

1. Ionizing radiation: enough energy to knock electrons from atoms forming ions, capable of causing cancer (examples: Gamma rays, X-rays, UV light)
2. High Quality Energy: organized & concentrated, can perform useful work (ex fossil fuel & nuclear)
3. Low Quality Energy: disorganized, dispersed (heat in ocean or air wind, solar)
4. First Law of Thermodynamics: energy is neither created nor destroyed, but may be converted from one form to another
5. Second Law of Thermodynamics: when energy is changed from one form to another, some useful energy is always degraded into lower quality energy (usually heat)
6. Natural radioactive decay: unstable radioisotopes decay releasing gamma rays, alpha & beta particles
7. Half-life: the time it takes for 1/2 the mass of a radioisotope to decay
8. Estimate of how long a radioactive isotope must be stored until it decays to a safe level: approximately 10 half-lives
9. Nuclear Fission: nuclei of isotopes split apart when struck by neutrons
10. Nuclear Fusion: 2 isotopes of light elements (H) forced together at high temperatures till they fuse to form a heavier nucleus. Expensive, break-even point not reached yet
11. Ore: a rock that contains a large enough concentration of a mineral making it profitable to mine
12. Mineral Reserve: identified deposits currently profitable to extract
13. Best solution to Energy shortage: conservation and increase efficiency
14. Surface mining: cheaper & can remove more mineral, less hazardous to workers
15. Humus: organic, dark material remaining after decomposition by microorganisms
16. Leaching: removal of dissolved materials from soil by water moving downwards
17. Illuviation: deposit of leached material in lower soil layers (B)
18. Loam: perfect agricultural soil with equal portions of sand, silt, clay
19. Solutions to soil problems: conservation tillage, crop rotation, contour plowing, organic fertilizers
20. Parts of the hydrologic cycle: evaporation, transpiration, runoff, condensation, precipitation, infiltration
21. Aquifer: any water bearing layer in the ground
22. Cone of depression: lowering of the water table around a pumping well
23. Salt water intrusion: near the coast, over-pumping of groundwater causes saltwater to move into the aquifer
24. ENSO: El Nino Southern Oscillation, see-sawing of air pressure over the S. Pacific
25. During an El Nino year: trade winds weaken & warm water sloshed back to SA
During a Non El Nino year: Easterly trade winds and ocean currents pool warm water in the western Pacific, allowing upwelling of nutrient rich water off the West coast of South America
26. Effects of El Nino: upwelling decreases disrupting food chains, N US has mild winters, SW US has increased rainfall, less Atlantic Hurricanes
27. Nitrogen fixing: because atmospheric N cannot be used directly by plants it must first be converted into ammonia by bacteria
28. Ammonification: decomposers covert organic waste into ammonia
29. Nitrification: ammonia is converted to nitrate ions (NO₃)
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. Because soils contain very little phosphorus: it is a major limiting factor for plant growth
34. Excess phosphorus is added to aquatic ecosystems by: runoff of animal wastes, fertilizer

discharge of sewage

35. Photosynthesis: plants convert atmospheric C (CO₂) into complex carbohydrates (glucose C₆H₁₂O₆)

36. Aerobic respiration: oxygen consuming producers, consumers & decomposers break down complex organic compounds & convert C back into CO₂

37. Largest reservoirs of C: carbonate rocks first, oceans second

38. Biotic/abiotic: living & nonliving components of an ecosystem

39. Producer/Autotroph: photosynthetic life

40. Major trophic levels: producers-primary consumer-secondary consumer-tertiary consumer

41. Energy flow in food webs: only 10% of the usable energy is transferred

42. Why is only 10% transferred: usable energy lost as heat (2nd law), not all biomass is digested & absorbed, predators expend energy to catch prey

