Answers:

Green Generation
Total points: 84

Multiple Choice: (2 points each numbers 1-10)

1. E

2. C

3. B

4. C

5. C

6. B

7. A

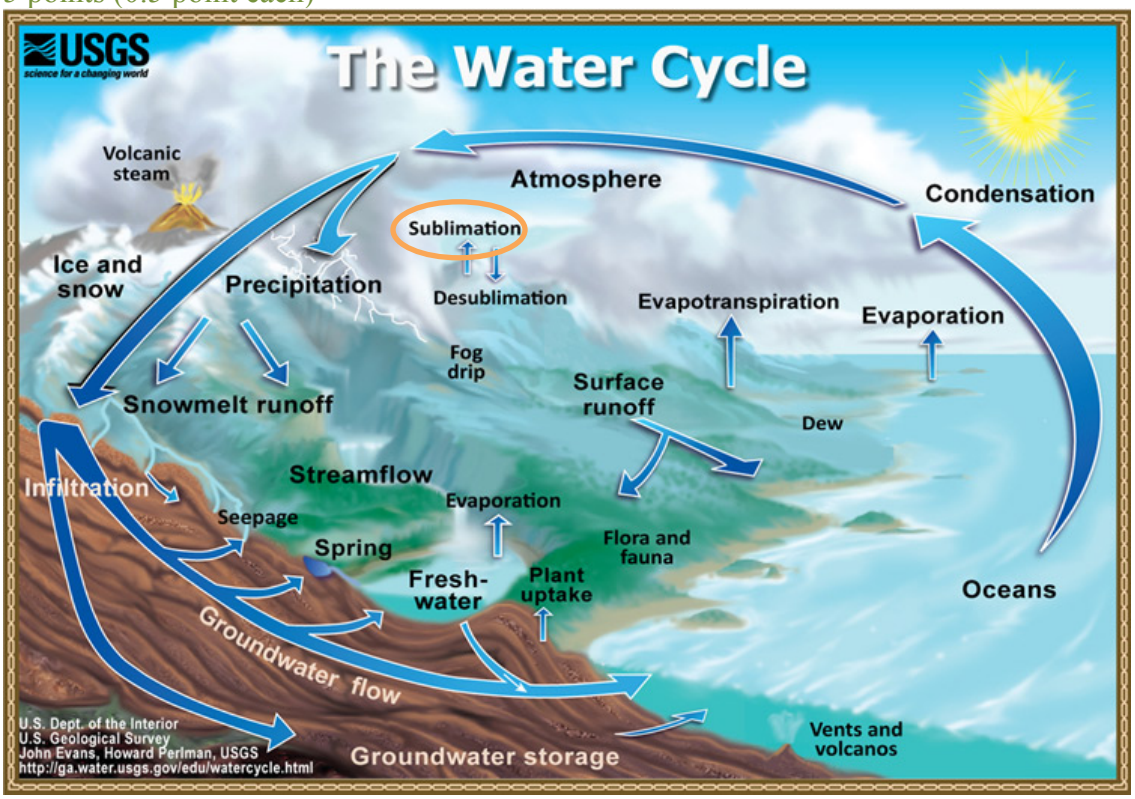
8. B

9. B

10. A

11. Draw a diagram of the water cycle. Include the following processes:
Infiltration, Evaporation, Condensation, Movement of Clouds, Percolation, Precipitation, Runoff, Sublimation, Evapotranspiration, and two major natural water reservoirs. (10 in total)

5 points (0.5 point each)



When grading:
Infiltration is water entering into the ground. Percolation is flow of groundwater.
Transpiration- evaporation of water from plants
Evapotranspiration- combined transpiration and evaporation

Major Water Reservoirs:
Lake, Stream, River, Ocean, Glaciers, Ice Caps, Groundwater, Clouds,

Short Answer:
Part I: Principles of Ecology (21 points)

