Event Supervisor Instructions for Green Generation Regional Exam

1. Printing and copying
    a. The test
        i. If running as paper test make one copy for each team.
        ii. If run as stations make enough copies to place the relevant part (A, B, or C) at each respective station.
        iii. Make sure if you are using images that they print clearly in black or white. If not print in color. Also make sure they are big enough to read easily.
    b. The answer sheet - make one copy per team
    c. The key - print copies as needed to cover all graders
2. Options for running the event- give instructions to students prior to the start of the event, point out tie breaker questions are marked
    a. Run as 12 stations, 3.5 minutes each part A, B, and C- Divide the number of teams competing at once by 3, and set up that many replicates of each part
    b. Run as paper test
        i. Hand out test in its entirety
        ii. Tell them they have 50 minutes to finish.

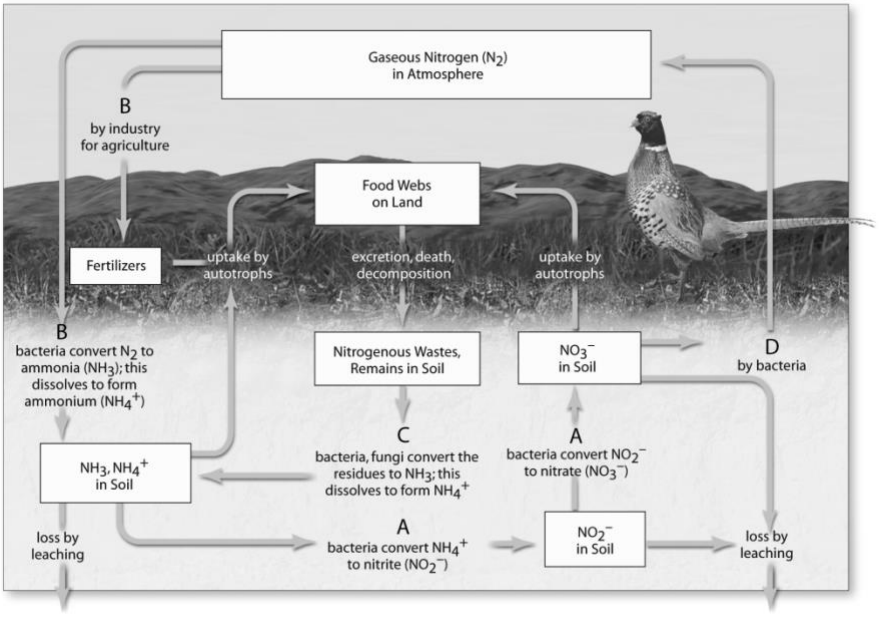
Part A Station 1: Biogeochemical Cycles

1. Of the following water-cycle processes, the one working against gravity is
   a. percolation
   b. infiltration.
   c. runoff.
   d. transpiration.
   e. precipitation

2. The hydrologic cycle is driven primarily by
   a. solar energy and gravity.
   b. solar energy and the moon.
   c. solar energy and mechanical energy.
   d. mechanical and chemical energy.
   e. chemical energy and the moon.

3. Transfer of carbon among organisms depends primarily on
   a. fuel combustion and decomposition.
   b. photosynthesis and cellular respiration.
   c. volcanic activity and organic decay.
   d. the rock cycle.
   e. bacteria and precipitation

4. Which one of the following is *not* one of the common phosphorous reservoirs in the ecosystem?
   a. water
   b. organisms
   c. atmosphere
   d. rocks
   e. marine sediment



5. On the nitrogen cycle figure, choose the process in which aerobic bacteria convert most of the ammonia into soil nitrate and nitrite ions.

6. On the nitrogen cycle figure, choose the process in which bacteria convert ammonia into nitrite and nitrate ions and then into nitrogen gas and nitrous oxide gas.

