some formosan subterranean termites into troy's build room unless he is paid a ransom of 3 nationals trophies. This is an example of what? (0.25pt)