1. Which are two characteristics of R-selected species? (2 points)

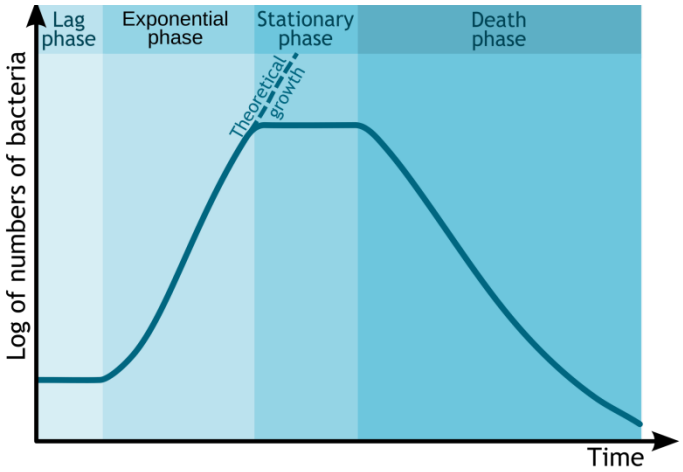
Many offspring, each with low chance of survival
Low parental care with offspring
Typically survive in unstable environments

2. Which ecological pyramid may sometimes be inverted? Explain how this happens. (3 points)

Numbers pyramid- if organisms higher up in trophic level are small.

Ex. Ecosystem with a large plants and many small herbivores

3. When growing bacteria in cultures, they take some time "moving in" and getting accustomed before experiencing explosive growth. Draw the graph of bacteria population over time in a nutrient-rich growing medium. Label each part of your graph, and explain what is happening to the growth rate at each stage.
(4 points- one point for each phase)



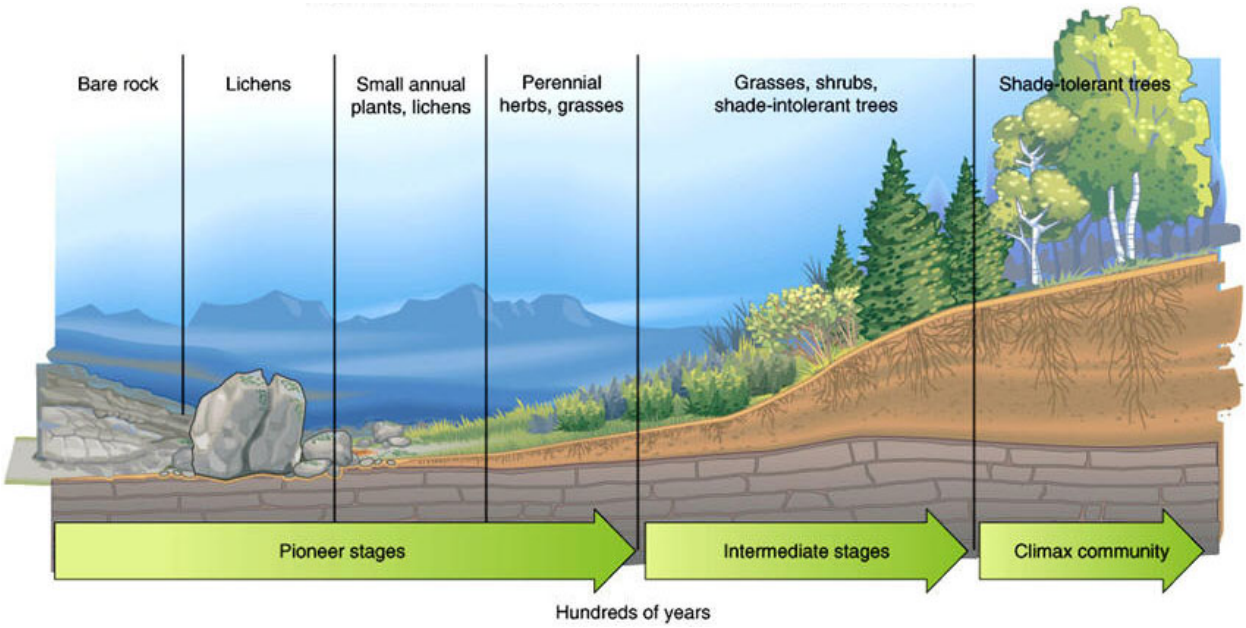
Lag- adjusting to environmental conditions
Exponential- bacteria accustomed. Rapid growth and consumption of resources
Stationary- growth starts to slow as resources are used up, space becomes more limited, and waste products accumulate. Death and birth rates equal.
Death- toxic waste products and little resources/space cause most to die of. Death rate higher than birth rate.

4. What is commensalism? Give an example. (2 points)

   One organism benefits, the other is unaffected.

   For the example, answers may vary. Ex. In tundra, caribou has a commensalism relationship with wolves. As caribou digs in snow to look for lichen, small animals are exposed and eaten by the wolf.