Part A Station 2: Energy, Ecosystems, and Food Chains

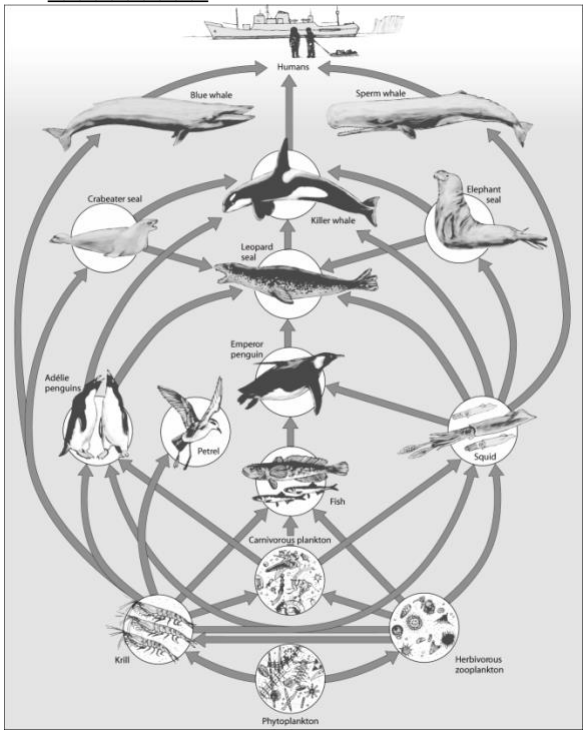
7. Organisms that feed on plants are called
   a. detritus feeders.
   b. omnivores.
   c. carnivores.
   d. herbivores.
   e. decomposers

8. Organisms that feed on both plants and animals are called
   a. detritus feeders.
   b. omnivores.
   c. carnivores.
   d. herbivores.
   e. decomposers.

9. The organisms that are classified as primary consumers are the
   a. detritivores.
   b. omnivores.
   c. carnivores.
   d. decomposers.
   e. herbivores.

10. If something is biodegradable, it
   a. can be broken down by autotrophs.
   b. can be broken down by heterotrophs.
   c. can be broken down by omnivores.
   d. cannot be broken down by any living processes.
   e. can be broken down by decomposers.

11. _____ are essential to us because they eat waste and recycle nutrients.



12. Using the image above, outline a possible food chain.

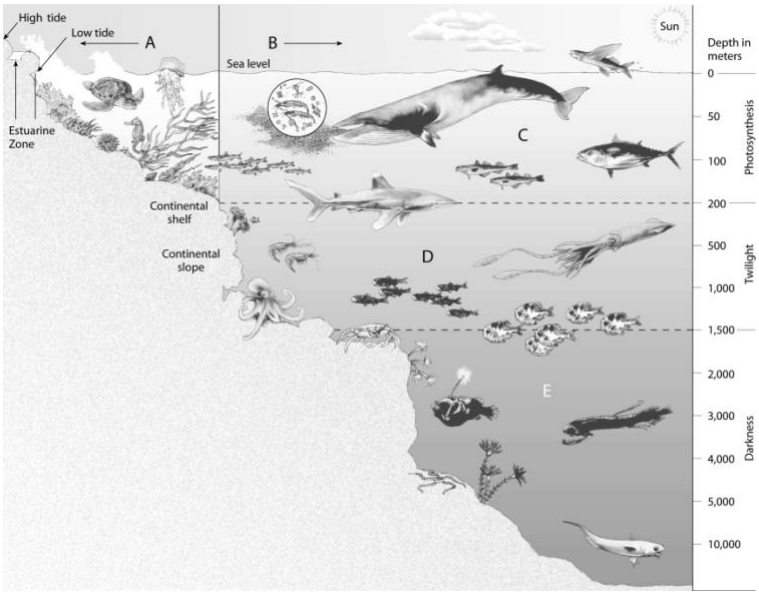
Part A Station 3: Marine Biomes

13. In your explorations as a marine biologist, you find a new species of algae floating on the surface of a coastal zone. You would most likely classify this species as
    a. phytoplankton.
    b. zooplankton.
    c. benthos.
    d. nekton.
    e. decomposer.

