**KEY**

1. **Describe the goal of a environmentally stable society:**
   The goal of an environmentally stable society is to live off its natural capital indefinitely by living sustainably.
   NECESSARY VOCAB: natural capital and sustainable (in some form of the word)

2. **Perpetual and renewable Resources:**
   a. **What are differences between a perpetual and a renewable resource?**
   Perpetual: continuously renewed
   Renewable: renewed through natural processes within a reasonable human timescale

   The difference in the time of renewal, perpetual renew instantaneously, while renewable takes some time

   b. **Explain the benefit of using a perpetual resource vs. using a renewable resource:**
   A perpetual resource can be used as much as needed, while a renewable resource must be used under sustainable yield to prevent ecological damage.

3. **Define environmental degradation:**
   The consumption of resources greater than the natural replacement rate

4. **What is the tragedy of the commons?**
   When many parties exploit a common resource, each party assumes that their small contribution to the environment's degradation is negligible. The resource is then degraded permanently, and nobody can use it.

5. **How can the tragedy of the commons be prevented?**
   It can be prevented by government regulations to keep usage under the sustainable yield, and by privatization of resources.

6. **Use of which energy source currently generates the largest amount of CO2 emissions and why?**
   Coal, because natural gas diesel fuel, etc. are hydrocarbons, whereas coal is mainly pure carbon.

7. **Define ecological tipping point:**
   The ecological tipping point is when an ecosystem is irreparably damaged.

8. **Why are the properties of water important? Give two examples of biological/ecological scenarios where water's unique properties are important to the function it serves.**
   Water, when frozen, is at a lower density than when liquid. This cycles water and nutrients in lakes. When the ice melts, the cold, heavy surface water sinks to the bottom, while the deeper water rises to the top.

   Water is also a polar molecule. This allows for various substances, such as O2 to be dissolved in it. Dissolved O2 makes ocean life possible.

   Water has a high specific heat. This makes the ocean a regulator of global climate.

9. **In order of highest priority, list the three Rs**
   Reduce, Reuse, Recycle

10. **Using the sequence from the question above, explain the its order and its significance to sustainability:**
    Reduce is the first step because it wastes the least. Reducing the amount one uses is much more energy efficient than recycling it, and is much easier than finding a way to reuse it.

    Reuse is the second step, because after reducing the amount one uses, waste is still produced. This waste should be reused before it is recycled, because recycling takes more energy than reusing.

    Recycling is the third step, because after one has reduced usage, and reused what is possible, the material should be remade into something more useful. However, recycling is the last step, because it uses the most energy and resources.

11. **What is an example of a point source pollutant?**
    Point source: a source that is single and identifiable
    Anything that fits the above definition is okay

12. **Why is a nonpoint source more difficult to control than a point source?**
    A nonpoint source is more difficult to control, because it is difficult to pinpoint. It isn't shutting down one coal factory, rather, it is finding a way to reduce pollution across the board.

13. **What are green house gases?**
    A gas in the atmosphere that can absorb infrared radiation

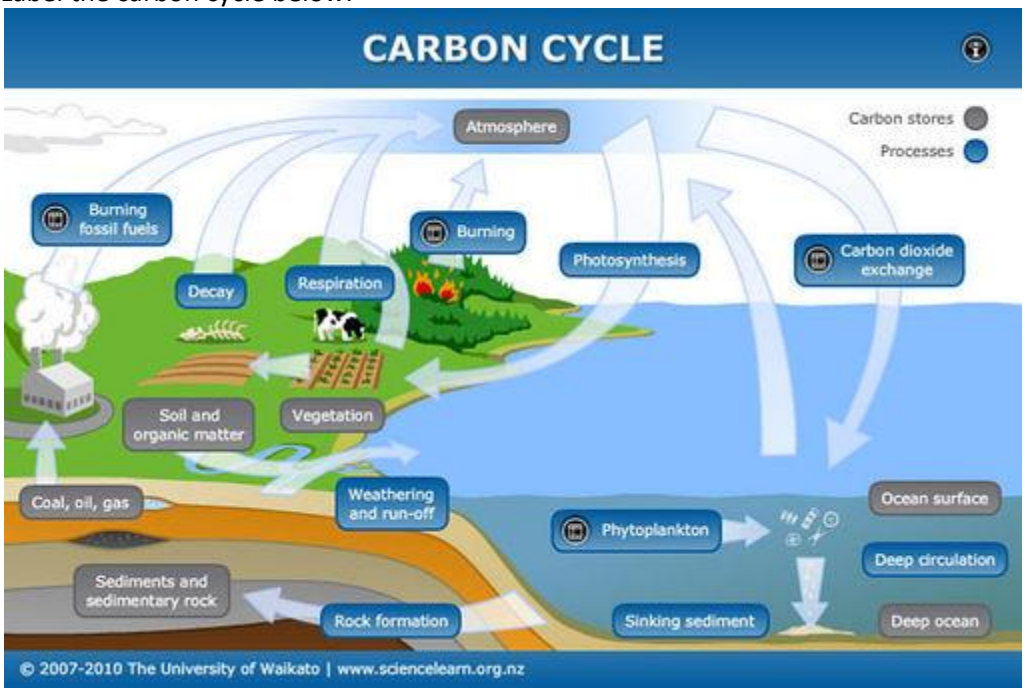
14. **What are some ways to curb carbon emissions in the industrial sector?**
    1. Government Regulation through laws (e.g. Clean Air Act)
    2. Government incentives to green industry (Less taxes, etc. )
    3. Economic incentives to green industry (making it cheaper to be green)
    4. Consumer backlash
    5. Labeling green products vs. non-green products (such as the labels on books "produced on recycled paper")

