APES REVIEW GUIDE 2020

AP exam is May 11, 2020 atnoon!

Table of Contents

Part 1: Managing your Time

Part 2: Keys to passing the APES exam

Part 3: Review Questions and Vocab Lists

Part 4: Case Study Connections

Part 5: Reference Sheets

The six-week study plan

Use this calendar to help you systematically prep for the AP exam. If you are a quick studier, use the lower suggested time. If you take more time studying, use the higher suggested time. You can also study other items such as the review books and apps. I suggest you cross off or highlight items on the chart as you do them. It'll motivate you to see your progress!

Study tips: Eliminate distractions. Put your phone in another room. Don't watch TV or have social media/games open on the computer while you use it. Listen to classical or soothing music or none at all. Find a quiet area. Eat a healthy snack for brain power

	Week 1 March 23	*Week 2 March 30*	*Week 3 April 6*	*Week 4 April 13*	*Week 5 April 20*	*Week 6 April 27*
*Time **per day***	*15-30 min*	*15-30 min*	*15-30 min*	*30-60 min*	*30-60 min*	*60-90 min*
Topics to review	*Ecology*	*Earth systems, Soil and Agriculture*	*Human Populations, Toxicology & Waste*	*Energy and Mining*	*Air and Water pollution*	*Everything*
*Look over unit notes & memorize vocab**	*Unit 3, 4, 6*	*Unit 2, 5*	*Unit 1, 7, 8*	*Unit 9*	*Unit 10, 11*	*Difficult topics you ID'd during review unit*
Practice FRQs	*2000 #3 2010 #2 2014 #4*	*2009 #4 2005 #2 2004 #4*	*2008 #4 2003 #2 2000 #4 2008 #2*	*2012 #1 2011 #1 2009 #2 2008 #3*	*2013 #1 2011 #2 2007 #3 2006 #2*	
Spend extra time on these concepts	*Nitrogen cycle, succession, primary productivity, invasive species*	*El Nino, soil texture, salinization, desertification*	*Population graphs and math, Bio-accumulation, IPM*	*Energy pros and cons; math; env. Impacts of mining*	*Eutrophication, water quality testing, climate change, pollutant source and effect*	
Fast track to a 5	*Ch. 9, 10,*	*Ch. 5, 6, 8, 12, 13*	*Ch. 11, 14*	*Ch. 15, 16, 17*	*Ch. 7, 18, 19*	*Environ. Laws*
*Bozeman science videos***	*001, 007, 008, 009, 010, 011, 012, 035*	*002, 003, 006, 016, 017, 018*	*013, 014, 015, 021, 031, 032*	*019, 022, 023, 024, 025, 026, 027, 028*	*004, 005, 020, 029, 030, 033, 034*	
Review book section	*Part 2*	*Part 1*	*Part 3*	*Part 5*	*Part 4, 6, 7*	

**As you look back at the material, highlight or make note of the topics you have trouble remembering. You can ask for help during class and focus your studying in the end on the harder topics.*

*** Bozeman website: http://www.bozemanscience.com/ap-environmental-science*

Keys to Passing the APES Exam

About the Exam: The exam is three hours long, 90 minutes for 100 multiple choice questions and 90 minutes for four free response questions. The multiple choice section is worth 60% of your score and the free response makes up the remaining 40%. Bring a small clock or wrist watch to carefully monitor your time. You may not use a calculator for this exam. In early June, the free response questions are scored by college professors and highly qualified high school teachers at the AP Reading. These test are posted to the College Board website, where teachers and students can download the questions and the scoring guides.

Succeeding on the Multiple Choice Questions The multiple choice questions cover a broad range of topics, therefore to succeed you will need a solid background in Environmental Science. The **Themes and Topics** are in this document. There are six underlying themes and seven major topics. The topics have a percentage which is a general guide for the number of questions out of the 100 multiple choice questions. **Below are some general test-taking skills that should help you on this section.**

1. **Read each question carefully**. This is as much a reading test as it is a science exam. You will have an average of 54 seconds for each multiple choice question, one hundred questions in ninety minutes.

2. To guarantee the highest number of correct answers, start by reading the whole test and answering only the questions that you know the answer to immediately or with a minimum of thought. Go all the way to question number 100, even though you probably are skipping quite a few. Time saved here can be used later to answer the questions that are more difficult. **Be very careful** that your responses on the answer sheet match the number of the question you are answering, that is you are bubbling the correct number.

3. Multiple-choice scores are based on the number of questions answered correctly. Points are not deducted for incorrect answers, and no points are awarded for unanswered questions. Because points are not deducted for incorrect answers, students are encouraged to answer all multiple-choice questions. On any questions students do not know the answer to, students should eliminate as many choices as they can, and then select the best answer among the remaining choices.

Free Response Questions Hints

Overview of the types of questions

There are three types of questions. One **Document Based** question, you will have to read a document and answer questions based on that information as well as your general knowledge. An **Analysis of a Data Set** question where you interpret graphs, maps or charts. There are two **Synthesis and Evaluation** questions. These questions may ask you to indicate the relationship between two or more concepts. If you do not know the relationship between the concepts, at least tell what you do know about them individually. Sometimes these questions will include experimental design.

Each question is graded on a 10-point scale. Some of the grading rubrics are set up to contain slightly more than 10 points (e.g., 11-13). However, you can only earn a maximum of 10 points on any one question. Remember, there are no calculators allowed. Use a ballpoint pen with dark black ink.

Succeeding on the FRQs

The questions are in two different books. The answer booklet will be the one shipped back and graded. The question booklet will be returned to you 48 hours after the exam. The question booklet is a great place to organize your notes, outline your answer and make some calculations. Only answers written on the answer booklet will be graded. The national average for the essay section will be about 50% correct (i.e., 5/10). It is very likely that you will not know everything, this is expected, but it is very likely that you do know something about each essay, so relax and do the best you can. Don't panic or get angry because you are unfamiliar with the question. Often they'll pick topics from the news that you may or may not be familiar with. You probably have read or heard something about the subject - be calm and think... look for classroom connections to the topics and use those clues to guide your answers.

1. Don't leave questions blank. Each point you earn on an essay question is the equivalent of two correct multiple-choice questions, and there is no penalty for a wrong guess, bad spelling or bad grammar. Make an effort on every question! **Don't Quit!**
2. **You cannot list items in an outline form**. Use normal sentence structure to give a list of items.
3. Read all four questions first, before you attempt to answer them. Start with the question you find the easiest for you to answer, many times while answering one question, you will recall answers to other questions, write down this information so you don't forget it.
4. Before you begin to answer any question, carefully reread the question, circle key words. Be sure to answer the question(s) asked and **only** those questions; and answer all parts of the question. If you are given a choice of parts to answer, choose carefully. It is best if you can answer the question parts in the order called for, but you don't have to.
5. It is a great idea to label the parts "a", "b", "c", etc. as they are labeled in the question. You can always answer the earlier parts later and you don't need to save space, just label the section. If you can't answer all of the parts of the question, answer what you can, you get credit for what you write if it fits the rubric, some points are better than none.
6. Outline the answer to avoid confusion and disorganization. Pay close attention to words used in the directions, such as **describe**, **explain**, **identify, support, provide evidence for**, **graph**, **calculate**, etc., and be sure to follow those directions.
    a. Describe- Identify a concept they are asking about but then include 2-3 sentences with details to tell about that concept. Be very specific with your language.
    b. Explain- Explain should be a longer response. Spend time giving details about the concept. This is where you dig into the science behind a phenomena.
    c. Identify- Usually this can be answered in one sentence.
    d. Support- This means you should have scientific evidence to back up a statement. Often this is used in the first FRQ with the reading passage. Most of the reading passage FRQs start with a question that can be found in the text.
    e. Calculate- You get credit for showing your work, having the correct answer with units. Showing your work means you write out the equation you used to find the answer. Make this very clear and write it in the answer blanks so the reader doesn't have to search for it.
7. If it asks for two examples, then only the first two are graded, if you give three and the first one is incorrect, then you won't get that point. Extra points are sometimes available for elaboration, when they are given.
8. Outlines and diagrams, no matter how elaborate and accurate, are not essays, and will not get you much credit, if any, by themselves, write the essay. (Unless they specifically ask you to complete a chart or diagram, such as a food web)
9. If asked to draw a diagram, be sure to label the components carefully and correctly.

10. Define and/or explain any terms you use. Say something about each of the important terms that you use. Rarely would the exam ask for a list of buzzwords. Use scientific answers. Include the vocabulary we've used in class. AP is college level, so write your answer using college level vocabulary.
11. Write clearly and neatly. If the grader can't read the answer because of penmanship, then you will more than likely receive a Zero (0) for the question.
12. Go into detail that is on the subject and to the point. Be sure to include the obvious (for example, "light is necessary for photosynthesis"). Answer the question thoroughly.
13. If you cannot remember a word exactly, take a shot at it, get as close as you can. Even if you don't remember the name of the concept, describe the concept.
14. Remember that no detail is too small to be included as long as it is to the point. Be sure to include the obvious, most points are given for the basics anyway.
15. Be concise. Be precise. This is a science test not an English test. Give examples whenever you can, but still be concise.

