Dear Students:

Welcome to AP® Environmental Science (APES)! I am excited that you are enrolled in the course this year and looking forward to working with all of you.

You will find below some details about the summer assignment. In addition to completing the assignments, you may want to visit the AP College Board APES website. Look through the site and familiarize yourself with the intent of the course. There are some exciting changes to 2020 exam, to include less questions and use of a calculator.

All assignments are due during your 1st class meeting 9/5(A-day); 9/6(B-day). Summer assignments count as your 1st marking period Quiz grade and will not be accepted late.

You will receive a test on Chapters 1-2 during the first full week of school.

**Summer Assignment details are as follows:**

**Part I.**
- A. Google Classroom Class Code: drya2q (includes instructions on accessing the digital textbook)
- B. Reading:

**Part II. 100 Multiple Choice Questions** (related to the readings)

**Part III. Written Assignment**
- A. Experimental Design
- B. FRQ

Please make every effort to make sure you have access to the online textbook. You may contact me at the email address below. **Please let me know if you have any questions prior to July 18, 2019.**

Have a wonderful summer. I am looking forward to working with all of you.

Best Regards,

Dr. Bakari
lsharibakari@ucvts.org
APES Summer Assignment Part I

1. Read the student welcome letter and follow ALL directions and note July communication deadline. [see Google Classroom]
2. Readings: Pre-Requisite Content Knowledge.
   a. Chapters 1 and 2; Pre-Req. Content Knowledge pages 51-64, 101-108, 351-352, 364-369, 475-476; Politics and Sustainability (select sections in Ch 24)
3. Print the scantron

APES Summer Assignment Part II (Worth 50 points)

On the scantron provided, indicate the answer choice that best completes the statement or answers the question.

1. Sustainability refers to ______.
   a. the way in which the natural world works
   b. how we interact with the environment
   c. human methods of coping with environmental problems
   d. refusing, reducing, reusing, and recycling
   e. the capacity of the earth’s natural systems to survive, flourish, and adapt

2. Using normally renewable resources faster than nature can renew them is called ______.
   a. nutrient cycling
   b. nutrient deficit
   c. sustainability
   d. trade-offs
   e. degrading natural capital

3. Solar energy is known as a(n) ______.
   a. renewable resource
   b. recyclable resource
   c. inexhaustible resource
   d. reusable resource
   e. nonrenewable resource

4. Topsoil is an important component of ______.
   a. biodiversity
   b. ecosystems
   c. natural resources
   d. win-win solutions
   e. nutrient cycling

5. What are the priorities for more sustainable use of renewable resources, in order?
   a. refuse, renew, reduce, and recycle
   b. recycle, renew, reuse, and reduce
   c. resource, recycle, renew, and reduce
   d. refuse, reduce, reuse, and recycle
   e. refuse, reduce, recycle, and renew

6. What is one of the three social science principles of sustainability?
   a. A dependence on solar energy
   b. A focus on chemical cycling
c. The degradation of natural capital
d. A responsibility to future generations
e. The ability to retain biodiversity

7. The primary difference between renewable resources and nonrenewable resources is ____.
   a. how easily each can be discovered
   b. the available amount of each resource
   c. the length of time it takes for each to be replenished
   d. how fast each is being consumed
   e. how quickly each can produce electricity

8. More-developed countries ____.
   a. have a lower average income
   b. use mostly renewable resources
   c. rely entirely on nonrenewable resources
   d. comprise 17% of the world’s population
   e. provide fewer recycling services

9. Which substance would be considered a nonrenewable resource?
   a. groundwater
   b. trees in a forest
   c. fertile soil
   d. oil
   e. crops

10. Which of the following illustrates natural capital degradation?
    a. use of wind power
    b. saving endangered species
    c. cleaning up pollution
    d. aquifer depletion
    e. water runoff

11. An average ecological footprint of an individual in a given country or area is known as ____.
    a. per capita gross GNP
    b. ecological footprint
    c. per capita GDP
    d. sustainable yield
    e. per capita ecological footprint

