

The New and Improved "137 WAYS TO GO APE!" APES REVIEW

The following is a list of the important concepts that you will need to know for the upcoming A.P. Exam in Environmental Science. Use this list as a review guide.

Review this list. Study this list. Learn this list. Know this list. Be this list.

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| 1. Ionizing radiation: | enough energy to knock electrons from atoms forming ions, can cause cancer (gamma-Xrays-UV) |
| 2. High Quality Energy: | organized, concentrated, can perform useful work |
| 3. Low Quality Energy: | disorganized, dispersed (heat in ocean or air wind, solar) |
| 4. First Law of Thermodynamics: | energy is neither created or destroyed, but changes forms |
| 5. Second Law of Thermodynamics: | when energy changes form, some useful energy is always degraded into lower quality energy (usually heat) |
| 6. Natural radioactive decay: | unstable isotopes release gamma rays, alpha & beta particles |
| 7. Half life: | time necessary for $\frac{1}{2}$ the mass of a radioisotope to decay |
| 8. Estimated time radioactive isotope must be stored until decaying to safe level: | ~10 half-lives |
| 9. Nuclear Fission: | nuclei of isotopes split apart when struck by neutrons |
| 10. Nuclear Fusion: | isotopes of light elements (H) forced together at high temperatures fuse to form a heavier nucleus |
| 11. Ore: | rock containing large enough concentration of a mineral making it profitable to mine |
| 12. Organic fertilizer: | slow acting, long lasting; needs time to be decomposed |
| 13. Best solution to Energy shortage: | conservation and increase efficiency |
| 14. Surface mining: | cheaper, can remove more mineral, less hazardous |
| 15. Humus: | organic, dark material remaining after decomposition |
| 16. Leaching: | dissolved material removed from soil by downward moving water |
| 17. Illuviation: | deposit of leached material in lower soil layers (B) |
| 18. Loam: | perfect agricultural soil; equal portions of sand, silt, clay |
| 19. Conservation: | allows the use of resources in a responsible manner |
| Preservation: | setting aside & protecting areas from human activities |
| 20. Hydrologic cycle: | evaporation, transpiration, runoff, condensation, precipitation, infiltration |
| 21. Aquifer: | water bearing layer beneath the ground |
| 22. Cone of depression: | lowering of the water table around a pumping well |
| 23. Salt water intrusion: | near coast, withdrawal of groundwater causes saltwater to encroach into aquifer |

24. Ethanol formed from grasses, sugarcane & corn, fermentation use: gasoline additive
25. El Nino Southern Oscillation
 During El Nino year ENSO trade winds weaken, Tropical Pacific, west coast of S. America. Warm water stays near shore, alters weather world wide
 During La Nina (non El Nino) year: Easterly trade winds, ocean currents pool warm water in the west Pacific, allowing upwelling of nutrient rich water off west coast of South America
26. Effects of El Nino: upwelling decreases - disrupting food chains, northern US has mild winters, southwest US has increased rainfall, fewer Atlantic Hurricanes
27. Nitrogen fixing: atmospheric N can't be used directly by plants, must be converted by bacteria
28. Ammonification: decomposers convert organic waste into ammonia
29. Nitrification: ammonia is converted to nitrate ions (NO_3^-)
30. Assimilation: inorganic N is converted into organic molecules such as DNA/amino acids & proteins
31. Denitrification: bacteria convert ammonia back into N
32. Phosphorus: does not circulate as easily as N because it does not exist as a gas, but is released by weathering of phosphate rocks
33. Sustainability: ability to meet current human needs without compromising the ability of future generations to meet their needs
34. Excess phosphorus is added to aquatic ecosystems by: runoff of animal wastes & fertilizer, discharge of sewage
35. Photosynthesis: plants convert atmospheric CO_2 into complex carbohydrates (glucose $\text{C}_6\text{H}_{12}\text{O}_6$)
36. Aerobic respiration: O_2 consuming producers, consumers, & decomposers break down complex organic compounds; convert C back into CO_2
37. Largest reservoirs of Carbon: carbonate rocks first, oceans second
38. Biotic/abiotic: living & nonliving components of an ecosystem
39. Producer/Autotroph: organisms capable of photosynthesis
40. Fecal coliform: indicator of sewage contamination
41. Energy flow in food webs: only 10% of usable energy is transferred because usable energy is lost as heat (2nd law), not all biomass is digested & absorbed, predators expend energy to catch prey
42. Chlorine: (good: disinfection of water) (bad: forms trihalomethanes)
43. Primary succession: development of communities in areas previously uninhabited
 Secondary succession: life progresses where soil remains (clear cut forest, fire)
44. Cogeneration: using waste heat to make electricity
45. Mutualism: symbiotic relationship; both partners benefit
46. Commensalism: symbiotic relationship; one benefits, other unaffected