Tips for the mathematical FRQ (#2)

Do this FRQ last! Save all the mathematical calculations for last since they take time.

1. Most math based FRQs have written questions following them. You can earn significant amounts of points on these sections. Often students get stuck on a math problem and run out of time to answer the easier points. Answer the written portions first if you can and then go back and calculate last.
1. On the math- write out the formulas and show your work! Many times, points are awarded for setting up the problem. If you provide only the answer and did not show how you obtained the answer, you will receive no points.
2. **Show all units!** Be really specific about what your numbers represent.
3. Show all your calculations in the answer spaces. You can use your question booklet to think through the problem but then show an organized solution in the answer booklet showing all your work.

When they ask for experimental design…

There have been several years where there has been an experimental design question. You have a lot of practice with this in the lab! Think through how we do experiments and write a full lab report. Do all of those same actions on the FRQ. If you are asked to design or describe an experiment, be sure to include the following:

- hypothesis and/or predictions
- identify the independent variable - what treatments will you apply
- identify the dependent variable - what will you measure
- identify several variables to be controlled (very important)
- describe the materials you would use to conduct the experiment. Be specific!
- describe what you will actually do. Give a specific list of steps you'd follow.
- describe how you will actually take and record data
- describe how the data will be graphed and analyzed
- state how you will draw a conclusion (claim-evidence-reasoning with comparison of outside sources)

Your experimental design needs to be at least theoretically possible and it is very important that your conclusions/predictions be consistent with the principles involved and with the way you set up the

experiment. When designing the experiment, I suggest you plan it backwards. Work from the expected result to the hypothesis. This is a great place to use the question booklet for planning.

When they ask you to graph…

- set up the graph with the independent variable along the x-axis and the dependent variable along the y-axis
- mark off axes in ***equal*** (proportional) increments and ***label*** with proper units
- plot points and attempt to sketch in the curve (line)
- if more than one curve is plotted, write a label on each curve
- label each axis
- give your graph an appropriate title (what is it showing?)

The Themes

The six themes, which provide a foundation for the structure of the APES course are:

1) Science is a process.

- Science is a method of learning more about the world.
- Science constantly changes the way we understand the world.

2) Energy conservation underlies all ecological processes.

- Energy cannot be created; it must come from somewhere.
- As energy flows through systems, at each step more of it becomes unusable.

3) The Earth itself is one interconnected system.

- Natural systems change over time and space.
- Biogeochemical systems vary in ability to recover from disturbances.

4) Humans alter natural systems.

- Humans have had an impact on the environment for millions of years.
- Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment.

5) Environmental problems have a cultural and social context.

- Understand the role of cultural, social, and economic factors is vital to the development of solutions.

6) Human survival depends on developing practices that will result in sustainable systems.

- A suitable combination of conservation and development is required.
- Management of common resources is essential.

Topic Outline

Since there are 100 questions on the test; each section listed below is 10-15 questions each; with the exception of pollution being 25-30 questions.

I. Earth Systems and Resources (10 – 15%)			
A. Earth Science Concepts • geological time scale • plate tectonics • earthquakes • volcanism • seasons • solar intensity • latitude	**B. The Atmosphere** • composition • structure • weather and climate • atmospheric circulation and the Coriolis Effect • atmosphere-ocean interactions • ENSO (El Niño-Southern Oscillation)	**C. Global Water Resources and Use** • freshwater/saltwater • ocean circulation • agricultural, industrial and domestic use • surface and groundwater issues • global problems • conservation	**D. Soil and Soil Dynamics** • rock cycle • formation • composition • physical and chemical properties • main soil types • erosion and other soil problems • soil conservation

II. The Living World (10 – 15%)				
A. Ecosystem Structure • biological populations and communities • ecological niches • interactions among species • keystone species • species diversity and edge effects • major terrestrial and aquatic biomes	**B. Energy Flow** • photosynthesis and cellular respiration • food webs and trophic levels • ecological pyramids	**C. Ecosystem Diversity** • biodiversity • natural selection • ecosystem services	**D. Natural Ecosystem Changes** • climate shifts • species movement • ecological succession	**E. Natural Biogeochemical Cycles** • carbon • nitrogen • phosphorus • sulfur • water • conservation of matter
III. Population (10 – 15%)				
A. Population Biology Concepts • population ecology • carrying capacity • reproductive strategies • survivorship	**B. Human Populations** <u>human population dynamics:</u> • historical population sizes • distribution • fertility rates • growth rates and doubling times • demographic transition • age-structure diagrams	<u>impacts of population growth:</u> • hunger • disease • economic effects • resource use • habitat destruction	<u>population size:</u> • strategies for sustainability • case studies • national policies	

IV. Land and water Use (10 – 15%)				
A. Agriculture 1. Feeding a growing population • Human nutritional needs • types of agriculture • Green Revolution • genetic engineering and crop production • deforestation • irrigation • sustainable agriculture 2. Controlling pest • Types of pesticides • cost and benefits of pesticides use • integrated pest management (IPM) • relevant laws	**B. Forestry** • Tree plantations • old growth forests • forest fires • forest management • national forest **C. rangelands** • overgrazing • deforestation • desertification • rangeland management • federal rangelands	**D. Other Land Use** 1. Urban land development • Planned development • Suburban sprawl • Urbanization 2. Transportation infrastructure • Federal highway system • Canals and channels • Roadless areas • Ecosystem impacts. 3. Public and federal lands • Management • Wilderness areas • National parks • Wildlife refuges • Forests • Wetlands	4. Land conservation options. • Preservation • Remediation • Mitigation • Restoration 5. Sustainable land-use strategies.	**E. Mining** • Mineral formations • Extraction • Global reserves • Relevant laws and treaties. **F. Fishing** • Fishing techniques • Overfishing • Aquaculture • Relevant laws and treaties. **G. Global Economics** • Globalization • World bank • Tragedy of the Commons • Relevant laws and treaties.

V. Energy Resources and Consumption (10 – 15%)

A. Energy Concepts
- Energy forms
- Power
- Units
- Conversions
- Laws of Thermodynamics

B. Energy Consumption

1. History
- Industrial Revolution
- Exponential growth
- Energy crisis

2. Present global energy use

3. Future energy needs

C. Fossil Fuel Resources and Use
- Formation of coal, oil, and natural gas
- Extraction/purification methods
- World reserves and global demand
- Synfuels
- Environmental advantages/disadvantages of sources

D. Nuclear Energy
- Nuclear fission processes
- Nuclear fuel
- Electricity production
- Nuclear reactor types
- Environmental advantages/disadvantages
- Safety issues
- Radiation and human health
- Radioactive wastes
- Nuclear fusion

E. Hydroelectric Power
- Dams
- Flood control
- Salmon
- Silting
- Other impacts

F. Energy Conservation
- Energy efficiency
- CAFÉ standards
- Hybrid electric vehicles
- Mass transit

G. Renewable Energy
- Solar energy
- Solar electricity
- Hydrogen fuel cells
- Biomass
- Wind energy
- Small-scale hydroelectric
- Ocean waves and tidal energy
- Geothermal
- Environmental advantages/disadvantages
-

VI. Pollution (25 – 30%)

A. Pollution Types

1. Air pollution
- Sources – primary and secondary
- Major air pollutants
- Measurement units
- Smog
- Acid deposition – causes and effects
- Heat islands and temperature inversions
- Indoor air pollution
- Remediation and reduction strategies
- Clean Air Act and other relevant laws

2. Noise pollution
- Sources
- Effects
- Control measures

3.Water pollution

Types

Sources, causes, and effects
- Cultural eutrophication
- Groundwater pollution
- Maintaining water quality
- Water purification
- Sewage treatment/septic systems
- Clean Water Act and other relevant laws

4. Solid Waste
- Types
- Disposal
- Reduction

B. Impacts on the Environment and Human Health

1. Hazards to human health
- Environmental risk analysis
- Acute and chronic effects
- Dose-response relationships
- Air pollutants
- Smoking and other risk

2. Hazardous chemicals in the environment
- Types of hazardous waste
- Treatment/disposal of hazardous waste
- Cleanup of contaminated sites
- Biomagnification
- Relevant laws

C. Economics Impacts
- Cost-benefit analysis
- Externalities
- Marginal costs
- sustainability

VII. Global Change (10 – 15%)				
A. Stratospheric Ozone • Formation of stratospheric ozone • Ultraviolet radiation • Causes of ozone depletion • Effects of ozone depletion • Strategies for reducing ozone depletion • Relevant laws and treaties	**B. Global Warming** • Greenhouse gases and the greenhouse effect • Impacts and consequences of global warming • Reducing climate change • Relevant laws and treaties	**C. Loss of Biodiversity** Loss of Biodiversity due to: ○ Habitat loss ○ Overuse ○ Pollution ○ Introduced species ○ Endangered and extinct species Maintenance through conservation Relevant laws and treaties		

