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**IDX G9 BIOLOGY H STUDY GUIDE ISSUE 4**

**By Edward**

This study guide covers sections 6.1 to 6.3. Sections 4.5 to 5.3 are covered in the previous Biology H issue, which you can find in this link: <https://pan.baidu.com/s/1JyfOo7j6Cbd66yeP0lnOlQ?pwd=9mcu>

**Vocabulary**

6.1

* monoculture
* renewable resource
* nonrenewable resource
* sustainable development

6.2

* desertification
* deforestation
* pollutant
* biological magnification
* smog
* acid rain

6.3

* biodiversity
* ecosystem diversity
* species diversity
* genetic diversity
* habitat fragmentation
* ecological hot spot

**6.1 A Changing Landscape**

Effects of Human Activity

* Humans affect regional and global environments through:
  + Agriculture
  + Development
  + Industry
* These factors impact the quality of Earth’s natural resources (soil, water, the atmosphere)

Agriculture

* Monoculture
  + Clearing large areas to plant one highly productive crop every year, such as soybeans
  + Enables efficient sorting, tending, and harvesting of crops using machines
  + Impacts freshwater and fertile soil
* Fertilizer production and farm machinery consume lots of fossil fuels

Development

* Dense human communities produce lots of waste
  + If not disposed of, waste can affect air, water, and soil resources
* Consumes farmland and fragments natural habitats

Industrial Growth

* Modern conveniences require lots of energy to produce and power
* Burning fossil fuels (coal, oil, natural gas) affects the environment
* Manufacturing and energy production waste from industries is often discarded directly into the air, water, and soil

Ecosystem Goods and Services

* The goods and services produced by healthy ecosystems that benefit the human economy
* Society must pay if the environment can’t provide them
* e.g., breathable air, drinkable water

Resources

* Renewable resources can be produced or replaced by a healthy ecosystem
  + e.g., wind, solar energy, water, trees
* Nonrenewable resources cannot be replenished within a reasonable amount of time
  + e.g., coal, oil, natural gas

Sustainable Development

* Providing for human needs while protecting the ecosystems that produce natural resources
* Using resources at a replaceable rate while preserving the biosphere’s environmental health

**6.2 Using Resources Wisely**

Soil Resources

* Healthy soil supports both agriculture and forestry
* Topsoil: The mineral- and nutrient-rich portion of soil
* Soil erosion: the removal of soil by water or wind
  + Desertification: a combination of farming, overgrazing, seasonal drought, and climate change that turns farmland into desert
  + Deforestation: loss of forests, may lead to severe erosion especially when followed by grazing and plowing
* Soil use and sustainability
  + Leaving stems and roots of previous crops to hold soil in place between plantings
  + Crop rotation: varying crops seasonally or yearly to prevent erosion and nutrient loss
  + Contour plowing: planting fields of crops across, instead of down, the slope of land
  + Terracing: shaping the land to create level “steps”
  + Forestry: selectively harvesting mature trees to promote the growth of younger trees

Freshwater Resources

* Humans depend on fresh water and freshwater ecosystems for goods and services, including drinking water, industry, transportation, energy, and waste disposal
* Pollutant: a harmful material that can enter the biosphere
* Single point sources: pollutants from a single source (e.g., factory, oil spill)
* Nonpoint sources: pollutants from many smaller sources (e.g., grease washed off streets)
* Primary sources of water pollution
  + Nonpoint sources
  + Industrial and agricultural chemicals
    - Leads to biological magnification of pollutants in the food chain
      * Biological magnification: the process through which small amounts of pollutants picked up by primary producers increase to dangerous amounts at high trophic levels if not eliminated or broken down
    - PCBs: organic chemicals widely used in industry
    - DDT: pesticides used in agriculture
  + Residential sewage
    - Rich in nitrogen and phosphorus, can stimulate bloom of bacteria and algae which rob water of oxygen, leaving oxygen-poor “dead zones”
* Water quality and sustainability
  + Watershed: includes all land whose groundwater, streams, and rivers drain into the same place, such as a large lake or river
  + Densely growing plants in wetlands, forests and other vegetation absorb some excess nutrients and filter out certain pollutants, purifying water

Atmospheric Resources

* Air pollution
  + Smog: a gray-brown haze formed by chemical reactions among pollutants
    - Released into the air by industrial processes and automobile exhaust
    - One product is ozone, which threatens people’s health at the ground level
  + Acid rain: nitrogen and sulfur compounds released by burning fossil fuels can form nitric and sulfuric acids in the air
    - Kills plants by damaging leaves
    - Changes the chemistry of soil and surface water
    - Dissolves and releases mercury and other toxic elements from soils
  + Greenhouse gases
    - Burning fossil fuels and forests releases stored carbon as carbon dioxide
    - Agricultural practices such as raising cattle and farming rice release methane
    - Excess accumulation of GHGs leads to global warming and climate change
  + Particulates: microscopic particles of ash and dust
    - Released by certain industrial processes and some kinds of diesel engines
    - Can cause serious health problems if they enter the lungs
* Air quality and sustainability
  + Automobile emission standards and clean-air regulations
  + In 1996, the sale of leaded gasoline was banned in the US
    - Lead levels in soils, rivers, and streams around the country have dropped

**6.3 Biodiversity**

The Basics of Biodiversity

* Biological diversity (a.k.a. biodiversity): the total of all the genetically based variation in all organisms in the biosphere
  + Ecosystem diversity: the variety of habitats, communities, and ecological processes
  + Species diversity: the number of different species in the biosphere or a certain area
  + Genetic diversity: the total of all different forms of genes present in a species
* Richness: the number of different species present
* Evenness: how similar the abundance for each species present is
* Simpson’s Diversity Index
  + = the total number of organisms of a particular species ()
  + = the total number of organisms of all species ()
  + Considers both richness and evenness
  + A higher D value means greater biodiversity
  + Maximum D = 1 (infinite diversity), minimum D = 0 (no diversity)

Valuing Biodiversity

* Medical value
  + Wild species are the original source of many medicines
  + e.g., painkillers like aspirin, antibiotics like penicillin
* Agricultural value
  + Wild plants may carry genes we can use, such as disease resistance or pest resistance
* Ecosystem value
  + The number and variety of species in an ecosystem can influence that ecosystem’s stability, productivity, and value to humans

Threats to Biodiversity

* Altered habitats
  + Habitat fragmentation: development or agriculture splitting ecosystems into pieces
* Climate change
  + If conditions change beyond an organism’s tolerance, it must migrate or go extinct
  + Species in fragmented habitats are more vulnerable as they may be unable to migrate
  + Global warming leads to habitat destruction of coral reefs and glaciers
* Hunting wildlife
  + Humans can push species to extinction by hunting
  + The CITES (Convention on International Trade in Endangered Species) bans international trade in products from a list of endangered species
* Introduced species
  + Alien species (organisms introduced to new habitats) can become invasive and threaten biodiversity, eventually outcompeting the native species
* Pollution and pollutants

Conserving Biodiversity

* Protecting individual species
  + Captive breeding
    - Animals are bred and raised in protective surroundings
    - Ultimate goal: releasing the animals to the wild
* Preserving habitats and ecosystems
  + Ecological hot spot
    - A place where significant numbers of species and habitats are in immediate danger of extinction
* Considering local interests
  + Tax credits given to people who install solar panels or buy hybrid cars
  + Ecotourism
  + Carbon credits for companies