14. Populations of organisms living in aquatic life zones may be limited by
    a. access to light.
    b. nutrient availability.
    c. dissolved oxygen.
    d. all of these answers.
    e. none of these answers.

15. The deepest part of the ocean is the
    a. abyssal zone.
    b. euphotic zone.
    c. estuary zone.
    d. bathyal zone.
    e. riparian zone.

16. Estuaries and coastal wetlands are important for all of the following reasons *except*
    a. spawning and nursery grounds for marine fish and shellfish.
    b. filtering out waterborne pollutants from swimming and wildlife areas.
    c. breeding grounds for waterfowl.
    d. providing coral for limestone production and the tourist trade.
    e. habitat for alligators.



17. On the ocean life zones figure, choose the zone in which most organisms are blind or have poor eyesight.

18. On the ocean life zones figure, choose the zone that contains the majority of all marine species.

Part A Station 4: Freshwater Biomes

19. In aquatic ecosystems, the factor *least* likely to limit growth of a population is
    a. salinity.
    b. temperature.
    c. sunlight.
    d. dissolved oxygen.
    e. precipitation.

20. In lakes, the nutrient-rich water near the shore is part of the
    a. limnetic zone.
    b. benthic zone.
    c. littoral zone.
    d. profundal zone.
    e. abyssal zone.

21. In lakes, the open-water surface layer is called the
    a. limnetic zone.
    b. benthic zone.
    c. littoral zone.
    d. profundal zone.
    e. abyssal zone.

22. Fish adapted to cool, dark water are most likely found in the zone of lakes called the
    a. limnetic zone.
    b. benthic zone.
    c. littoral zone.
    d. profudal zone.
    e. abyssal zone.

23. During routine water testing on a level one stream you find nitrates are present in higher concentrations than usual. You hypothesize that the nitrates are running into the stream from a chicken house in the stream's
    a. floodplain.
    b. source area.
    c. watershed.
    d. aquifer.
    e. headwaters.

24. _____ management is necessary to protect streams and rivers from excessive input of nutrients.

25. Aquatic _____ is determined by environmental factors including temperature, sunlight, dissolved oxygen, and available nutrients.

Part B Station 5: Air Pollution

1. Ozone that contributes to the formation of smog is found in the
   a. troposphere.
   b. thermosphere.
   c. mesosphere.
   d. stratosphere
   e. mesopause

2. Photochemical smog is formed when primary pollutants interact with
   a. sunlight.
   b. water vapor.
   c. sulfur dioxide.
   d. oxygen
   e. carbon

3. A thermal inversion is the result of
   a. precipitation.
   b. cold air drainage.
   c. a lid of warm air on top of cooler, stagnant air.
   d. a cold blanket of air that prevents warm air from rising.
   e. mixing of cool and warm air.

4. Experts rate indoor air pollution as a
   a. high-risk health problem for humans.
   b. medium-risk health problem for humans.
   c. low-risk health problem for humans.
   d. high-risk ecological problem but no-risk health problem for humans.
   e. none of these answers.

5. Years of smoking and exposure to air pollutants can contribute to the incidence of
   a. emphysema.
   b. chronic bronchitis.
   c. lung cancer.
   d. asthma
   e. all of these answers

6. Sources of carbon monoxide include all of the following *except*
   a. cigarette smoking.
   b. anaerobic respiration.
   c. motor vehicles.
   d. faulty heating systems
   e. airplanes

7. Of the following motor vehicle fuels, the greatest polluter is
   a. gasoline.
   b. hydrogen gas.
   c. alcohol.
   d. natural gas
   e. battery