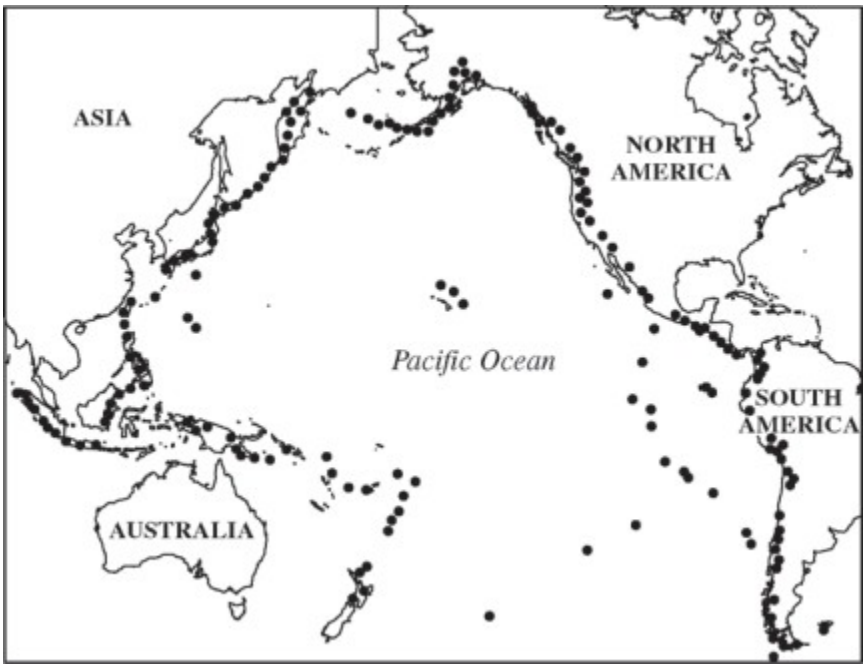
Part 1- Earth Systems and Resources

Vocabulary:

1. altitude
2. arid
3. asthenosphere
4. atmospheric pressure
5. clay
6. climate
7. cold front
8. condensation
9. convection current
10. convection cells
11. convergent plate boundary
12. core (Earth's)
13. Coriolis effect
14. crust
15. density
16. divergent plate boundary
17. earthquake
18. elevation
19. erosion
20. evaporation
21. front
22. greenhouse effect
23. greenhouse gases
24. groundwater
25. gully erosion
26. hot spots
27. humus
28. hydrosphere
29. igneous rock
30. infiltration
31. inorganic compounds
32. jet stream
33. latitude
34. leaching
35. lithosphere
36. loams
37. mantle
38. metamorphic rock
39. micronutrients
40. mineral resource
41. monsoons
42. natural recharge
43. organic compounds
44. ozone layer
45. parent material
46. permeability
47. porosity
48. precipitation
49. rain shadow effect
50. rift
51. rill
52. ring of fire
53. runoff
54. sand
55. sedimentary rock
56. sheet
57. silt
58. soil erosion
59. soil horizons
60. soil permeability
61. soil porosity
62. soil profile
63. soil structure
64. soil texture
65. stratosphere
66. subduction
67. surface runoff
68. surface water
69. tectonic plate
70. temperature inversion
71. terrestrial
72. thermal inversion
73. trade winds
74. transform fault
75. transpiration
76. troposphere
77. upwelling
78. warm front
79. water cycle
80. waterlogging
81. water table
82. watershed
83. weather
84. weathering
85. zone of aeration
86. zone of illuviation
87. zone of saturation

Earth Science Concepts

1. The approximate age of the Earth is_____years.



2. FRQ sample- Plate tectonic theory states that the Earth's lithosphere is broken into very slowly moving pieces or plates. Plate movements over vast stretches of time have led to the current orientation of our continents and oceans. Individual events along plate boundaries, such as earthquakes and volcanic eruptions, pose periodic threats to human activity and ecosystems. The "Ring of Fire" is a term that describes the location of increased seismic and volcanic activity around the margins of the Pacific Ocean basin. On the map above, each dot represents a volcano or an earthquake.
   a) Japan, Indonesia and the Philippines are examples of volcanic island chains that have formed along subduction zones between plates in the western Pacific.
      i. Describe what happens when two tectonic plates collide along a subduction zone.
      ii. Explain how subduction leads to volcanic activity.

3. Identify the following locations on the map above.

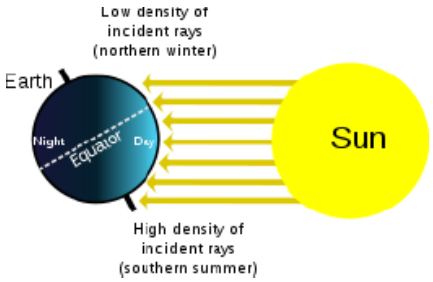
   a. Area that exhibits island arcs

   b. Area that exhibits a growing non-volcanic mountain chain due to uplift

   c. Area where new crust is being created at a divergent plate boundary

4. What causes seasons to occur in temperate zones?

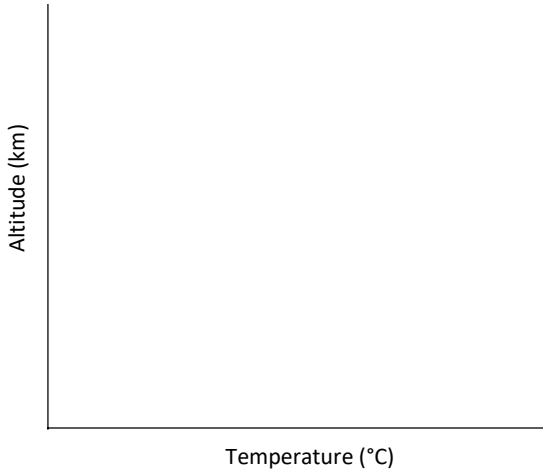
5. Describe how solar insolation shown at the right affects wind currents and precipitation patterns.



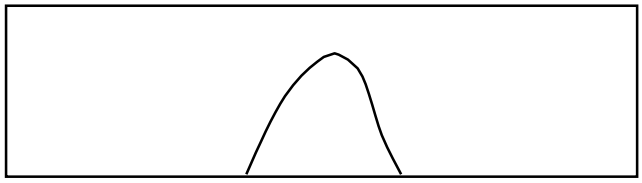
6. On the world atlas below, label the following:
    a. Equator
    b. Arctic circle
    c. Antarctic circle
    d. Tropic of cancer
    e. Tropic of Capricorn
    f. Polar region
    g. Temperate region
    h. Tropic region
    i. Northern Hemisphere
    j. Southern Hemisphere
    k. Label the major continents.

The Atmosphere

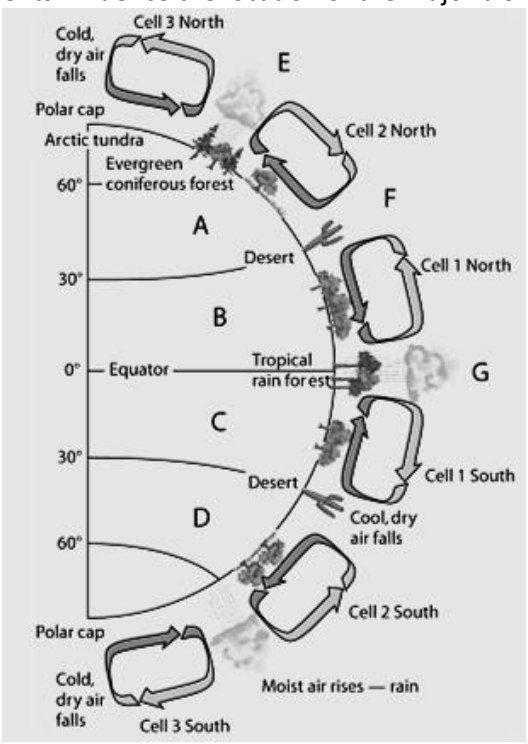
7. Use the axes to the right for the following:
    a. Draw a line representing the Earth's atmosphere.
    b. Label each layer of the Earth's atmosphere and identify where the greenhouse effect occurs and the ozone layer is situated.



8. The box to the right contains a crude depiction of a mountain, use it to sketch and label the essential atributes of a rain shadow. Include labels for the direction of the prevailing winds and nearest ocean.



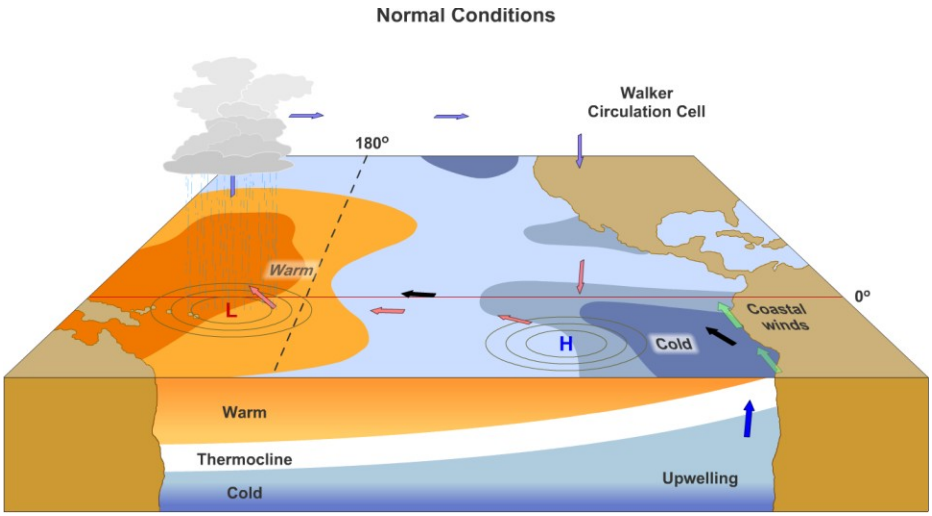
9. Describe the following diagram of the Coriolis effect. How does the solar intensity and atmospheric convection currents influence the location of the major biomes?