43. Primary succession: development of communities in a lifeless area not previously inhabited by life (lava)

44. Secondary succession: life progresses where soil remains (clear cut forest)

45. Mutualism: symbiotic relationship where both partners benefit

46. Commensalism: symbiotic relationship where one partner benefits & the other is unaffected

47. Parasitism: relationship in which one partner obtains nutrients at the expense of the host

48. Biome: large distinct terrestrial region having similar climate, soil, plants & animals

49. Carrying capacity: the number of individuals that can be sustained in an area

50. R strategist: reproduce early, many small unprotected offspring

51. K strategist: reproduce late, few, cared for offspring

52. Natural selection: organisms that possess favorable adaptations pass them onto the next generation

53. Malthus: said human population cannot continue to increase..consequences will be war, famine & disease

54. Doubling time: rule of 70 70 divided by the percent growth rate

55. Replacement level fertility: the number of children a couple must have to replace themselves (2.1 developed, 2.7 developing)

56. World Population ~ 7.2 billion 7,200,000,000 US Population ~ 325 million 325,000,000

57. Preindustrial stage: birth & death rates high, population grows slowly, infant mortality high

58. Transitional stage: death rate lower, better health care, population 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. 1st & 2nd most populated countries: China & India

63. Most important thing 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: 97.5% seawater, 2.5% freshwater

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, from specific location such as pipe)(Non-point, from over an area such as runoff)

69. BOD: biological oxygen demand, amount of dissolved oxygen needed by aerobic decomposers to break down organic materials

70. Eutrophication: rapid algal growth caused by an excess of N & P

71. Hypoxia: when aquatic plants die, the BOD rises as aerobic decomposers break down the plants, the DO drops & the water cannot support life

72. Minamata Disease: mental impairments caused by mercury, named after town in Japan

73. Primary air pollutants: produced by humans & nature (CO,CO₂,SO₂,NO,hydrocarbons,

particulates)

74. Secondary pollutants: formed by reaction of primary pollutants

75. Particulate matter (source, effect, reduction): (burning fossil fuels & car exhaust) (reduces visibility & respiratory irritation) (filtering, electrostatic precipitators, alternative energy)

76. Nitrogen Oxides: (Source: auto exhaust) (Effects: acidification of lakes, respiratory irritation, leads to smog & ozone) (Equation for acid formation: $\text{NO} + \text{O}_2 = \text{NO}_2 + \text{H}_2\text{O} = \text{HNO}_3$) (Reduction: catalytic converter)

77. Sulfur oxides: (Source: coal burning) (Effects: acid deposition, respiratory irritation, damages plants) (Equation for acid formation: $\text{SO}_2 + \text{O}_2 = \text{SO}_3 + \text{H}_2\text{O} = \text{H}_2\text{SO}_4$) (Reduction: scrubbers, burn low sulfur fuel)

78. Carbon oxides: (Source: auto exhaust, incomplete combustion) (Effects: CO binds to hemoglobin reducing blood's ability to carry O, CO₂ contributes to global warming) (Reduction: catalytic converter, emission testing, oxygenated fuel, mass transit)

79. Ozone: (Formation: secondary pollutant, $\text{NO}_2 + \text{UV} = \text{NO} + \text{O}$ $\text{O} + \text{O}_2 = \text{O}_3$, with VOC's) (Effects: respiratory irritant, plant damage) (Reduction: reduce NO emissions & VOCs)

80. Industrial smog: found in cities that burn large amounts of coal

81. Photochemical smog: formed by chemical reactions involving sunlight (NO, VOC, O)

82. Acid deposition: caused by sulfuric and nitric acids resulting in lowered pH of surface waters

83. Greenhouse gases: (Examples: H₂O, CO₂, O₃, methane (CH₄), CFC's) (EFFECT: they trap outgoing infrared (heat) energy causing earth to warm)

84. Effects of global warming: rising sealevel (thermal expansion), extreme weather, droughts (famine), extinctions

85. Ozone depletion caused by: 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. Municipal solid waste is mostly: paper

89. Most municipal waste is: landfilled

90. Sanitary landfill problems and solutions: (leachate, liner with collection system) (methane gas, collect gas and burn) (volume of garbage, compact & reduce)