12. In the IPAT equation, the ‘P’ stands for ____.
    a. poverty
    b. pollution
    c. per capita ecological footprint
    d. percent
    e. population size

13. The first major cultural change that occurred in the human population was the ____.
    a. information-globalization revolution
b. agricultural revolution  
c. industrial-medical revolution  
d. technological revolution  
e. sustainability revolution

14. What is the most likely effect of a pollutant?  
   a. degradation of life-support systems for humans  
   b. more cooperative behavior among wildlife  
   c. greater allocation of resources to human health  
   d. natural recycling of atmospheric air  
   e. renewable natural capital

15. Which of the following is a point source of pollution?  
   a. wind carrying dirt and pesticides from croplands  
   b. runoff from a stockyard  
   c. a smokestack from a power plant  
   d. fertilizer runoff from lawns  
   e. runoff from cropland

16. _____ growth starts off slowly, but after only a few doublings, grows at an enormous rate.  
   a. Exponential  
   b. Logarithmic  
   c. Parallel  
   d. Linear  
   e. Resource

17. What situation is most likely to occur as a result of poverty?  
   a. increased media attention on children’s health  
   b. access to clean drinking water  
   c. increased consumption in average  
   d. spread of disease from poor sanitation  
   e. heart disease and diabetes from obesity

18. Affluence typically results in _____.  
   a. population growth  
   b. less education  
   c. increased poverty  
   d. environmental restoration  
   e. environmental degradation

Indicate whether the statement is true or false.

19. The Tragedy of the Commons refers to a lack of agricultural resources available for the common (poor) people in a country.  
   a. True  
   b. False

20. A basic cause of environmental problems results from the fact that companies using resources have to pay for the cost of the harmful environmental costs of supplying their products.
a. True
b. False

Indicate the answer choice that best completes the statement or answers the question.

21. The term _____ refers to the contamination of the environment by a chemical or other agent that is harmful to organisms.
   a. natural capital
   b. pollution
   c. pesticide
   d. human activity
   e. point source

22. What term describes the highest rate at which a renewable resource can be used indefinitely without reducing its available supply?
   a. conservation
   b. sustainable yield
   c. preservation
   d. perpetual resource
   e. degradation

23. A forest with plants, animals, and various other organisms is an example of a(n) _____.
   a. ecosystem
   b. species
   c. ecology
   d. life-support system
   e. nutrient

24. When an overwhelming body of observations and measurements supports a scientific hypothesis or group of related hypotheses, it becomes a(n) _____.
   a. hypothesis
   b. scientific law
   c. scientific variable
   d. scientific theory
   e. conclusion

25. What is a well-tested and widely accepted description of what scientists find happening repeatedly in nature in the same way?
   a. theory
   b. scientific law
   c. hypothesis
   d. conclusion
   e. model

26. Which of the following is an example of an organic compound?
   a. H₂O
   b. NaCl
   c. H₂SO₄
   d. N₂O
   e. CH₄
27. Complex carbohydrates are a type of ____.
   a. lipid
   b. chemical formula
   c. monomer
   d. protein
   e. organic polymer

28. What is the distinct piece of DNA containing instructions for making proteins?
   a. chromosome
   b. nucleotide
   c. amino acid
   d. cell membrane
   e. hydrocarbon

29. Radioactive decay is best characterized as a type of ____.
   a. physical change
   b. nuclear change
   c. chemical change
   d. chemical decay
   e. organic change

30. Which statement is an example of a chemical change?
   a. Confetti is cut from pieces of paper.
   b. Water evaporates from a lake.
   c. Ice cubes are formed in the freezer.
   d. A plant converts carbon dioxide into carbohydrates.
   e. A tree is cut down in the forest.