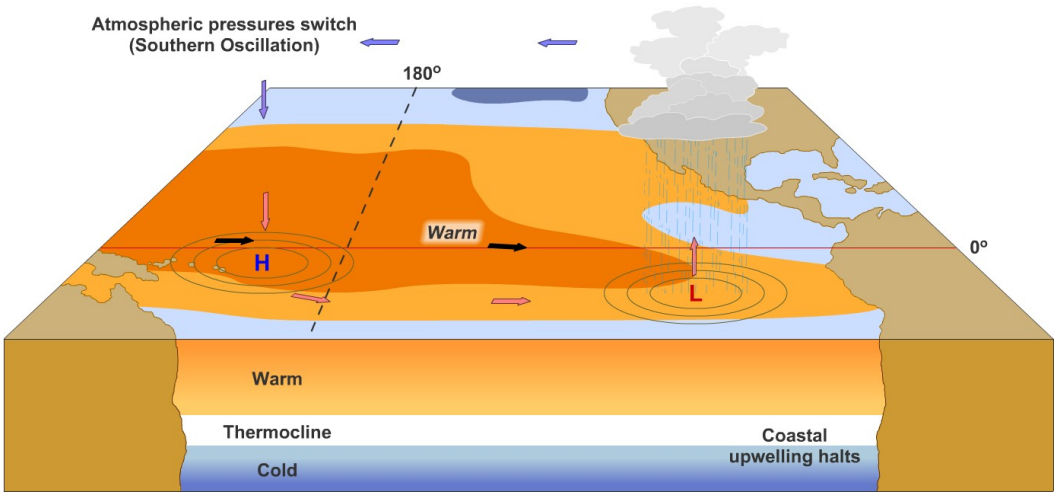


10. Describe how the ocean currents, temperature and gas concentrations are directly related to those of the atmosphere.

11. The acronym ENSO refers to_____, a phenomenon that occurs in the_____Ocean.

12. Using the following diagrams, explain what an *El Niño* event is and why it is significant.





Global Water Resources and Use

13. _____% of the Earth is covered with water. Of all the water on Earth_____% of it is saltwater,_____% is frozen, and _____% is available and relatively accessible.
14. Explain what evapotranspiration is and why it is significant.

15. Explain what a watershed is and why it is significant.

16. For each of the following locations, explain what surface and groundwater issues occur there.

    a. Colorado river basin

    b. Ogallala Aquifer

    c. Aral Sea

17. Explain why freshwater is considered a(n):
    a. Ecosystem service

    b. Economic service

    c. Global security issue

    d. Natural capital

18. List specific water conservation strategies for the following situations:
    a. Irrigation in agriculture

    b. Municipal use

    c. Hydroelectric energy production

    d. Industrial use

Soil and Soil Dynamics

19. Explain the rock cycle. What are the three types of rocks and the forces that convert one form to another?

20. Contrast the processes of weathering and erosion.

21. Which horizon do you find the following layers? Add in a description of each:

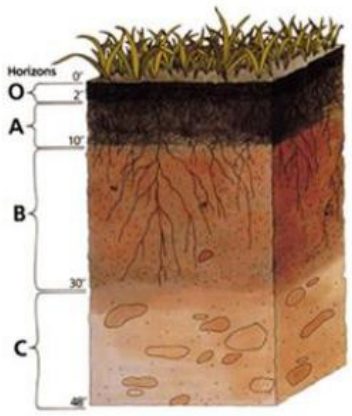
    a. Eluviation layer _____

    b. Top soil _____

    c. Parent material _____

    d. Sub soil _____

    e. Leaf litter _____



22. Identify three examples organic compounds and three examples of inorganic compounds.

	(1)_____		(1) _____
Organic:	(2)_____	Inorganic:	(2) _____
	(3)_____		(3) _____

23. Arrange the following particles in order of smallest to largest: clay, sand, silt
(1)_____ (2)_____ (3) _____

24. Explain how each of the following anthropogenic issues contribute to erosion
    a. Agricultural practices
    b. Urban development
    c. River channelization
    d. Deforestation
    e. Mining

25. Explain what human activities lead to
    a. Desertification
    b. Salinization

26. What strategies can be used in the following issues to conserve soil nutrients while preventing erosion, desertification and/or salinization?
    a. Agricultural practices
    b. Urban development
    c. River channelization
    d. Deforestation
    e. Mining

Part 2: Living World 10-15%

Vocabulary:

1. abiotic
2. adaptation
3. aerobic respiration
4. ammonification
5. assimilation
6. autotroph
7. background extinction
8. bacteria
9. benthos
10. biodiversity
11. biogeochemical cycle
12. biological diversity
13. biome
14. biosphere
15. biotic
16. deciduous plants
17. carbon cycle
18. carbon sink
19. carnivore
20. climax community
21. coastal wetland
22. commensalism
23. community
24. competitive exclusion
25. coniferous trees
26. coral reef
27. deciduous plants
28. decomposer
29. denitrification
30. detritivore
31. detritus
32. detritus feeder
33. diffusion
34. ecological diversity
35. ecological niche
36. ecology
37. ecosystem
38. endangered species
39. endemic species
40. energy productivity
41. estuary
42. evolution
43. extinction
44. fundamental niche
45. first law of thermodynamics
46. food chain
47. food web
48. freshwater life zones
49. fundamental niche
50. generalist species
51. genetic diversity
52. geographic isolation
53. gross primary productivity (GPP)
54. groundwater
55. habitat
56. herbivore
57. heterotroph
58. host
59. hydrologic cycle
60. indicator species
61. infiltration
62. interspecific competition
63. intraspecific competition
64. keystone species
65. kilocalorie (kcal)
66. law of conservation of energy
67. law of conservation of matter
68. leaching
69. limiting factor
70. mass extinction
71. mutualism
72. natural selection
73. net energy
74. net primary productivity (NPP)
75. niche
76. nitrogen cycle
77. nitrogen fixation
78. nitrification
79. omnivore
80. parasitism
81. phosphorus cycle
82. photosynthesis
83. phytoplankton
84. plankton
85. pioneer species
86. population
87. precipitation
88. predation
89. primary consumer
90. primary pollutant
91. primary productivity
92. primary succession
93. producer
94. pyramid of energy flow
95. range
96. range of tolerance
97. realized niche
98. reproductive isolation
99. respiration
100. resource partitioning
101. riparian zones
102. runoff
103. scavenger
104. second law of energy
105. second law of thermodynamics
106. secondary consumer
107. secondary succession
108. specialist species
109. speciation
110. species
111. species eveness
112. species diversity
113. species richness
114. sulfur cycle
115. sulfur dioxide (SO_2)
116. sulfuric acid (H_2SO_4)
117. surface runoff
118. surface water
119. terrestrial
120. tertiary (higher-level) consumers
121. theory of evolution
122. transpiration
123. trophic level
124. water cycle
125. water table
126. zone of aeration
127. zone of saturation

Review Questions:

A. Ecosystem Structure

1. Contrast what biotic and abiotic factors would be studied in a population, community and an ecosystem.

2. What types of factors would determine a species' ecological niche? What is the purpose of a niche?

3. How do organisms use resource partitioning to avoid competition?

4. How does a species range of tolerance directly relate to competition?

5. For each of the following species interactions, define it and give a common example.

	Definition	Example
Mutualism		
Commensalism		
Parasitism		
Competition		
Predation		

6. Match the following:

a. generalist species	____Zebra mussel
b. specialist species	____Galapagos tortoise
c. invasive species	____American Alligator
d. keystone species	____Tiger salamander
e. indicator species	____Norway rat
f. endemic Species	____Giant Panda

7. Contrast genetic, ecosystem and species biodiversity.

8. If a forest is fragmented due to deforestation, explain how the edge effects impact species diversity and population sizes.