Part B Station 6: Climate Change

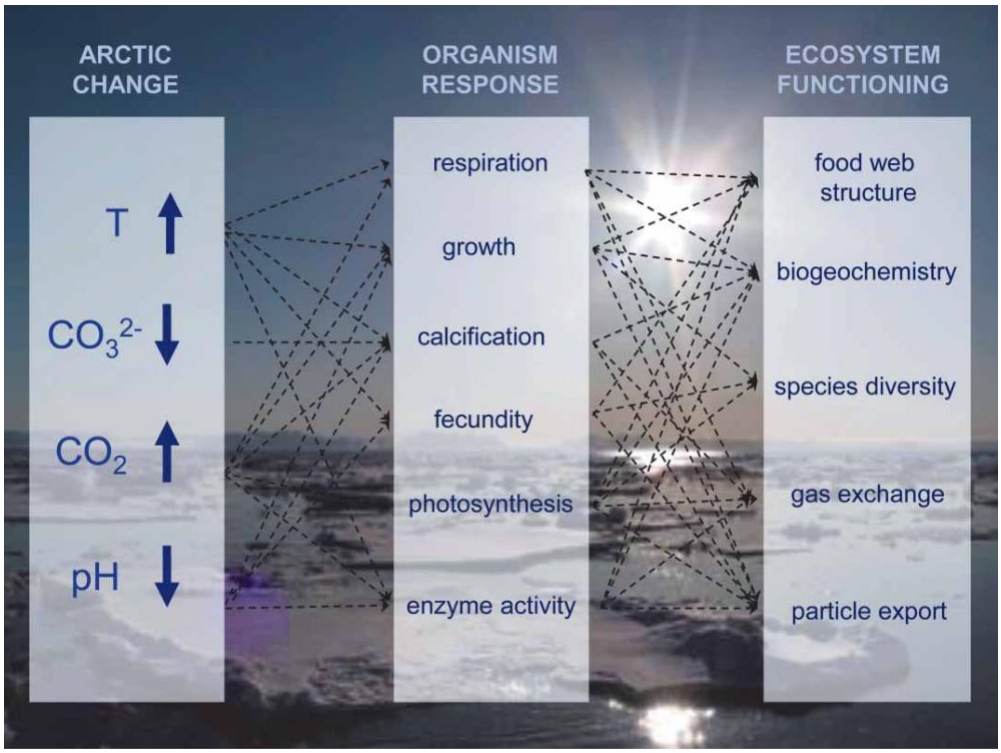


Figure 1. Exemplified scheme of direct effects and ecological consequences of physical and chemical environmental changes, potentially impacting future carbon cycling in the Arctic Ocean.
http://www.whrc.org/resources/publications/pdf/GoetzetalILeaps.09.pdf#search="climate change and taiga"