31. What law states that when matter undergoes a physical or chemical change, no atoms are created or destroyed?
   a. The second law of thermodynamics
   b. The law of conservation of matter
   c. The first law of thermodynamics
   d. The atomic exchange law
   e. The law of conservation of energy

32. Nuclear ____ occurs when two nuclei are forced together.
   a. decay
   b. fission
   c. dissipation
   d. fusion
   e. equilibrium

33. What is the most basic building block of matter?
   a. molecules
   b. compounds
   c. ions
   d. atoms
   e. minerals
Indicate whether the statement is true or false.

34. A negative feedback loop causes a system to further change in the same direction.
   a. True
   b. False

Indicate the answer choice that best completes the statement or answers the question.

35. Feedback causes ____ in a system.
   a. change
   b. equilibrium
   c. chaos
   d. error
   e. noise

36. Human events that affect the environment are generally characterized by ____.
   a. predictability as a result of population size
   b. many experiences leading to accurate generalizations
   c. long delays between events and responses
   d. obvious and immediate feedback
   e. negative feedback

37. Energy can be formally defined as ____.
   a. the random motion of molecules
   b. the ability to do work and transfer heat
   c. a force that is exerted over some distance
   d. the movement of molecules
   e. the loss of matter

38. Which of the following represents kinetic energy?
   a. water in a reservoir behind a dam
   b. a rock held in your hand
   c. chemical energy stored in food
   d. water in a stream
   e. light from the sun

39. What does the first law of thermodynamics tell us?
   a. Doing work always creates heat.
   b. Altering matter is the best source of energy.
   c. Energy cannot be recycled.
   d. Energy is neither created nor destroyed.
   e. Energy cannot be converted.

40. What is an example of low-quality energy?
   a. electricity
   b. heat in the ocean
   c. nuclear fission
d. gasoline
e. food

41. Fossil fuels are best characterized as a type of ____.
   a. atomic particle
   b. renewable energy
   c. nonrenewable energy
   d. electromagnetic energy
   e. thermal energy

42. An ion has a net positive or negative ______.
   a. proton
   b. isotope
   c. charge
   d. acid
   e. electron

43. The mass number of an atom is equal to the sum of the ____.
   a. neutrons and isotopes
   b. neutrons and electrons
   c. neutrons and protons
   d. protons and electrons
   e. ions and isotopes

44. Fundamental types of matter that have unique sets of properties and cannot be broken down into simpler substances by chemical means are called ____.
   a. mixtures
   b. compounds
   c. isotopes
   d. elements
   e. atoms

45. Biological evolution by natural selection is when genes ____., individuals ____., and populations ____.
   a. evolve; mutate; are selected
   b. are selected; mutate; evolve
   c. mutate; evolve; are selected
   d. evolve; are selected; mutate
   e. mutate; are selected; evolve

46. The process whereby the earth’s life changes over time through changes in genes of populations of organisms in succeeding generations is called ____.
   a. emigration
   b. mutation
   c. natural selection
   d. evolution
   e. genetic drift
47. Who was responsible for providing a convincing explanation of how organisms change over time and are descended from a single common ancestor through the mechanism of natural selection?
   
   a. Charles Darwin
   b. Alfred Russel Wallace
   c. Edward O. Wilson
   d. Charles Darwin and Alfred Russel Wallace
   e. Charles Darwin and Edward O. Wilson

48. The process in which individuals with certain traits are more likely to survive and reproduce under a particular set of environmental conditions than are those without the trait is called ____.
   
   a. natural selection
   b. adaptability
   c. genetic drift
   d. mutation
   e. scientific theory

49. Geographic isolation may result from ____.
   
   a. reproductive isolation
   b. artificial selection
   c. mountain ranges
   d. extinction
   e. speciation

50. A species with a broad niche is considered a(n) ____.
   
   a. endemic species
   b. endangered species
   c. specialist species
   d. native species
   e. generalist species

51. What type of rock is formed from the weathered remains of other rocks?
   
   a. igneous
   b. mineral
   c. metamorphic
   d. sedimentary
   e. organic

52. The interaction of physical and chemical processes that change rocks from one type to another type is known as ____.
   
   a. metamorphism
   b. the rock cycle
   c. petrography
   d. consolidation
   e. hydrogeology