9. Fill out the chart below on the various biomes.

Type of Biome	Typical Location	Typical Climate	Characteristic adaptations for survival
Tropical Rain Forest			Plants – Animals –
Temperate Deciduous Forest			Plants – Animals –
Taiga (Boreal) Forest			Plants – Animals –
Tropical Grasslands (Savanna)			Plants – Animals –
Temperate Grassland (Prairie)			Plants – Animals –
Tundra (Cold Grassland)			Plants – Animals –
Desert			Plants – Animals –

10. What climatic patterns determines the type of biome an area will have?

11. For each of the following biomes, identify a specific country in which each biome occurs in relative abundance:

Taiga_____ Desert _____

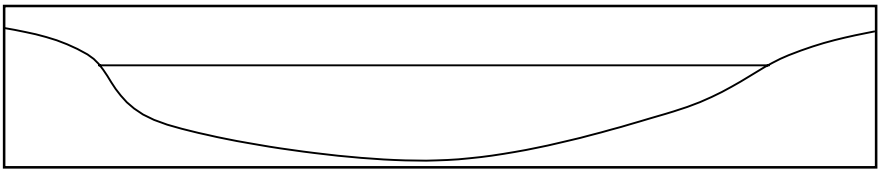
Tropical rainforest_____ Temperate grassland _____

Tropical grassland_____ Coral reef _____

Temperate deciduous forest_____ Tundra _____

12. List two environmental benefits of wetlands.
    a) _____
    b) _____

13. Label the four major zones of life in the appropriate areas on the diagram representing a temperate lake in the box to the right.



14. Identify three examples of biotic components of an ecosystem and three examples of abiotic components of an ecosystem.

	(1)_____		(1) _____
Biotic:	(2)_____	Abiotic:	(2) _____
	(3)_____		(3) _____

B. Energy Flow

15. Write the balanced chemical equation for photosynthesis in the box on the right.

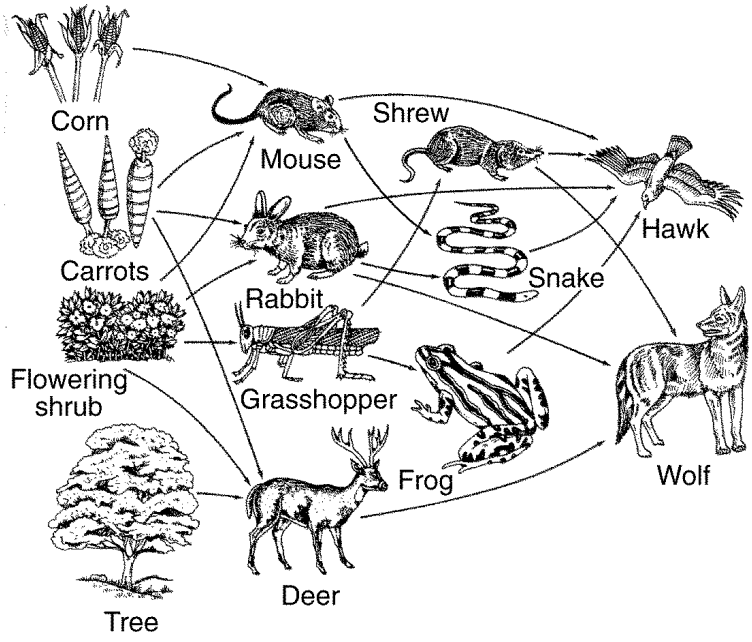
Photosynthesis:

16. Write the balanced chemical equation for cellular respiration in the box on the right.

Cellular Respiration:

17. Perform the following calculation. Show all of your work. If the grasses on a 100-hectare area of grassland grow at an average rate of 1 cm/day, the average volume of grass that is added to the grassland each day is _____ m^3. If the density of the grasses that grow in the grassland averages 400 kg/m^3, the net primary productivity is approximately_____g/m^2/day or_____g/m^2/year.
Show work:

18. On the following food web, classify each species into its trophic level.



19. Next to the food web, draw an ecological pyramid using the food web above and determine the biomass of the deer if the wolf consumes 9643 kg.

20. Explain how the law of conservation of matter relates to the cycling of carbon through a food web.

21. Calculate net primary productivity of the tree if its Gross Primary Productivity is 56 mg O_2/L/day and its rate of respiration is 4 O_2/L/day.

C. Ecosystem Diversity

22. Explain how preserving biodiversity is directly related to the availability of natural capital.

23. Explain how biodiversity increases the survival of a species during the process natural selection and evolution.

24. Two islands, different distances from the mainland have different rates of extinction, this is explained by the theory of island_____.

25. Complete the following table:

Ecosystem Component	An economically valuable ecosystem services it provides
honey bee	
water cycle	
forest	
bat	
bacteria	
coral reef	
wetland	

26. Strengthen this weak statement: "Protecting endangered species like the Giant Panda costs too much and should be stopped."

27. Explain what evapotranspiration is and why it is significant.

D. Natural Ecosystem Changes

28. Describe how the following examples of climate shifts have impacted natural selection during Earth's history.

Climatic shift	Impact on natural selection
Tectonic plate movement (Pangea)	
Ice ages	
Climatic warming	
Island formation	
Earthquakes/formations of canyons	

29. Contrast primary and secondary ecological succession. What types of events cause each? Contrast the pioneer species found in each.

E. Natural Biogeochemical Cycles

30. Complete the following table for these biogeochemical cycles:

Trait	Carbon	Nitrogen	Phosphorus	Water
Importance to life				
Largest reservoir				
Methods of transport				
Cycle duration (long/short)				

31. Name the molecules that match each step of the nitrogen cycle: (FIXNAAD ANPAN)

Nitrogen **fix**ation _____

Nitrification _____

Assimilation _____

Ammonification _____

Denitrification _____

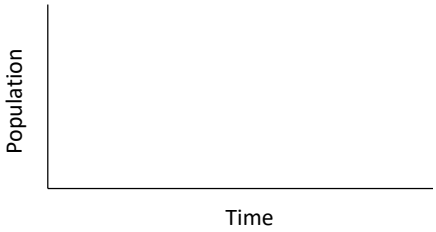
Part 3: Population 10-15%

Vocabulary

1. age structure
2. agricultural revolution
3. baby bust
4. baby boom
5. biotic potential
6. birth rate
7. carrying capacity (K)
8. competitors
9. cost-benefit analysis (CBA)
10. crude birth rate
11. crude death rate
12. death rate
13. debt-for-nature swap
14. demographic transition
15. demography
16. density dependent factors
17. density independent factors
18. developed country
19. developing country
20. doubling time
21. ecological footprint
22. economy
23. emigration
24. environmental degradation
25. environmental ethics
26. environmental resistance
27. environmentally sustainable economic development
28. exponential growth
29. external cost
30. family planning
31. famine
32. fertility
33. globalization
34. green revolution
35. gross domestic product (GDP)
36. immigration
37. industrial
38. infant mortality rate
39. K-strategists
40. J-curve
41. land degradation
42. land-use planning
43. less developed country (LDC)
44. life expectancy
45. limiting factor
46. linear growth
47. logistic growth
48. malnutrition
49. mass transit
50. more developed country (MDC)
51. natural capital
52. opportunist
53. overnutrition
54. overshoot
55. per capita GDP
56. population density
57. population dispersion
58. population distribution
59. population dynamics
60. population momentum
61. population size
62. post industrial
63. post- reproductive age
64. poverty
65. pre-industrial
66. pre-reproductive age
67. replacement-level fertility
68. r-strategists
69. rule of 70
70. S- curve
71. surplus
72. survivorship curve
73. total fertility rate (TFR)
74. transitional
75. tragedy of the commons
76. undernutrition
77. urban area
78. urban growth
79. urban sprawl
80. urbanization

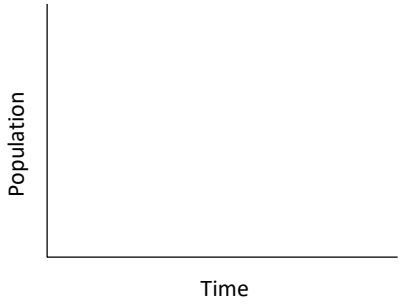
A. Population Biology Concepts

1. Use the axes to the right for the following:
   1. Draw and label a line that represents linear growth.
   2. Draw and label a line that represents exponential growth.



2. List the four most populated countries in the world.
   (1) _____ (3) _____
   (2) _____ (4) _____

3. On the axes to the right, draw a line showing a population that exemplifies logistic growth. (s-curve) and label the carrying capacity.



4. Perform the following calculation. Show all of your work. In a particular year a population has the following characteristics: the crude birth rate is 45, the crude death rate is 20, the immigration rate is 1%, and the emigration rate is 0.5%. The percent rate of growth for that year is_____.
   Show work:

5. List two characteristics of an r-selected species.
   (1)_____ (2) _____

6. List two characteristics of a K-selected species.
   (1)_____ (2) _____

7. Draw a survivorship curve for R- vs. K- selected species. Label the environmental resistance and biotic potential.

B. Human Populations

8. In what regions of the world is population density the greatest concern? How is population distribution a food and water security issue?

9. Explain two reasons why a population can continue to grow even if fertility rates decrease.

10. Perform the following calculations: (Show all of your work in a logical progression to the final answer.)
    1. A city has a population of 50,000 in 2012. If the population of the city grows at an annual rate of 2%, the year in which the population will reach 100,000 is_____and the year it will reach 200,000 is_____.