5. How does primary succession differ from secondary succession? Draw a diagram of primary succession. Label the types of organisms found in each stage. (6 points)

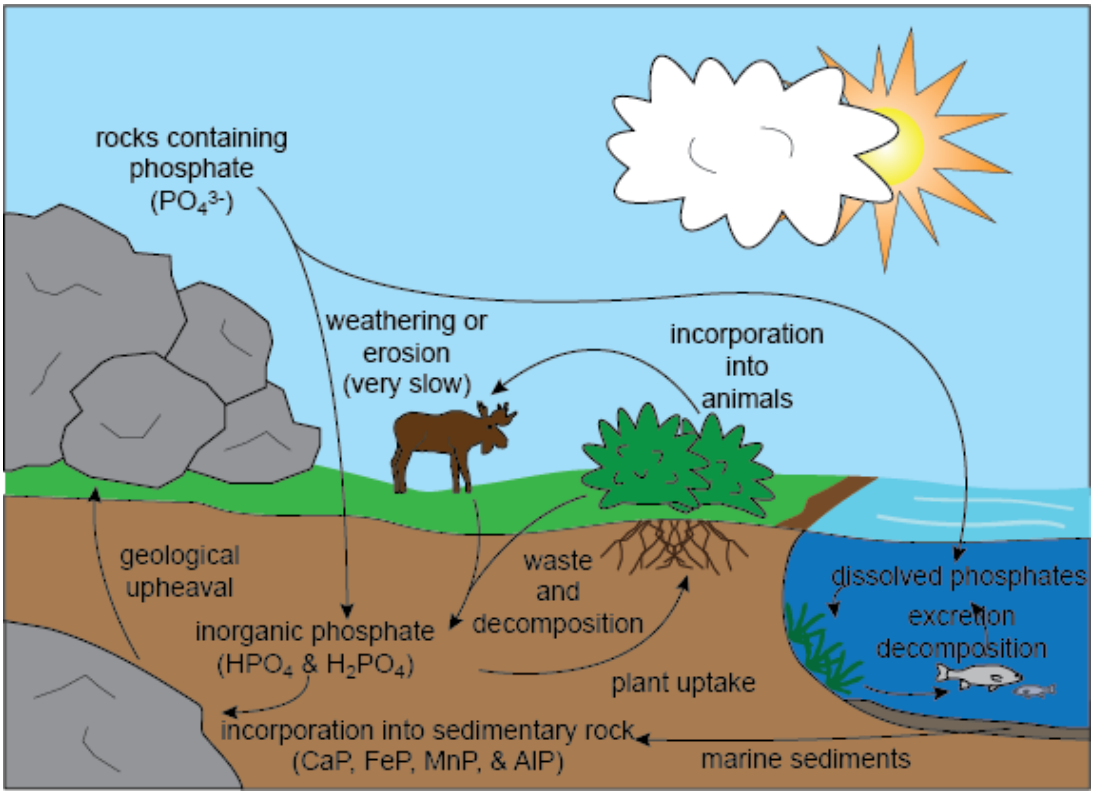


   Primary succession- from barren ground (newly formed land), and there is no available soil.

   Secondary- occurs after disturbance but soil layer is NOT disturbed. Soil is still intact and plants can start growing immediately in the soil. (2 points)

   Diagram may be simpler than the chart- as long as it begins with barren ground (1 point), lichen/small plants (1 point), perennials/shrubs and herbivores (1 point), mature forest (1 point)

6. Draw the phosphorus cycle, a type of biogeochemical cycle. Label 2 biotic and abiotic components of the cycle.



Abiotic- weathering, erosion, sedimentation, geologic upheaval,
Biotic- uptake by plants, consumed by herbivores and animals, excreted through waste,

(4 points) Cycle should have at least the required 2 abiotic and 2 biotic, and include some aspect of geology and biology.

Part II: Human Impacts (22 points)

1. A body of water is located near a chemical factory, farm, and roadway. List one way how each affects the water quality, and specify point source/non-point source pollution. (3 points)

Chemical factory- release pollutants into the water- mention chemical, thermal, sediments, or heavy metals
Point source
(+1)

Farm- manure, fertilizer washes off into water due to runoff
Non-point source
(+1)

Roadway- road salts, gasoline, sediments
Non-point source
(+1)

2. What is a watershed, and how does this concept be used in water quality monitoring? (2 points)

Watershed - all the area of land where water drains into one body of water.