53. The slowest of the earth’s cyclic processes is the ____.
   
   a. hydrological cycle
   b. carbon cycle
   c. rock cycle
d. phosphorus cycle
e. nutrient cycle

54. What moves large volumes of rock and heat within the mantle, much like gigantic conveyor belts?
   a. convection cells
   b. concurrent cells
   c. magma chambers
   d. convergent plates
   e. divergent plates

55. What element below makes up 71% of the earth’s crust?
   a. oceanic crust
   b. asthenosphere
   c. lithosphere
   d. continental crust
   e. geosphere

56. When an oceanic plate collides with a continental plate, the continental plate usually slides up and over the denser oceanic plate, pushing it down into the mantle, a process called ____.
   a. production
   b. subduction
   c. induction
   d. convection
   e. trenching

57. Tectonic plates can move in opposite but parallel directions along a fracture or fault at a boundary called a ____.
   a. divergent plate boundary
   b. convergent plate boundary
   c. subduction zone
   d. mantle fault
   e. transform fault

58. What is the zone of hot, partly melted rock that flows and that can be deformed?
   a. crust
   b. asthenosphere
   c. core
   d. mantle
   e. lithosphere

59. The place where an earthquake begins is called its ____.
   a. start
   b. focus
   c. magnitude
   d. epicenter
   e. fault

60. Vibrations caused when energy accumulated over time is released are called ____.
   a. fractures
b. seismic waves
c. glaciations
d. tsunamis
e. drift

61. The severity of an earthquake is a measure of its seismic waves, and is called ____.
   a. epicenter
   b. focus
   c. magnitude
   d. ridges
   e. valleys

62. What are a series of large waves generated in the ocean by an earthquake, landslide, or volcanic activity?
   a. pipe waves
   b. quake waves
   c. seismic waves
   d. rollers
   e. tsunamis

63. A major earthquake is one that measures in what range on the Richter scale?
   a. 4.0 to 4.9
   b. 5.0 to 5.9
   c. 6.0 to 6.9
   d. 7.0 to 7.9
   e. over 8.0

64. The second largest volcanic eruption of the 20th century occurred in 1991 when ____ erupted.
   a. Mt. Pinatubo
   b. Mt. McKinley
   c. Mt. St. Helens
   d. Mt. Everest
   e. Humphrey's Peak

65. Large sections of the earth's crust, called ____, slowly separate, collide, or grind along against each other at the earth’s surface.
   a. tailings
   b. mantle
   c. tectonic plates
   d. low-grade core
   e. oceanic ridges

66. In 2008, the first college level School of Sustainability was opened at ____.
   a. Berea College
   b. University of Wisconsin - Madison
   c. Arizona State University
   d. Northland College
   e. Warren Wilson College

67. History shows that significant changes to environmental policy usually come from ____.
68. Which branch of government is responsible for overseeing the agencies that carry out government policies?
   a. judicial
   b. executive
   c. legislative
   d. administrative
   e. military

69. Most environmental lawsuits are ____.
   a. administrative suits
   b. regulatory suits
   c. civil suits
   d. statutory suits
   e. criminal suits

70. In order have legal standing, ____.
   a. lawyers must prove they have not received any form of compensation from the companies being sued
   b. plaintiffs must demonstrate that they have no reason to be biased against the entity they are suing
   c. plaintiffs must demonstrate that they have tried nonjudicial methods of remedy
   d. plaintiffs must show that they have suffered health or financial losses from some alleged environmental harm
   e. lawyers must file exemption papers with the court, agreeing not to pursue other, concurrent actions

71. Which statement best describes the current state of environmental laws in the United States?
   a. There has been a growing effort to weaken laws designed to protect the environment since 2000.
   b. Environmental laws are well accepted by most of the corporations that are regulated by them.
   c. Politicians are willing to work across party lines to protect the environment even when they will not do so to address other issues.
   d. There is strong support for strengthening existing laws and implementing new ones.
   e. Because they has failed so often, legislative attempts to halt environmental damage have been abandoned.