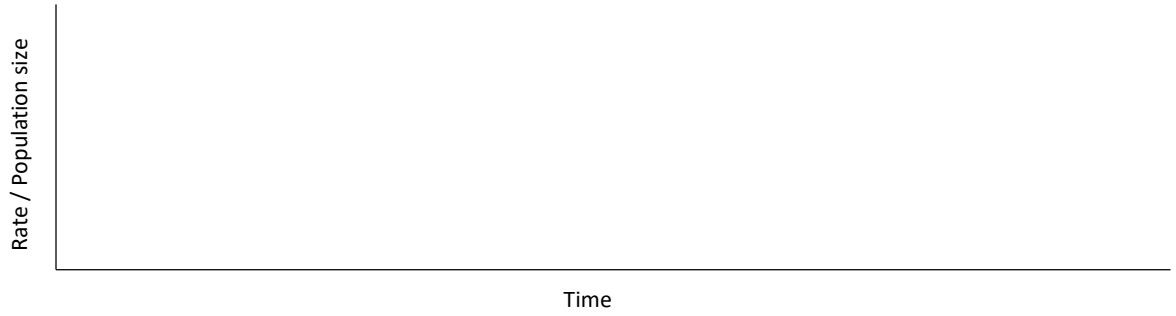
    Show work:

    2. A country's population was 12 million in 1992 and in 2012 it is 24 million. If the population grew at a constant rate, that percent rate of growth was_____.

    Show work:

11. Write an equation for the rule of 70: _____

12. Use the axes below to draw and label lines representing the birth rate, death rate and total population size during the idealized demographic transition of a country. Include, written directly onto the graph, an explanation for each change in the birth rate, death rate and total population size.



13. On the axes below, draw and completely label four age-structure diagrams that represent slow growth, rapid growth, negative growth, and zero population growth (include labels on the x- and y-axes)

14. Complete the following table by writing “high” or “low” in each box below.

Characteristic	More Economically Developed Counties (MEDCs)	Less Economically Developed Countries (LEDCs)
per capita GDP		
degree of industrialization		
infant mortality rate		
per capita fossil fuel use		
ecological footprint		
greenhouse gas emissions		
risk from heart disease		
risk from infectious diseases		

15. What was the Green Revolution and why is it important?

16. Contrast the types of disease you find in developed countries versus undeveloped countries.

17. How is the stage of demographics directly related to the economy of a country?

18. Contrast resource use in each demographic stage.

19. Describe some strategies for sustainability in urban regions.

20. Contrast the national policies of the United States, China and India that directly impact the population growth rates of those countries.

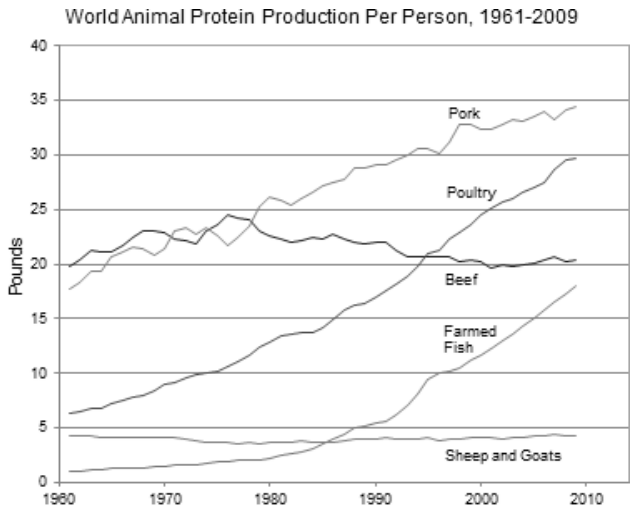
Part 4: Land and Water Use 10-15%

Vocabulary

1. Abyssal zone
2. agricultural revolution
3. agroforestry
4. alley cropping
5. anthropocentric
6. aquaculture
7. aquifer
8. arable land
9. area strip mining
10. bathyal
11. benthic zone
12. benthos
13. by-catch
14. clear-cutting
15. commercial inorganic fertilizer
16. conservation
17. conservationist
18. conservation-tillage farming
19. contour farming
20. contour strip mining
21. controlled burning
22. conventional-tillage farming
23. cost-benefit analysis (CBA)
24. crop rotation
25. desalinization
26. Desertification
27. Drainage basin
28. Drift net fishing
29. dredging
30. drift-net fishing
31. ecological restoration
32. euphotic
33. environmentalist
34. environmentally sustainable economic development
35. environmentally sustainable society
36. erosion
37. estuary
38. euphotic zone
39. eutrophic
40. externalities
41. feedlot (CAFO)
42. fertility
43. fertilizer
44. fish farming
45. fish ranching
46. fishery
47. food security
48. fungicide
49. genetically modified crops (GMO)
50. globalization
51. herbicide
52. high-input agriculture
53. human capital
54. industrialized agriculture
55. insecticide
56. integrated pest management (IPM)
57. intercropping
58. interplanting
59. land degradation
60. land-use planning
61. lentic
62. limnetic zone
63. littoral zone
64. long line fishing
65. low-input agriculture
66. intertidal zone
67. macronutrient
68. malnutrition
69. mangrove forest
70. marine snow
71. marsh
72. mass transit
73. micronutrient
74. mineral resource
75. minimum-tillage farming
76. monoculture
77. mountaintop removal
78. natural capital
79. natural recharge
80. nekton
81. no-till farming
82. old-growth forest
83. oligiotrophic
84. open-pit mining
85. ore
86. organic fertilizer
87. overfishing
88. overgrazing
89. overnutrition
90. pasture
91. pelagic
92. persistence
93. pest
94. pesticide
95. plankton
96. polyculture
97. polyvarietal cultivation
98. purse seines
99. profundal zone
100. rangeland
101. reforestation
102. reserves
103. restoration ecology
104. salinity
105. salinization
106. second-growth forest
107. selective cutting
108. strip cropping
109. strip cutting
110. strip mining
111. subsistence farming
112. subsurface mining
113. surface mining
114. sustainable agriculture
115. sustainable development
116. sustainable living
117. sustainable society
118. sustainable yield (sustained yield)
119. swamp
120. tailings
121. tar sand
122. terracing
123. thermal stratification
124. tragedy of the commons
125. undernutrition
126. urban sprawl
127. watershed
128. water table
129. wetland
130. wilderness
131. xeriscaping
132. zone of saturation

Part 4- Review Questions- Land and Water Use

A. Agriculture



Use the information in the diagram on the left, to answer the following:

1. The percent change in the per capita global production of protein from poultry between 1980 and 2000 was approximately_____.
2. The percent change in the per capita global production of protein from farmed fish between 1980 and 2000 was approximately_____.
3. The percent change in the per capita global production of protein from beef between 1961 and 2009 was approximately_____.

4. Perform the following calculation. Show all of your work. If the grasses on a 100-hectare area of grassland grow at an average rate of 1 cm/day, the average volume of grass that is added to the grassland each day is _____m^3. If the density of the grasses that grow in the grassland averages 400 kg/m^3, the net primary productivity is approximately_____g/m^2/day or_____g/m^2/year.

Show work:

5. The acronym CAFO refers to_____, which is important because:

_____

_____

6. What is different about growing plants hydroponically?

7. What was the Green Revolution and why is it important?

_____

_____

8. The acronym GMO refers to_____, which is:

_____

_____

9. Arrange the following foods in order of highest to lowest in terms of global production: corn (maize); rice; wheat.

(1)_____ (2)_____ (3) _____

10. List four innovations that led to the Green revolution.
    (1) _____ (3) _____
    (2) _____ (4) _____

11. Explain what two issues can result from over- irrigation of crops in arid regions of the world.

12. What is a monoculture? What issues result from planting monocultures.

13. Explain four methods of sustainable agriculture practices that help reduce erosion and desertification.

14. Contrast industrial versus integrated pest management strategies of controlling pests.

15. What are the main types of pesticides? What does it mean when a pesticide is persistent?

16. What are the costs and benefits of pesticides use?

18. Explain what the FIFRA law protects you from.

B. Forestry

19. Perform the following calculations: (Show all of your work.)
    A rectangular area of forest that measures 10 thousand meters by 300 thousand meters has an area of _____square kilometers and_____hectares.
    Show work:

20. A company is importing rare tropical hardwood to manufacture furniture, list three laws, regulations, treaties, or acts that the company may have violated.
    (1) _____
    (2) _____
    (3) _____

21. In terms of biodiversity, contrast the health of an old growth forest versus a tree plantation that has remediated a deforested region.

22. Describe the impact of natural forest fires on the health of a coniferous ecosystem. How have humans learned to manage controlled burns to maximize the fire's benefits?

23. Describe the different methods of deforestation. Rank them from most damaging to forest health to least damaging.

24. Explain how national forest land is managed by the US Forest service. Would you consider this land a common? Why or why not?

C. rangelands

25. Explain how overgrazing can lead to desertification and a collapse of a grassland ecosystem. What methods are used to avoid this issue?

D. Other Land Use

26. For each of the following urban land development listed below, explain what issue(s) they create andwhat sustainable alternatives exist for each.