15. **Why is it important to prevent pollution, rather than clean it up afterwards?**
    Clean is often a temporary fix, more costly, and is usually just moving pollutants around. Prevention is a better strategy long term.

16. **What is the difference between a decomposer and a detrivore?**
    A decomposer breaks down wastes, while a detrivore feeds on the dead matter.

17. **What is the importance of nutrient cycling?**
    Nutrient cycling is what makes the environment sustainable. It is the recycling of matter in nature.

**18.** Label the carbon cycle below:




**19. Relate nutrient cycling to the three principles of sustainability:**

1. Maintaining the viability of the planet: nutrient cycling replenishes the matter on Earth for reuse

2. Providing for the future: nutrient cycling leaves matter for the next generation of organism to use,

3. Solving problems holistically: nutrient cycling makes the whole system closed, leaving no waste

**20. Describe the difference between weather and climate:**
Weather is day to day, climate is measured over decades

**21. How does the ocean affect global warming and Earth's climate?**
The ocean has dissolved CO2 that is buried into the sediments on the sea floor. The ocean is also a stabilizer of climate, due to water's high specific heat.

**22. Define water shed:**
Area of land where all of the water that is under it or drains off of it goes into the same place.

**23. List three advantages of dams:**
Flooding control, hydroelectric power, water storage, irrigation

**24. List three disadvantages of dams:**
Relocation, cost, alteration of the water table

25. **What are the three limitations of desalination?**
    Cost, Waste Product disposal, high energy usage

26. **Distinguish between a mutagen and a carcinogen:**
    A mutagen promotes mutations in the DNA of an organism, while a carcinogen promotes cancerous growth through deregulation of the cell cycle and apoptosis

27. **Is it possible for a mutagen to be a carcinogen?**
    Yes, a carcinogen causes mutations, so it is considered a specific type of mutagen.

28. **Distinguish between primary and secondary pollutants:**
    Primary pollutants are released into the air directly, while secondary pollutants are formed through reaction with other compounds in the air

29. **Is dilution a solution to pollution?**
    only when you have few pollutants and small populations.

30. **Differences between industrial and photochemical smog:**
    They both require different temperatures and humidity levels, and have different compositions.

31. **List four indoor air pollutants:**
    Any four out of:
    Radon, secondhand smoke, mold/mildew, carbon monoxide, nitrogen dioxide, Volatile Organic Compounds (VOCS), Formaldehyde, pesticides, asbestos, lead

32. **In what quantity is lead deemed toxic, and why?**
    Lead is harmful in any quantity, because it interferes with hemoglobin production in the red blood cells.

33. **Why should we prevent/clean up indoor air pollution?**
    Low indoor air quality can exacerbate asthma, allergies, and can be a detriment to health.

34. **List one of the human body's defenses against pollution and how it can be overwhelmed:**
    Cilia in respiratory tract, overwhelmed by smoking
    Mucus in respiratory tract, overwhelmed by smoking
    Skin, overwhelmed by concentrated exposure
    Eyelids, overwhelmed by fine particles (such as sand)

35. **What is the greenhouse effect?**
    The greenhouse effect is the trapping of the sun's warmth, by reducing outgoing infrared radiation.

36. **Define indicator species:**
    An indicator species is one whose condition acts as an indicator for the health of an ecosystem, before the ecological tipping point is reached.

37. **Composting is most closely related to:**
    a. **Nutrient Cycling**
    b. Natural service
    c. Reusing

38. **Where does all the energy in an ecosystem originate from, and how does it travel in a food chain?**
    The Sun, and it travels through the food chain through producers. Producers capture the sun's energy and store it in themselves. Consumers than eat the producers, and energy is transferred through the food web.