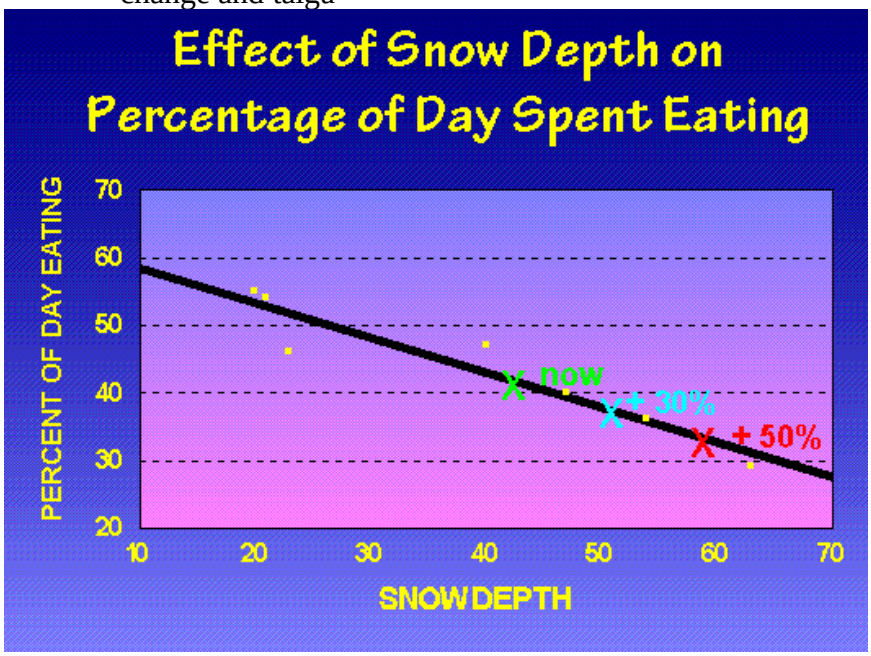


Figure 2. Porcupine caribou and climate change.
http://www.taiga.net/caribou/pch/slides/pch17.html

Part B Station 6: Climate Change

Using Figure 1, answer the following questions.

8. If temperature increases, how will organisms respond?

9. If temperature increases, would species diversity be affected? If yes, do you think it would increase or decrease?

Using Figure 2, answer the following questions.

10. If snow depth increases by 30%, how much **less time** are the caribou hypothesized to spend eating? Show your calculations.

11. Give one example of an activity that may be impacted if caribou are spending more time eating.

Answer the following questions.

12. How does logging in the taiga impact the rate of climate change?
    a. Increases
    b. Decreases
    c. No affect

13. How would climate change affect the frequency of fire in the taiga?
    a. Increase
    b. Decrease
    c. No affect

Part B Station 7: Water Pollution

14. Of the following organisms, the group that is *least* likely to cause waterborne disease is
    a. bacteria.
    b. protozoa.
    c. algae.
    d. parasitic worms.
    e. viruses.

15. A good indicator of water quality for drinking or swimming is the number of colonies of
    a. coliform bacteria.
    b. algae.
    c. dinoflagellates.
    d. manatees
    e. protozoa.

16. A body of water can be depleted of its oxygen by
    a. viruses and parasitic worms.
    b. organic wastes.
    c. sediments and suspended matter.
    d. organic compounds such as oil, plastics, solvents, and detergents.
    e. all of these answers.

17. Which of the following statements is *false?*
    a. Heat can lower dissolved oxygen and make fish vulnerable to disease.
    b. Organic wastes that can be decomposed by aerobic bacteria reduce the amount of oxygen in the water supply.
    c. Radioactive wastes and toxins can be concentrated by biological amplification.
    d. Inorganic nutrients such as fertilizers have no adverse effects on aquatic ecosystems.
    e. Sediment can cloud water and reduce photosynthesis.

18. One class of pollutants that can cause a population explosion of aerobic bacteria is
    a. disease-causing agents.
    b. oxygen-demanding wastes.
    c. inorganic chemicals.
    d. organic chemicals.
    e. sediment

19. The greatest source of water pollution in terms of total weight is
    a. fertilizers.
    b. sediments.
    c. oxygen-demanding wastes.
    d. water-soluble inorganic chemicals.
    e. organic chemicals.

Part B Station 8: Human Impact on Ecosystems

20. The hydrologic cycle will naturally purify and recycle fresh water as long as humans don't
    a. pollute the water faster than it is replenished.
    b. withdraw it from groundwater supplies faster than it is replenished.
    c. overload it with slowly degradable and nondegradable wastes.
    d. a and b only.
    e. all of these answers.

21. One main problem with water pollution is
    a. the pollutants cause photochemical smog.
    b. it contributes to climate change.
    c. it causes deforestation.
    d. the pollutants are difficult to remove.
    e. all of these choices.

1. Agricultural chemicals, such as DDT, are so damaging to predator populations because
    a. Of biological magnification
    b. Top predators consume many plants
    c. DDT is targeted at the top predators
    d. All food items are killed by DDT and the predators starve

23. All of the following human behaviors substantially affect the nitrogen cycle in aquatic systems *except*
    a. runoff from salt-treated icy highways.
    b. using nitrogen fertilizers.
    c. runoff from feedlots.
    d. adding sewage to aquatic systems.
    e. none of these answers.