Urban land development	Issue	Sustainable alternative
Transportation infrastructure		
Canals and channels		

27. What economic and environmental issues are related to suburban sprawl?

28. For each of the following public and federal lands, explain their purpose and challenges.

Public land	Purpose
Wilderness areas	
National parks	
National Wildlife refuges	
National Forests	
Wetlands	
Bureau of land management (BLM)	

29. Contrast the difference between the following land management techniques:
    a) Preservation
    b) Conservation
    c) Remediation
    d) Mitigation
    e) Restoration

E. Mining

30. Name where you find large reserves of the following mineral formations
    a) Coal

    b) Oil

    c) Natural gas

31. Complete the following chart.

Mining Technique	Description	Environmental consequences
Open-Pit mining		
Subsurface mining		
Strip mining		
Mountaintop removal		
Drilling		

32. Strengthen this weak statement: "Mining causes pollution that may disrupt the environment."

33. What laws prevent mining issues such as acid drainage and the displacement of tailings?

F. Fishing

34. _____ is a technique typically used to harvest scallops, crabs, and shrimp from the sea floor.

35. Contrast the environmental impact of dredging, bottom trawling and longline fishing.

36. Why is overfishing such a difficult issue to solve in our oceans? Explain the solutions or alternatives related to sustainable fishing practices.

37. Explain the pros and cons related to aquaculture.

38. What relevant laws and treaties prevent overfishing and preserve ocean species.

G. Global Economics

39. Explain the world bank and how it has helped reduce people overpopulation and issues related to poverty.

Part 5: Energy Resources and Consumption

1. Active solar heating system
2. Anthracite coal
3. Biofuel
4. biodiesel
5. biomass
6. bituminous coal
7. breeder nuclear fission reactor
8. clean coal
9. coal
10. coal gasification
11. coal liquefaction
12. cogeneration
13. control rod
14. coolant
15. containment structure
16. crude oil
17. decommissioned
18. energy
19. energy efficiency
20. energy productivity
21. fuel rod
22. fracking
23. geothermal energy
24. half-life
25. Hydroelectric
26. LEED program
27. lignite
28. liquefied natural gas (LNG)
29. liquefied petroleum gas (LPG)
30. natural gas
31. nonrenewable resource
32. nuclear fission
33. nuclear fusion
34. oil
35. oil sands
36. oil shale
37. ore
38. passive solar heating system
39. peat
40. petrochemicals
41. petroleum
42. photochemical
43. photovoltaic cells (PV)
44. radioactive waste
45. reactor
46. refining
47. renewable resource
48. shale oil
49. solar energy
50. solar thermal systems
51. spent
52. subsidy
53. synfuels
54. synthetic natural gas (SNG)
55. tar sand
56. tidal power
57. turbine

Review Questions- Energy

A. Energy Concepts

1. Perform the following calculation. Show all of your work. A 40 m^2 solar array is installed on a house where the average insolation is 6 kWh/m^2/day if the average total electricity output of the array is 1.2 kWh/hr; the efficiency of the array is_____.
   Show work:

2. A 60-Watt light bulb that is used for an average of 4 hours each day uses_____kilowatt-hours of electricity per year.
   Show work:

3. If the cost of gas is $3.50 per gallon and the average gas mileage of a car is 25 mpg, the cost of driving the car per mile is_____$/mi, or_____¢/mi.

Show work:

4. When energy that is stored in fossil fuels are burned, it changes form. Explain, using the law of thermodynamics, how energy forms change and what happens to it during the chemical change.

B. Energy Consumption

5. Explain how the major types of energy use have changed in the following historical circumstances:
   - Industrial Revolution

   - Exponential growth of developing nations

6. Periods of energy crisis such as the gasoline shortage in 1970's

7. At present, what are the top five types of energy used globally?

8. In the future, how will energy needs and sources expected to change?

C. Fossil Fuel Resources and Use

9. In the box to the right, list the ranks of coal in order from highest to lowest energy content. (indicate the direction in the box.)

10. List seven products that are derived primarily from crude oil:

    _____ _____ _____ _____ _____ _____ _____

11. Fracking is a common name for_____and it is a concern because…

    _____

    _____

12. The acronym ANWR refers to_____, which is important because:

    _____

    _____

13. Perform the following calculations: (Show all of your work in a logical progression to the final answer.)
    A family has a total of 1500 Watts of light bulbs throughout their house, if they replace them all with LED light bulbs, which use 90% less energy, the family will now use_____Watts of electricity.
    Show work:

14. A space heater operates at 1500 Watts, if it is used for 10 hours each day for one week and the cost of electricity is 20 cents per kilowatt-hour, it will cost_____to operate the heater for the week.
    Show work:

15. What are the advantages and disadvantages to using synfuels?

16. On the following chart, summarize the environmental advantages/disadvantages of each energy source

Energy source	Advantages	Disadvantages
Nuclear		
Hydroelectric		
Solar electricity		
Hydrogen fuel cells		
Biomass		
Wind energy		
Ocean waves and tidal energy		
Geothermal		

D. Nuclear Energy

21. Explain how nuclear fission works.

22. Explain how uranium is used to make electricity in a nuclear power plant.

23. What are the safety issues associated with nuclear fission? How do nuclear power plants reduce those risks?

24. Explain what happened at Fukushima and why it is significant?

25. State where Chernobyl is located and explain what happened there.

26. Perform the following calculation. Show all of your work. A radioactive cloud may contain Iodine-131, which has a half-life of 8 days. If the waste must decay to a concentration of less than 0.1% to be considered safe, it will take approximately_____days to reach safe levels.
    Show work:

27. Perform the following calculation. (Show all of your work in a logical progression to the final answer.) A family has a 75 m^2 solar array on their house, which has an efficiency of 10%. If the average insolation on their array is 6 kWh/m^2/day and their average cost of electricity is 20 cents per kilowatt-hour, the family has the capacity to produce_____worth of electricity daily, and_____annually, from the sun.
    Show work:

28. What are the issues related to radioactive wastes? Explain the controversy surround Yucca Mountain as a waste disposal site.

29. Contrast nuclear fusion and nuclear fission.

E. Hydroelectric Power

30. In the box to the right, draw a diagram that illustrates how electricity is produced by a dam

31. How are hydroelectric power plants used for flood control? What issues are related concerning flooding and sediment at dams?

32. How do hydroelectric power plants affect salmon populations? What strategies do they use to account for this?

33. Explain the role of silting in a hydroelectric dam. How can that affect water quality?

F. Energy Conservation

34. List four things you could do to conserve energy.
    (1) _____

    (2) _____

    (3) _____

    (4) _____

G. Renewable Energy

35. List two species that may be threatened by the construction of a solar power tower in the California Desert.
    (1)_____ (2) _____

36. _____is the active element in most photovoltaic cells.

37. In the box to the right, sketch a house and the surroundings of a house that is designed to make the greatest use of passive solar energy in the northern hemisphere. Include, inside the box, the location of both the winter and summer sun, and labels to indicate the compass direction that the house faces.

Part 6: Pollution 25-30%

Vocabulary

1. acid
2. acid deposition
3. advanced sewage treatment
4. air pollution
5. biological oxygen demand (BOD)
6. biotic pollution
7. broad spectrum agent
8. carcinogen
9. CERCLA (superfund act)
10. Cultural eutrophication
11. deep well disposal
12. dissolved oxygen (DO) content
13. dose response curve
14. effluent
15. environmental degradation
16. Environmental Protection Agency (EPA)
17. eutrophication
18. environmental justice
19. e-waste
20. first generation pesticide
21. fungicide
22. genetic resistance
23. greenhouse effect
24. greenhouse gases
25. hazardous waste
26. herbicide
27. incineration
28. industrial smog
29. industrial waste
30. insecticide
31. integrated waste management
32. leachate
33. LD50
34. Materials recovery facility (MRF)
35. Municipal solid waste (MSW)
36. nitrogen oxides (NO_x)
37. noise pollution
38. nondegradable pollutant
39. nonpersistent pollutant
40. nonpoint source
41. open landfill
42. oxygen-demanding wastes
43. ozone (O_3)
44. ozone depletion
45. ozone layer
46. PANs
47. particulates
48. parts per billion (ppb)
49. parts per million (ppm)
50. parts per trillion (ppt)
51. persistence
52. persistent pollutant
53. pest
54. pesticide
55. phytoremediation
56. point source
57. pollutant
58. primary/closed loop recycling
59. primary pollutant
60. primary sewage treatment
61. radon (Rn)
62. risk assessment
63. sanitary landfill
64. second generation pesticide
65. secondary pollutant
66. secondary recycling
67. secondary sewage treatment
68. septic tank
69. sludge
70. smog
71. solid waste
72. subsidence
73. subsistence farming
74. surface impoundment
75. temperature inversion
76. thermal inversion
77. turbidity
78. toxicity
79. toxicology
80. volatile organic compounds (VOCs)

Pollution Review Questions

A. Pollution Types

Air pollution

1. Identify significant sources of the following air pollutants. Indicate if they are primary or secondary pollutants:

Formaldehyde: _____

Radon: _____

Mercury: _____

Carbon monoxide: _____

Nitrous oxide: _____

2. List three specific health effects of lead on humans.

_____

_____

3. Name the following:

SO_X _____ N_2 _____

NH_4^+ _____ NO_x _____

4. NO_2 is converted to N_2 and O_2 in a _____, which also converts _____ to _____.

5. Explain the causes of an urban heat island.

6. In the area below, write a series of chemical reactions that leads to the formation of tropospheric ozone in photochemical smog.