47. **Parasitism:** symbiotic relationship; one benefits, other hurt
48. **Biome:** large distinct terrestrial region having similar climate, soil, plants & animals
49. **Carrying capacity:** number of individuals that can be sustained in an area
50. **R strategist:** reproduce early, many small unprotected offspring, short life
K strategist: reproduce late, few, cared for offspring, long life
51. **Positive feedback loop:** change in some condition triggers a response that intensifies the change (warmer Earth - snow melts - less light reflected, more absorbed → warmer earth)
52. **Natural selection:** favorable adaptations are passed onto the next generation
53. **Malthus:** said human population cannot continue to increase; the consequences will be war, famine & disease
54. **Doubling time:** rule of 70: 70 divided by the percent growth rate
55. **Replacement level fertility:** # children couple must have to replace themselves
(2.1 developed, 2.7 developing)
56. **World Population:** 7.5 billion
US Population: 324 million
57. **Preindustrial stage:** birth & death rates both high, pop. grows slowly, infant mortality high
58. **Transitional stage:** death rate lower, better health care, pop. grows fast
59. **Industrial stage:** decline in birth rate, population growth slows
60. **Postindustrial stage:** low birth & death rates
61. **Age structure diagrams:** (broad base, rapid growth)(narrow base, negative growth)
(uniform shape, zero growth)
62. **Most populated countries:** China (#1), India (#2), United States (#3)
63. **Most important factor affecting population growth:** low status of women
64. **Ways to decrease birth rate:** family planning, contraception, economic rewards & penalties
65. **Percent water on earth by type:** 97% seawater, 3% freshwater (2% ice, 1% liquid)
66. **Salinization of soil:** in arid regions, water evaporates leaving salts behind
67. **Ways to conserve water:** (agriculture: drip/trickle irrigation) (industry: recycling)
(home: use gray water, repair leaks, low flow fixtures)
68. **Point vs Non point sources:** (point= specific location such as pipe)
(non-point = from an area such as runoff)
69. **biological oxygen demand (BOD):** dissolved oxygen needed by aerobic decomposers to break down organic matter
70. **Eutrophication:** rapid algal growth caused by an excess of N & P
71. **Hypoxia:** aquatic plants die, aerobic decomposers break down plants, BOD rises, DO drops, can't support life
72. **Minamata Disease:** mental impairments caused by mercury

73. **Primary air pollutants:** produced by humans & nature (CO , CO_2 , SO_2 , NO , HC , PM)
74. **Negative feedback:** changing condition triggers a response that counteracts the changed condition (warmer earth - more evaporation - more stratus clouds - less sunlight - cooler Earth)
75. **Particulate matter:** (Source: burning fossil fuels & car exhaust) (Effects: reduces visibility & respiratory irritation) (Reduction: filtering, electrostatic precipitators, alternative energy)
76. **Nitrogen Oxides:** (Source: auto exhaust) (Effects: acid deposition, acidification of lakes, respiratory irritation, smog & ozone) (Reduction: catalytic converter) (Equation for acid formation: $NO + O_2 = NO_2 + H_2O = HNO_3$) (NO_x =primary pollutant, HNO_3 = secondary pollutant)
77. **Sulfur oxides:** (Source: coal burning) (Effects: acid deposition, respiratory irritation, damages plants) (Reduction: scrubbers, burn low sulfur fuel) (Acid formation equation: $SO_2 + O_2 = SO_3 + H_2O = H_2SO_4$) (SO_x =primary pollutant, H_2SNO_4 = secondary pollutant)
78. **Carbon oxides:** (Source: auto exhaust, incomplete combustion) (Effects: CO binds to hemoglobin reducing blood's ability to carry O , CO_2 contributes to global warming) (Reduction: catalytic converter, emission testing, oxygenated fuel, mass transit)
79. **Ozone:** (Formation: secondary pollutant, $NO_2 + UV = NO + O$ $O + O_2 = O_3$, with VOC's) (Effects: respiratory irritant, plant damage) (Reduction: reduce NO emissions & VOCs)
80. **Radon:** radioactive gas, from decay of Uranium, causes lung cancer
81. **Photochemical smog:** formed by chemical reactions involving sunlight (NO , VOC , O)
82. **Acid deposition:** sulfuric & nitric acid; results in lowered pH of surface water
83. **Greenhouse gases:** Examples: H_2O , CO_2 , O_3 , methane (CH_4), CFC's (very strong) Effect: trap outgoing infrared (heat) energy warming earth
84. **Effects of global warming:** rising sea-level (thermal expansion), extreme weather, droughts (famine), extinctions
85. **Causes of Ozone Depletion:** CFC's, methyl chloroform, carbon tetrachloride, halon, methyl bromide all of which attack stratospheric ozone
86. **Effects of Ozone Depletion:** increased UV, skin cancer, cataracts, decreased plant growth
87. **Love Canal, NY:** chemicals buried in old canal and school & homes built over it causing birth defects & cancer
88. **True/External/Marginal costs:** harmful side effects not reflected in a product's price
89. **Sanitary landfill problems and solutions:** (leachate; liner with collection system) (methane gas; collect gas, burn) (volume of garbage; compact & reduce)
90. **Incineration advantages:** volume of waste reduced by 90%, waste heat can be used
91. **Incineration disadvantages:** air pollution; toxic emissions (polyvinyl chloride—dioxin), scrubbers & electrostatic precipitators needed, ash disposal (heavy metals)

