Module 5- Ecology

1. What is the hierarchy of life starting with the smallest unit of life and ending with the entire Earth?
   * Cell-> Tissue-> Organ->organ system->Organism-> Population-> Community -> Ecosystem -> Biosphere
2. What are a community, an ecosystem, and a population composed of?
   * A population is a group of individuals of the same species living in the same location, while a community is composed of all the different species in an area. An ecosystem, in addition to organisms also includes non-living components.
3. How are abiotic and biotic factors different; what are 3 examples of each?
   * Abiotic factors are nonliving (rocks, water, weather), while abiotic factors are alive (plants, animals, fungi)
4. What term describes world’s major ecosystems, each characterized by specific climate conditions (rain and temperature) and vegetation?
   * Biomes
5. How are most biomes distributed around the world?
   * Most Biomes of the same type are located at similar latitudes around the world (for example, most tropical rainforests are located close to the equator, while tundra’s are close to the poles).
6. What are 4 of the major terrestrial biomes?
   * Desert, Grassland (savanna, chaparral), Forests (tropical, deciduous, boreal), and Tundra
7. What are the 3 examples of freshwater biomes?
   * Standing water (lentic: lakes or ponds), Flowing water (lotic: rivers or streams), and wetlands (marshes or swamps)
8. Oceans represent what biome?
   * Marine Biome
9. What two processes are the reverse of each other in that one produces glucose from CO2 (with help from the sun) and the other one breaks down glucose and releases CO2 (while making ATP for the cell)?
   * Photosynthesis <-> Cellular Respiration
10. What are the major bacteria called needed by plants and what chemical reaction do they perform in the nitrogen cycle?
    * Nitrogen fixing and Nitrifying bacteria N2 -> NH4 -> NO3- gas -> ammonia -> nitrates
11. Why are phosphate ions needed by plants as a nutrient and where does it come from?
    * Phosphorus is critical for all organisms because as an ion it forms part of the DNA and RNA backbones and the energy molecule, ATP. Phosphorus comes from decaying organisms and eroding rocks.
12. What are the 4 main steps in the water cycle?
    * Water in oceans, and even plants is heated by the sun and evaporates. (2) Water vapor is lifted up by air currents, condenses and forms into clouds (3) Water falls to the ground as precipitation (rain, snow, hail) (4) Water is taken up by plants and other organisms, stored in lakes and aquifers, move as part of rivers and groundwater, and eventually returns to the oceans.
13. What 3 types of organisms (and examples of each) are part of many food chains?
    * Producer (grass) -> primary consumer (antelope) -> secondary consumer (lion)
    * \* examples of organisms can vary as long as the producer ois an autotroph (usually a plant), the primary consumer is either an omnivore or a carnivore
14. What diagrams are used to represent the complex predatory relationships between organisms by combining several food chains using both vertical and diagonal connections?
    * Food Webs
15. What characteristic of energy flow between organisms do food pyramids emphasize?
    * Because energy transfers in living organisms are not fully efficient , less energy is available at each subsequent level of a food pyramid. For example, there are many more producers than consumers.
16. What factors affect the success of a species in a new environment?
    * Crowding which affects competition for water, nutrients and shelter; climate; and predation
17. What term is used to describe various long term interactions between organisms?
    * Symbiosis
18. What is the relationship called when one organism benefits while another one neither benefits or is harmed?
    * Commensalism
19. What is parasitism and one example of it?
    * Parasitism is a symbiotic relationship between 2 organisms in which one organism benefits while harming another; example: tape worms live ing in the gut of another organism while robbing it of its nutrients.
20. What is the name of the symbiosis in which both organisms benefit?
    * Mutualsm
21. What is the difference between primary and secondary succession and what are examples of each?
    * During primary succession new plant life begins growing on surfaces devoid of living matter or soil (like after a volcanic eruption or glacier passage); wheras, in secondary succession new plants begin growing on matter left by other living things (like after a fire or flood).
22. What 4 major types of negative effects have we had on our planet?
    * (1) Human beings have polluted air, water and soil with harmful chemicals. (2) Our actions (such as rain forest deforestation) have caused the extinction of numerous species (3) Use of fossil fuels has released dangerous levels of carbon dioxide in our atmosphere which is leading to a drastic climate change (global warming) (4) Use of various chemicalsd (chlorofluorocarbons, CFC’s) has led to ozone depletion, which results in loss of protection against the damaging UV radiation from the sun.
23. Why is resource conservation so critical to our environment?
    * Our natural resources are limited and once we use them , they will be gone forever; also, processing of most resources results in dramatic pollution of our environment.
24. How can we help to solve the problem of overflowing landfills?
    * Recycle, reduce, reuse
25. Which of the following is pure and which is applied science: (1) when discovering how a chemical from a plant works as an anticancer drug and (2) mass-producing it as a drug?
    * Discovering how a chemical works is pure science and producing it is applied science
26. What is the main difference between science and technology?
    * Technology is application of science
27. When considering the scientific process what are some key ethical issues that concern the scientific community?
    * Scientific data presented to others should be verifiable and not made up; experiments that include vertebrate animals, need to be approved by an impartial IRB (institutional review board).
28. Based on what you have learned this year, what responsibility do we have to our environment and what are the consequences of ignoring this responsibility?
    * Some of the greatest threats to Earth’s environment are human overpopulation, misuse of natural resources, pollution, landfill expansion, and extinction of numerous species due to human overdevelopment. We can positively affect the environment by reducing our impact on it. If we ignore these problems, the planet will become less hospitable not only to other organisms but also to us.
29. What is a good source of information about issues in science and what have you learned this year about current scientific research in biology?
    * Students need to explain that verifying scientific claims needs to include checking several sources, especially peer reviewed journals. Answers about recent research will vary but can include molecular biology (stem cell research, RNA interference, gene therapy), medicine (diagnostic techniques/ equipment, preventative studies, treatments) and environmental sciences (bioengineering, alternative energy sources, improved efficiency and conservation).
30. What 3 science careers might you consider for your future and why?
    * Answers can vary….Some examples include careers in: research (lab/field technician, research professor), academia (high school teacher, University journalist), medicine (physician, Pharmacist, dentist).