39. **Gasoline is produced by refining which fossil fuel?**
    a. **Oil**
    b. Natural Gas
    c. Propane
    d. Coal

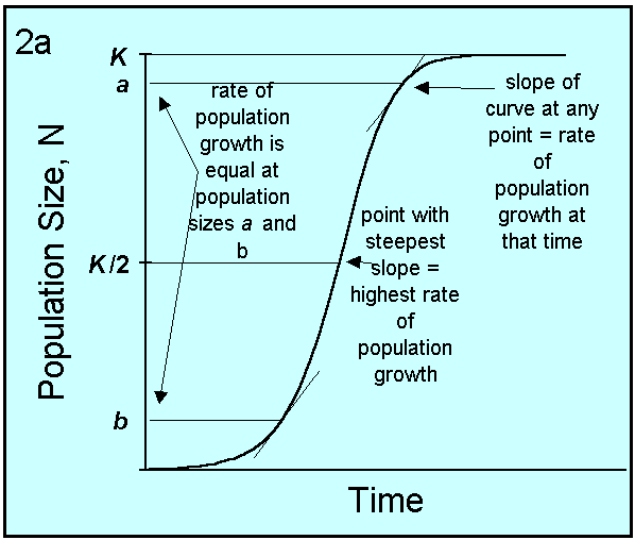
40. **What are some disadvantages to wind power?**
    - Wind is a fluctuating (intermittent) source of energy and is not suited to meet the base load energy demand unless some form of energy storage is utilized (e.g. batteries, pumped hydro).
    - The manufacturing and installation of wind turbines requires heavy upfront investments – both in commercial and residential applications.
    - Wind turbines can be a threat to wildlife (e.g. birds, bats).
    - Noise is regularly reported as a problem by neighboring homes.
    - How wind turbines look (aesthetics) is a legitimate concern for some people.

41. **How do solar panels convert the Sun's energy into electricity?**
    The solar panels are made of solar cells. A cell is a small disk of a semiconductor like silicon. They are attached by wire to a circuit. As light strikes the semiconductor, light is converted into electricity that flows through the circuit. As soon as the light is removed, the solar cell stops producing power**.**

42. **Why do food pyramids typically end around the tertiary/quaternary consumer?**
    Energy is lost at each trophic level due to heat loss, so an higher level consumer would to be able to survive off of so little energy.

43. **How has natural selection powered evolution?**
    Individual organisms with higher fitness survive more often; this is natural selection. The genes these individuals carry change the gene pool of that species, furthering evolution.

**44. Is this exponential, or <u>logistic growth?</u>**




**45. In the graph above, what is K referred to as?**
The carrying capacity

**46. Explain the healthy forest initiative act:**
It was an act proposed in response to forest fires in the summer of 2002. It concerned reducing hazardous fires, improve fire fighting, and halting destructive insects.

**47. What did the Clean Air Act of 1970 accomplish?**
The Clean Air Act of 1970 is a U.S. federal law intended to reduce air pollution and protect air quality. The act deals with ambient air pollution (that which is present in the open air) as well as source-specific air pollution (that which can be traced to identifiable sources, such as factories and automobiles). The Clean Air Act sets standards for air quality that limit the amount of various pollutants to specified levels. The Clean Air Act also sets deadlines for governments and industries to meet the standards. Polluting industries may be forced to control air pollution through end-of-pipe methods, which capture pollution that has already been created and remove it from the air. Or businesses may be required to implement preventative measures, which limit the quantity of pollutants produced in the course of their operations. In either case, the cost of compliance with Clean Air Act regulations can be high. At the same time, however, the Clean Air Act has been largely successful in reducing air pollution. According to *Business Week,* it has contributed to a reduction in total emissions of major air pollutants in the United States of 30 percent between 1970 and 1995, despite the fact that U.S. population increased 28 percent during that same period.

**48. What is the global effect of ocean currents?**

They redistributes heat around the globe.

**49. Why is methane collected from sanitary landfills?**

Methane can be used as a form of fuel, so it is harvested from waste sites. It is also a greenhouse gas, and capturing it keeps it from polluting the atmosphere.

**50. How can a dam cause international issues?**

Construction of a dam can reduce water flow downstream. If a river is part of different countries, they could disagree with the location of the dam.

**51. What are the causes of dead zones in the ocean?**

Dead zones are caused by a lack of dissolved oygen in the water. The cause of such hypoxic (lacking oxygen) conditions is usually eutrophication, an increase in chemical nutrients in the water, leading to excessive blooms of algae that deplete underwater oxygen levels. Nitrogen and phosphorous from agricultural runoff are the primary culprits, but sewage, vehicular and industrial emissions and even natural factors also play a role in the development of dead zones.

**52. Why is ozone at the poles depleted when pollution is closer to the equator?**

Ozone-depleting gases are present throughout the stratospheric ozone layer because they are transported great distances by atmospheric air motions. The severe depletion of the Antarctic ozone layer known as the “ozone hole” forms because of the special weather conditions that exist there and nowhere else on the globe. The very cold temperatures of the Antarctic stratosphere create ice clouds called polar stratospheric clouds (PSCs). Special reactions that occur on PSCs and the relative isolation of Polar stratospheric air allows chlorine and bromine reactions to produce the ozone hole in Antarctic springtime.