Determines how to best monitor and protect waterways by determining which bodies of water pollutants will travel to

3. List 3 indexes used to measure water quality. Indicate how they are measured and how they affect biotic health. (6 points- two each)

Salinity- organisms can survive under narrow conditions of salinity. Affect levels of dissolved oxygen

Temperature- affect metabolism, ability to defend against infections

pH- organisms sensitive to changes in H+ concentration. Affects heavy metals. Low pH makes heavy metals more harmful

Turbidity- how clear water is. Determines amount of sunlight can penetrate and level of photosynthesis. Sediments usually also carry pollutants.

Dissolved oxygen- oxygen required for all organisms. DO low, many non-tolerant organisms die or move away

Biological Oxygen Demand- amount of oxygen consumed by organisms over time. High indicates high levels of eutrophication, large dissolved oxygen fluctuations

Phosphate and Nitrates- limiting nutrients. Lead to eutrophication

Total solids- amount of sediment found in water. Affect sunlight penetration and photosynthesis. Harms gills of organisms.

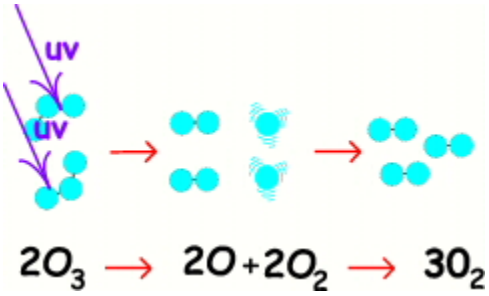
Fecal coliform- bacteria excreted from mammals. Indicative of pollution and pathogens.

Indicator organisms (macroinvertebrates)- number of sensitive organisms found indicate health of water

4. How is smog produced? (2 points)

Sunlight reacts with volatile organic compounds (VOC) such as car exhaust, factory emissions

5. Draw the chemical reaction for the equilibrium between oxygen and ozone. What is the beneficial function of the ozone layer, and how does this reaction relate to that function? (4 points)



(2 points)
(should be double arrows)
Ozone protects against UV by converting high-energy UV radiation into harmless heat energy.

Reaction occurs when UV radiation is absorbed by ozone molecules.
(2 points)

6. How are humans contributing to ozone layer depletion? (2 points)

Release CFCs (chlorofluorocarbons)

Carbon and Bromine are catalysts that speed up the decomposition of ozone into oxygen. Harming the delicate balance between level of oxygen and ozone in the atmosphere.

Mention CFCs +1
Effect of CFCs +1

7. Draw a food web of a marine ecosystem with at least 6 organisms. (3 points)

Answers may vary.
Some typical producers: phytoplankton, sea grasses, algae
Herbivores: invertebrates, zooplankton,
2nd order consumers: heron, crane, tuna, sea birds,
(3 points)

Part III: Legislation (16 points)

1. What are "Superfunds"? Name one superfund site, as well as the name of the act that established these funds. (3 points)

Superfund- environmental program addresses abandoned hazardous waste sites. It allows the EPA to clean up such sites and to compel responsible parties to perform cleanups or reimburse the government for EPA-lead cleanups

Established by Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA)

Examples: Love Canal, Times beach

Knowledge of superfund +1
Site +1
Name of act +1

2. List two major regulations addressed in the Clean Water Act of 1972. (2 points)

Wastewater standards

Water Quality standards for contaminants
Illegal for point source pollution w/o permit

3. How might a city develop a sustainable yield of groundwater? (2 points)

Monitor level of groundwater increase and decrease. Make sure rate of groundwater withdrawal not exceed rate of groundwater replenishment

4. How was bioremediation used in the Deepwater Horizon oil spill? What must be considered for bioremediation to be successful? (2 points)

Microbes break down oil. +1

Must consider right temperature, nutrients, oxygen level for microbes +1

5. Name an invasive species and how it wreaks havoc. Include how it was introduced, the damage it causes, and actions taken to counteract their effects. (3 points)

Answers may vary

6. What's the difference between passive and active solar energy? (2 points)

Active- directly convert into energy. Solar panels etc.

Passive- take advantage of climate and make best use of solar energy.

Ex. Windows angled so sunlight shines during the winter, but doesn't shine during the summer. (Sun is lower in the summer and higher in the winter)

7. What were the resolutions of the Kyoto Protocol and the Montreal Protocol? (2 points)

Kyoto- industrialized nations reduce emissions of greenhouse gases

Montreal- ban ozone-depleting substances, including CFCs.