24. Humans strongly affect the hydrologic cycle through all of the following *except*
    a. water withdrawal in heavily populated areas.
    b. clearing vegetation for agriculture.
    c. creating housing developments.
    d. paving roads and parking lots.
    e. boiling water.

25. One class of pollutants that can cause excessive growth of algae is
    a. radioactive substances.
    b. oxygen-demanding wastes.
    c. inorganic plant nutrients.
    d. organic chemicals.
    e. sediment.

Part C Station 9: Cleaning Polluted Water

1. Which of the following types of sewage treatment are properly matched?
    a. primary—biological process
    b. secondary—mechanical process
    c. advanced—physical and chemical processes
    d. secondary—chemical process
    e. primary—chemical process

2. Which of the following substances are removed to the greatest extent by combined primary and secondary wastewater treatment?
    a. organic pesticides
    b. organic oxygen-demanding wastes
    c. toxic metals and synthetic organic chemicals
    d. radioactive isotopes
    e. all of these answers

3. All of the following are used to disinfect or to purify water *except*
    a. ozone
    b. chlorine
    c. iodine
    d. ultraviolet radiation
    e. all choices are acceptable

4. Which of the following is NOT true?
    a. Water pollution can come from a natural source.
    b. The water cycle naturally cleans water.
    c. All sewage treatment facilities in the US have tertiary processes in addition to primary and secondary processes.
    d. Sewage treatment is regulated by the Clean Water Act.
    e. The Great Lakes are moderately polluted.

5. This step in sewage treatment utilizes filtration and sedimentation.
    a. Primary
    b. Secondary
    c. Tertiary
    d. Quaternary
    e. All of the choices.

6. _____ sewage treatment is simple and removes approximately half of the pollutants.

7._____ sewage treatment uses bacteria to break down organic waste.

Part C Station 10: Sustainable Strategies

8. All of the following are taken into consideration when calculating ecological footprint except
   a. acreage for recreation
   b. acreage for forest products
   c. acreage for housing
   d. acreage to absorb the carbon dioxide produced by burning fossil fuel
   e. acreage for food production

9. If we were to live completely sustainably, we would use NO MORE than the _____ for all of our freshwater use.
   a. reliable surface runoff
   b. annual surface runoff
   c. annual precipitation
   d. aquifer
   e. drainage basin

10. Integrated coastal management systems, such as those used by Australia to manage the Great Barrie Reef Marine Park,
   a. seek to preserve coastal systems by keeping people and human disturbances out.
   b. seek to identify problems, and develop sustainable solutions for human use while maintaining biodiversity and environmental quality.
   c. suspend all human activities (fishing, diving, etc.) for 100 years, so that reefs have time to fully recover.
   d. is an ecotourism endeavor seeking to build international good will, interest in, and sustainability of, coastal systems.
   e. works to maximize service output of the ocean (especially fishing) with minimal disturbance to the aquatic system.

11. Which approach may be best to take if there is limited information on which to base how many fish may be taken?
   a. maximum sustained yield
   b. complex computer models in large marine systems
   c. optimum sustained yield
   d. precautionary principle
   e. multispecies management

12. Which of the following management systems deals with getting the best fish yield, taking into account interactions among species?
   a. maximum sustained yield
   b. complex computer models in large marine systems
   c. optimum sustained yield
   d. precautionary principle

13. _____ management is necessary to protect streams and rivers from excessive input of nutrients.

Part C Station 11: Bioremediation

Match the following terms with their definition.