91. Incineration advantages: volume of waste reduced by 90% & waste heat can be used

92. Incineration disadvantages: toxic emissions (polyvinyl chloride-dioxin), scrubbers & electrostatic precipitators needed, ash disposal

93. Best way to solve waste problem: reduce the amounts of waste at the source

94. Keystone species: species whose role in an ecosystem are more important than others

95. Indicator species: species that 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, 50-90% of 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 from insect transmitted disease, increases food supply, increases profits for farmers

100. Pesticide cons: genetic resistance, ecosystem imbalance, pesticide treadmill, persistence, bioaccumulation, biological magnification

101. Natural pest control: better agricultural practices, genetically resistant plants, natural enemies, bio-pesticides, sex attractants

102. Electricity is generated by: using steam (from water boiled by fossil fuels or nuclear) or falling water to turn a generator

103. Petroleum forms from: microscopic aquatic organisms in sediments 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 CO₂
106. Steps in coal formation: peat, lignite, bituminous, anthracite
107. Major parts of a nuclear reactor: core, control rods, steam generator, turbine, containment building
108. Two most serious nuclear accidents: (Chernobyl, Ukraine) (Three Mile Island, PA)
109. Alternate energy sources: wind, solar, waves, biomass, geothermal, fuel cells
110. LD50: the amount of a chemical that kills 50% of the animals in a test population
111. Mutagen, Teratogen, Carcinogen: causes hereditary changes, Fetus deformities, cancer
112. Multiple use US public land: National Forest & National Resource lands
113. Moderately restricted use land: National Wildlife Refuges
114. Restricted Use lands: National Parks, National Wilderness Preservation System
115. Volcanoes and Earthquakes occur: at plate boundaries (divergent, spreading, mid-ocean ridges) (convergent, trenches) (transform, sliding, San Andreas)
116. Survivorship Curves
 - Type I: low mortality at birth, survive to old age, and then die (humans, annual plants)*
 - Type II: uniform death rates, subject to predation (insects, birds)*
 - Type III: high mortality at birth but long lifespans otherwise (turtles, trees)*
117. Density dependent factors: competition, parasitism, predation
118. Density independent factors: fires, floods, extreme cold
119. Biotic potential: maximum amount of offspring a species can have
120. Effects of Global Warming: bleaching of coral reefs, animals and plants forced out of their current range, melting glaciers, rising sea level, droughts, spread of infectious diseases and more extreme weather conditions.
121. Exotic species are known as invasive species because they often can grow at an uncontrolled rate because they have no natural predators, disrupt the balance of the ecosystem and have no competition because they kill off many natural inhabitants.
122. Forests regulate climate, control water runoff, produce oxygen and provide food and shelter for many creatures.
123. Clear cutting is bad because it increases soil erosion dramatically, increases nitrate runoff into water bodies, makes it hard for an area to recover, leaves animals no place to live and can lead to extinctions.
124. Selective Cutting: harvesting only mature trees of certain species and size. More expensive but less disruptive to wildlife than clear cutting.
125. Utilitarianism is the belief that something is right if it produces the greatest good for the greatest number of people for the longest time.
126. Conservation is the management of a resource to make certain to produces the greatest benefit to humans in the future.
127. Preservation is the concept that the land should be kept in its natural state- never touched or developed.
128. NIMBY- public protests cause wastes and other pollutants to be dumped in someone else's backyard. Mostly hurts the poor who cannot pay for representation to fight against potential pollution.
129. Range of Tolerance: minimum and maximum levels of conditions in which organisms can survive.
- 130 1.5 billion people lack access to clean drinking water and 3 billion people lack good sanitation need to prevent communicable diseases from spreading.
131. 75% of water pollution in the US comes from soil erosion, atmospheric deposition and surface run off.
132. 95% of water pollution in developing countries come from raw sewage (high population growth without the money for treatment plants)