92. **Municipal solid waste:** is mostly paper, and most is landfilled
93. **Best solution waste problem:** reduce the amounts of waste at the source
94. **Keystone species:** species whose role in an ecosystem are more important than others, ex sea otter
95. **Indicator species:** serve as early warnings that an ecosystem is being damaged
96. **Most endangered species:** have a small range, require large territory or live on an island
97. **In natural ecosystems, pest species are kept under control by:** predators, diseases, parasites
98. **Major insecticide groups and examples:** (chlorinated hydrocarbons: DDT) (organophosphates: malathion) (carbamates: aldicarb)
99. **Pesticide pros:** saves lives (disease), increases food supply, profits for farmers
100. **Pesticide cons:** genetic resistance, ecosystem imbalance, pesticide treadmill, persistence, bioaccumulation, biological magnification
101. **Integrated Pest Management:** better agricultural practices, genetically resistant plants, natural enemies, biopesticides, sex attractants
102. **Electricity is generated by:** using steam (from water boiled by fossils fuels, biomass, or nuclear), falling water, tides, or wind to turn a generator
103. **Petroleum forms from:** remains of organisms converted by heat & pressure into a mixture of hydrocarbons
104. **Pros of petroleum:** cheap, easily transported, high quality energy
105. **Cons of petroleum:** reserves depleted soon, pollution during drilling, transport and refining, burning makes CO_2
106. **Steps in coal formation:** peat, lignite, bituminous, anthracite
107. **Coal Usage** rapid \uparrow in use in 2000; development in China
108. **Major parts of a nuclear reactor:** core, control rods, steam generator, turbine, containment
109. **Serious nuclear accidents:** Chernobyl, Ukraine/Three Mile Island, PA/ Fukushima, Japan
110. **Alternate energy sources:** wind, solar, waves, tides, biomass, geothermal, fuel cells
111. **LD₅₀:** amount of a chemical that kills 50% of the test population
112. **Mutagen, Teratogen, Carcinogen:** causes hereditary changes, Fetus deformities, cancer
113. **Endangered species:** Northern Spotted Owl (loss of habitat), Bald Eagle (DDT), Piping Plover (development of nesting areas)
114. **LI Exotic species:** gypsy moth, Asian Long Horned Beetle
115. **Garrett Hardin & Tragedy of the Commons:** Freedom to breed is bringing ruin to all. Global commons such as atmosphere & oceans are used by all and owned by none
116. **Volcanoes and Earthquakes:** occur at plate boundaries (divergent: mid-ocean ridges) (convergent: trenches) (transform: San Andreas)
117. **Sources of mercury:** burning coal, Compact Fluorescent bulbs
118. **Major source of sulfur:** burning coal
119. **Threshold dose:** the maximum dose that has no measurable effect

120. Indoor Air Pollution	CO: combustion, formaldehyde: furniture, radon: bedrock
121. Gaia Hypothesis	the Earth is a single and self-regulating complex system
122. Sources of greenhouse gasses	primarily combustion of fossil fuels, cattle farms, rice paddies
123. Reduce air pollutants	wet scrubber, baghouse filter, afterburner, catalytic converter, vapor recovery nozzle, electrostatic precipitator
124. Population Change	$r = \frac{\text{birth rate} - \text{death rate}}{1000} \times 100\% \quad \text{or} \quad r = \frac{\text{br} - \text{dr}}{10}$
125. Resource Partitioning	minimizing competition by sharing or dividing a resource
126. Competitive Exclusion Principle	complete competitors cannot coexist
127. Cause of Seasons	23.5° tilt of Earth's axis; sun overhead at Tropic of Cancer on 6/21, overhead at Tropic of Capricorn on 12/21
128. Water Diversion	dams stop sediment & cause less water downstream
129. Use of Fossil Fuels	natural gas is the cleanest burning (less CO ₂ than coal or oil)
130. Most Used Sustainable Energy Source	hydroelectric (others: wind, biomass, solar - order?)
131. Waterborne Diseases	caused by unsanitary conditions or flooding; cholera, guinea worm, schistosomiasis
132. Over-extraction of Groundwater	can lead to cone of depression, saltwater intrusion, sinkholes, land subsidence
133. Soil Profile	consists of horizons (O,A,B,C, & R); Zone of Eluviation, Zone of Illuviation, leaching
134. Polychlorinated Biphenyls (PCBs)	type of chlorinated hydrocarbon; used as insulator - especially in electrical transformers. Cause a variety of health issues (a carcinogen and hormone disruptor that affects the nervous, immune, and reproductive systems
135. Bioaccumulation	accumulation of a substance, such as a toxin, in various tissues of a living organism
136. Biomagnification	increasing concentration of a substance, such as a toxin, in organisms at successively higher levels in a food web
137. Wastewater (Sewage) Treatment	physical, chemical, and biological processes used to remove pollutants from wastewater before discharging it into a body of water; primary treatment, secondary treatment, tertiary (advanced treatment), disinfection.