A. utilizing plant and microbe interactions in cleanup of contaminated soil
B. cleanup of contaminated soil without human intervention
C. soil that is influenced by root secretions and soil associated microbes
D. utilizing the addition of external microbes in cleanup of contaminated soil
E. utilizing plants in cleanup of contaminated soil
F. utilizing the addition of nutrients in cleanup of contaminated soil

14. phytoremediation
15. rhizoremediation
16. natural attenuation
17. biostimulation
18. bioaugmentation
19. rhizosphere

Part C Station 12: Biodiversity

20. When you _____ resources you use them in a responsible fashion, for example limiting water use.

21. When you _____ resources you set them aside and protect them from human activities.

22. Organisms such as sea otters with a more important role than other organisms in an ecosystem are called _____ species.

23. _____ species are in danger of becoming extinct.

24. Species that serve as early warnings of environmental damage are called
    a. nonnative species.
    b. native species.
    c. specialist species.
    d. indicator species.
    e. keystone species.

25. The purple loosestrife is an introduced plant that has created havoc in wetlands, taking over habitat and displacing many native species. A leaf-eating beetle has been introduced as an experimental measure to eat the plant. Which of the following is **false**?
a. We know that the beetle will control the loosestrife without causing other problems.
b. There is a concern that this introduced species could eat plants other than loosestrife.
c. the beetle might control the loosestrife, yet create other (unforeseen) problems that would need to be dealt with.
d. There is <u>always</u> a danger of ecosystem disruption when we introduce new species into the wild.
e. Only time will tell if introducing the beetle was a success.

Division C Sample Legislation Questions

1. CITES is a
a. type of pollution particularly harmful to aquatic systems.
b. species of fish currently coming back from the brink of extinction.
c. legislation protecting endangered species from being bought or sold.
d. is a type of fishing that degrades the ocean floor and is especially disruptive.

2. The _____ identifies threatened and endangered species in the US.
a. Red List
b. Endangered Species Act
c. Kyoto Protocol
d. Wilderness Act

3. The goal of the _____ Act was to make water swimmable and fishable.

Answer Key
Part A

1. D
2. A
3. B
4. C
5. A
6. D
7. D
8. B
9. E
10. E
11. Decomposers
12. Example: Phytoplankton – krill – fish – emperor penguin – leopard seal, etc.
13. A
14. D
15. A
16. D
17. E
18. A
19. E
20. C
21. A
22. D
23. A
24. Watershed
25. Biodiversity

Part B

1. A
2. A
3. C
4. A
5. E
6. B
7. A
8. There will be changes in respiration, growth, calcification, fecundity and enzyme activity.
9. Yes, species diversity would likely decrease.
10. Approx answer: Now = 40%, +30% = 38%, 2% of 24 hours is 0.48 hour less each day. (a little less than 30 min less a day)
11. Examples such as reproduction, sleeping, etc.
12. A
13. A
14. C
15. A
16. E
17. D
18. B
19. B
20. E
21. D
22. A
23. A
24. E
25. C

Part C

1. C
2. B
3. E
4. C
5. A
6. Primary
7. Secondary
8. A
9. A
10. B
11. D
12. C
13. Watershed
14. E
15. A
16. B
17. F
18. D
19. C
20. Conserve
21. Preserve
22. Keystone
23. Endangered
24. D
25. A

Sample Legislation Questions

1. C
2. B
3. Clean Water

NOTE: At least **THREE** questions should be marked as TIE BREAKER questions.

GREEN GENERATION – SAMPLE EXAM

Student Name(s) _____
School Name and Number _____ JV? Yes or No _____

Part A- 25 points, 1 point each NOTE- mark tie breaker questions as well

1. ___
2. ___
3. ___
4. ___
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16. ___
17. ___ Point total part A _____
18. ___ Point total part B _____
19. ___ Point total part C _____
20. ___
21. ___ EXAM TOTAL SCORE _____
22. ___
23. ___ TIE BREAKER REQUIRED? ___
24. _____ MODIFIED SCORE ____
25. _____

Part B- 25 points total, 1 point each

1. ____
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24. _____
25. _____

TOTAL PART B _____

Part C- 25 points total, 1 point each

1. ____
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24. _____
25. _____

TOTAL PART C _____