133. The US uses 77% of all pesticides used in world
134. The troposphere contains weather and stratosphere contains the ozone.
135. The atmosphere is 78% nitrogen, 21% oxygen, and a small amount of argon, carbon dioxide, water, salt and dust.
136. Weather moves from west to east across America and winds are named for the direction they come from.
137. Bioaccumulation is the selective absorption and storage of a great variety of molecules
138. Biomagnification is a continued increase in the concentration of pollutants in higher levels of a food chain.
139. Acute effects are caused by a single exposure to a toxin and results in an immediate health crisis of some sort.
140. Chronic effects are long lasting and can result from a single exposure of a very toxic substance or a continuous exposure to the toxin.
141. Salt water intrusion is the movement of salt water into freshwater aquifers in coastal areas where groundwater is withdrawn faster than it's replenished
142. Watershed: land surface and groundwater aquifers drained by a particular river system.
143. Forests cover 32% of the land surface, 11% is used for crops and 26% is range and pasture.
144. 99% of all the species that ever existed are now extinct but the average rate of extinction was one species per decade.
145. Human have caused extinction rates of hundreds to thousands of species per YEAR. If these trends continue, 1/3 to 2/3 of all current species will be lost by the year 2050.

LAWS, LAWS & MORE LAWS

1. Surface Mining Control & Reclamation Act: requires coal strip mines to reclaim the land
2. Madrid Protocol: Moratorium on mineral exploration for 50 years in Antarctica
3. Safe Drinking Water Act: set maximum contaminant levels for pollutants that may have adverse effects on human health
4. Clean Water Act: set maximum permissible amounts of water pollutants that can be discharged into waterways..aim to make surface waters swimmable and fishable
5. Water Quality Act: attempt to reduce non-point source pollution
6. Ocean Dumping Ban Act: bans ocean dumping of sewage sludge and industrial waste
7. National Environmental Policy Act: Environmental Impact Statements must be done before any project affecting federal lands can be started
8. Clean Air Act: Set emission standards for cars and limits for release of air pollutants
9. Kyoto Protocol: controls global warming by setting greenhouse gas emissions targets for developed countries
10. Montreal Protocol: phaseout of ozone depleting substances
11. Resource Conservation & Recovery Act: controls hazardous waste with a cradle to grave system
12. Comprehensive Environmental Response, Compensation & Liability Act: Superfund, designed to identify and clean up abandoned hazardous waste dump sites
13. Endangered Species Act: identifies threatened and endangered species in the US, and puts their protection ahead of economic considerations
14. Convention on International Trade in Endangered Species: lists species that cannot be commercially traded as live specimens or wildlife products
15. Federal Insecticide, Fungicide, Rodenticide Act: regulates the effectiveness of pesticides
16. Food Quality Protection Act: set pesticide limits in food and all active and inactive ingredients must be screened for estrogenic/endocrine effects
17. Low Level Radioactive Policy Act: all states must have facilities to handle low level radioactive

wastes

18. Nuclear Waste Policy Act: US government must develop a high level nuclear waste site by 2015

19. Migratory Bird Treaty Act- prohibits shooting non-game migratory birds

20. Wilderness Act- recognizes wilderness areas and strives to preserve them by keeping them road and development free

21. Delaney Clause- prohibits adding cancer causing agents to food

22. Agenda 21- UN program to make development environmentally and socially sustainable in the 21st century (sustainable development)

23. London Dumping Convention (Law of the Sea)- international agreement banning ocean dumping of plastics, oil and industry waste

4 FRQs : Free Response Questions

<i>1 Data Set Question</i>	<i>1 Document Based Question</i>	<i>2 Synthesis & Evaluation Qs</i>
The so-called “math “ question 50% is NOT math.	Don’t simply repeat info in the document. Draw from what you have learned to ADD to what is given.	A small paragraph with 4-5 questions around the topic

Vocabulary used in the PROMPTS: How much should I write?

Identify, List: 1 sentence Describe: 2-3 sentences Explain/Discuss: 2-3+ sentences

Calculate: Show your work, and box your answers. Don’t forget UNITS!