72. Which environmental NGO helped U.S. citizens organize massive opposition to a proposed government policy that would have allowed sewer operators to routinely dump virtually untreated sewage into the nation’s lakes, rivers, and streams?
   a. Greenpeace
   b. The Audubon Society
   c. Friends of the Earth
   d. The Environmental Defense Fund
   e. Natural Resources Defense Council

73. Which environmental NGO worked with McDonald’s to redesign its packaging system to eliminate its plastic hamburger containers?
   a. Greenpeace
   b. The Audubon Society
   c. Friends of the Earth
   d. The Environmental Defense Fund
   e. Natural Resources Defense Council
74. The oceans of the earth cover approximately what percentage of the earth’s surface?
   a. 3%
   b. 29%
   c. 51%
   d. 71%
   e. 97%

75. What is the term for the portion of the earth's atmosphere, hydrosphere, and geosphere where life is found?
   a. organosphere
   b. biological base
   c. community
   d. ecosystem
   e. biosphere

76. Fossil fuels and minerals are found in the ____.
   a. unisphere
   b. atmosphere
   c. hydrosphere
   d. geosphere
   e. biosphere

77. Ecology is the study of ____.
   a. how human impacts the environment
   b. the abiotic elements of the environment
   c. the biotic elements of the environment
   d. how organisms interact with each other and the nonliving environment
   e. how evolution formed populations

78. Aerobic respiration requires ____.
   a. glucose and carbon dioxide
   b. glucose and oxygen
   c. oxygen and water
   d. carbon dioxide and water
   e. carbon dioxide and oxygen

79. Which of the following is an abiotic component of an ecosystem?
   a. nutrients
   b. microbes
   c. autotrophs
   d. heterotrophs
   e. tertiary consumers

80. What term describes groups of different species living together in a particular place with a potential for interacting with one another?
   a. organism
   b. population
c. community
d. ecosystem
e. biosphere

81. Complex networks of interconnected food chains are ____.
   a. food webs
   b. food distribution interactions
   c. trophic levels
   d. pyramids of energy
   e. trophic chains

82. The most fundamental structural and functional units of life are ____.
   a. atoms
   b. molecules
   c. compounds
   d. cells
   e. mitochondrion

83. The very necessary process of breaking down the dead bodies of organisms is a function of ____.
   a. detritivores
   b. omnivores
   c. carnivores
   d. herbivores
   e. producers

84. Each trophic level in a food chain or food web contains a certain amount of organic matter, called ____.
   a. food
   b. energy
   c. biomass
   d. organisms
   e. decomposition

85. Carbon is a major component of ____.
   a. water
   b. the oceans
   c. organic compounds
   d. the atmosphere
   e. hydrologic cycle

86. What refers to the conversion of water from liquid to vapor from the earth’s oceans, lakes, rivers, and soil?
   a. substitution
   b. evaporation
   c. transpiration
   d. precipitation
   e. respiration
87. What term describes organisms that complete the final breakdown and recycling of organic materials from the remains of all organisms?
   a. detritivores
   b. omnivores
   c. carnivores
   d. herbivores
   e. decomposers

88. Organisms that feed only on plants are called ____.
   a. detritivores
   b. omnivores
   c. carnivores
   d. herbivores
   e. decomposers

89. What is an end product of anaerobic respiration?
   a. acetic acid
   b. glucose
   c. oxygen
   d. carbon dioxide
   e. water

90. Life on the earth depends on interaction of gravity, the cycling of matter, and the ____.
   a. recycling of energy
   b. one-way flow of high-quality energy
   c. one-way flow of matter
   d. destruction of energy
   e. consumption of matter

91. All physical forms of water (solid, liquid, and gas) on or near the earth’s surface make up the ____.
   a. atmosphere
   b. lithosphere
   c. biosphere
   d. hydrosphere
   e. troposphere

92. What is the innermost layer of the atmosphere, extending 17 kilometers above sea level at the tropics and about 7 kilometers above the earth’s north and south poles?
   a. troposphere
   b. stratosphere
   c. hydrosphere
   d. geosphere
   e. biosphere

93. Which consumers feed on the flesh of herbivores?
   a. primary consumers
   b. secondary consumers
   c. tertiary consumers
   d. apoptotic consumers
94. The hydrologic cycle is the movement of ____.
   a. carbon
   b. hydrogen
   c. hydrocarbons
   d. carbohydrates
   e. water

95. Which revolution began about 50 years ago and involved the development of technologies for gaining rapid access to all kinds of information and resources on a global scale?
   a. The technology revolution
   b. The information-globalization revolution
   c. The agricultural revolution
   d. The industrial-medical revolution
   e. The sustainability revolution

96. The real prices of goods and services do not include the ____.
   a. cost of raw materials
   b. cost of manufacturing
   c. environmental costs of resource use
   d. cost of distribution
   e. cost of advertising

97. According to the World Bank, about how many people worldwide live in extreme poverty?
   a. 1 million
   b. 9 million
   c. 40 million
   d. 90 million
   e. 900 million

98. How many people can the earth support indefinitely?
   a. No one knows.
   b. 5 billion
   c. 10 billion
   d. 15 billion
   e. 20 billion

99. Which discipline is most associated with environmental science?
   a. botany
   b. political science
   c. sociology
   d. ecology
   e. psychology

100. Which substance would be considered a renewable resource?
    a. copper
    b. oil
c. fresh air
d. salt
e. sand

APES Summer Assignment Part II _ Written Assignment (Worth 50pts)

After completing all required readings, please answer the following questions to include your understanding of key content.
Your answers should be “hand-written” and legible.

Scientific Method Key Terms: [REVIEW your understanding of these terms.]

<table>
<thead>
<tr>
<th>scientific method</th>
<th>peer review</th>
<th>scientific theory</th>
<th>scientific law</th>
<th>dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>independent variable</td>
<td>constants</td>
<td>control group</td>
<td>hypothesis</td>
<td></td>
</tr>
</tbody>
</table>

101. **(Worth 25 points)** Design a simple experiment testing the effect of pesticides on corn borer beetles on a corn crop. Be sure to write all of the appropriate steps and identify independent variable, dependent variable, constants, control group.

102. **(Worth 25 points)** Environmental Worldviews, Ethics, and Sustainability

Directions: Answer the following Free-Response Questions as thoroughly and specifically as possible. Where calculations are required, clearly show how you arrived at your answer(s). Where explanation or discussion is required, support your answers with relevant information and/or specific examples. Please be sure to address all parts of the question.

Read the following article from *The West Freemont Focus* and answer the questions that follow.

---

**Living Large Not Living Best**

Typically the average U.S. citizen consumes more than any other person on the planet. Researchers have found that the average American buys 53 times as many products as the typical Chinese and consumes the equivalent to that of 35 Indian citizens. In 1950, the global population was approximately 2.5 billion people and there were about 50 million cars. In 2002 there were about 6 billion people and 500 million cars, half of those cars are found in the United States alone. Today, the U.S. population makes up about 5% of the world’s population but consumes 25% of the world’s resources. It is estimated that, as a country, the U.S. consumes 815 billion calories of food each day – approximately 200 billion more than needed or enough to support another 80 million people. Certainly living large is not living best and it is not sustainable. ~
(a) List TWO ways that humans can withdraw from the consuming addiction of buying more and more stuff. Choose one and explain how it would help overcome consuming.

(b) Discuss ONE way how incurring a large personal debt from buying more items effect the global ecology.

(c) Describe TWO cultural shifts in emphasis that will be necessary to bring about the environmental or sustainability revolution.

(d) Calculate the ratio of people to cars for the world in 1950 with 2002. Then compare the ratio of the world in 2002 with the ratio for the United States. Use the figure of \( 3 \times 10^6 \) people living in the U.S. [You may use a calculator, but you must show the set-up]

(e) List TWO ways in which people can live more lightly and sustainable on earth.