7. For each of the following substances, draw an arrow that points to an unambiguous location along the line, below, representing pH: **orange juice**; **normal rain**; **ammonia**; **lime (calcium carbonate)**; **sulfuric acid**; **acid rain**; **human blood**.

1 2 3 4 5 6 7 8 9 10 11 12 13 14

pH

8. Explain the cause of acid deposition and its major environmental effects

9. How are heat islands and temperature inversions formed? Why are they concerns related to smog?

10. Explain how ozone is “good up high but bad nearby”.

11. Why is indoor air pollution the most unregulated form of air pollution? What sources of indoor air pollution are the biggest issues?

12. Explain the remediation and reduction strategies for controlling radon in the home.

13. Explain the main components of the Clean Air Act and other relevant air pollution laws

Noise pollution

14. What are the sources, effects and control measures of noise pollution?

Water pollution

15. Explain how thermal pollution is produced by power plants.

16. Explain what a watershed is and why it is significant.

17. A family has a rectangular swimming pool that measures 15 feet by 20 feet. If water evaporates from the pool at a rate of 50 gallons per square foot per year and a pool cover will reduce evaporation by 90 percent, the family can save_____gallons of water per year by using a pool cover.

Show work:

18. List three things you could do to conserve water.

(1) _____

(2) _____

(3) _____

Perform the following calculations: (Show all of your work.)

19. A family of 5 replaces a 6-gallon/minute showerhead with a new 2-gallon/minute low-flow showerhead. If every member of the family takes one 10-minute shower per day, the family will save_____gallons of water in one year.

Show work:

20. Draw a diagram of cultural eutrophication below. Explain what water quality measurements are best at detecting eutrophication.

21. Groundwater pollution

22. Define the following:

pH: _____

_____

Turbidity: _____

_____

Water hardness:

_____

_____

Biological oxygen demand: _____

_____

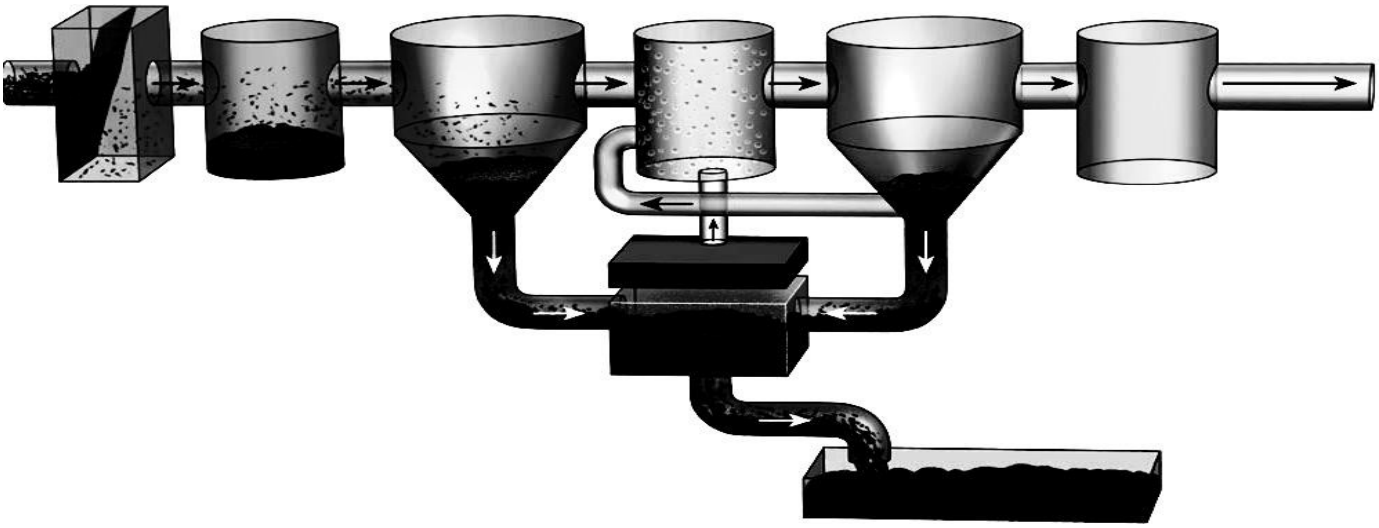
Organic waste: _____

_____

23. List three disinfectants that are commonly used to make drinking water safe during in the water treatment process.

1)_____ 2)_____ 3) _____

24. Completely label the following diagram of a sewage treatment plant and list the items removed at each step.



25. The acronym BOD refers to_____, which is:

_____

_____

26. Define the following…

Watershed: _____

_____

Clean Water Act: _____

_____

Clean Drinking Water Act: _____

_____

Solid Waste

27. List four characteristics that will result in waste being classified as “hazardous”

28. Contrast the benefits and disadvantages to disposing waste via:

    i. Incineration

    ii. Sanitary landfill

    iii. Deep well injection

    iv. Surface impoundment

29. What are some reduction strategies used to reduce trash bulk and conserve materials? List them in order of greatest reduction to least.

30. The acronym NIMBY refers to _____ _____ _____ _____ _____, which is:

_____

_____

B. Impacts on the Environment and Human Health

Hazards to human health

31. What factors are considered when determining the magnitude of an environmental risk?

32. Contrast acute and chronic effects of toxins. Which have more stringent laws governing them?

33. Contrast a threshold dose-response curve versus a non-threshold response. What is the difference?

34. What major air pollutants are considered hazards to human health? What human health issues do they cause?

35. What are the two main causes of lung cancer?

Hazardous chemicals in the environment

36. What are the main sources of hazardous wastes? How do we classify them?

37. Rachel Carson wrote the book_____to raise people's awareness of the harmful effects of the pesticide_____.

38. Explain how the biomagnification of DDT led to the (near) demise of the Bald Eagle population in the US.

39. Describe the treatment/disposal options for hazardous waste. What are their pros and cons?

40. What branch of government is responsible for the cleanup and remediation of contaminated sites? What laws govern this process?

Part 7: Global Change (10 – 15%)

Vocabulary

1. albedo
2. anthropocentric
3. artificial selection
4. background extinction
5. bioaccumulation
6. biodiversity hotspots
7. biological extinction
8. biomagnification
9. biotic pollution
10. botanical garden
11. captive breeding
12. CITIES
13. climate
14. climate change
15. cost-benefit analysis (CBA)
16. drought
17. endangered species
18. endemic species
19. ESA
20. extinction
21. feedback loop
22. genetic engineering
23. geographic isolation
24. greenhouse effect
25. greenhouse gases
26. habitat fragmentation
27. HIPPO (**H**abitat destruction, **I**nvasive species, **P**ollution, **P**opulation, and **O**verharvesting)
28. hydrologic cycle
29. hydrosphere
30. indicator species
31. in situ
32. invasive species
33. keystone species
34. Lacey Act
35. mass extinction
36. mitigation
37. model
38. monsoons
39. mutations
40. natural greenhouse effect
41. natural rate of extinction
42. natural selection
43. negative feedback loop
44. non-native species
45. overexploitation
46. ozone (O3)
47. ozone depletion
48. ozone layer
49. poaching
50. pollution
51. positive feedback loop
52. preservation
53. rehabilitation
54. remediation
55. restoration
56. reproductive isolation
57. second growth forests
58. seed bank
59. speciation
60. species richness
61. threatened species
62. urbanization
63. wildlife refuge

Review Questions- Global Change

A. Stratospheric Ozone

1. The molecular formula of ozone is_____.

2. In the box below, write out a series of chemical equations that illustrate the destruction of the ozone in the ozone layer.

3. The acronym HCFC refers to_____, which is:

_____

_____

4. Explain the dangers related to too much exposure to ultraviolet radiation.

5. What are the environmental and economic effects of ozone depletion.

6. What strategies and laws/treaties have reduced ozone depletion? Why do the effects of remediation take so long to occur?

B. Global Warming

7. List three consequences of global warming.

(1) _____

(2) _____

(3) _____

8. List three things you could do to decrease your contribution to global warming.

(1) _____

(2) _____

(3) _____

9. List four greenhouse gases.

(1) _____ (3) _____

(2) _____ (4) _____

10. Contrast the layers of the atmosphere, the molecules involved and the type of radiation involved in ozone depletion and global warming.

11. Describe an example of a positive feedback loop.

12. Describe an example of a negative feedback loop.

13. What are the relevant laws and treaties that have attempted to solve climate change? Why is climate change so difficult to solve?

C. Loss of Biodiversity

14. Give examples of organisms affected by the loss of biodiversity due to:

    Habitat loss
    Overuse
    Pollution
    Introduced species
    Endangered and extinct species

15. Strengthen this weak statement: “Protecting endangered species like the Giant Panda costs too much and should be stopped.”

16. What relevant laws and treaties are used to protect species from loss of diversity?

Must-Know Math Review

Things to know…..

Million= 10^6
Billion= 10^9

Mega= 10^6 (ex: 1,000,000 BTU/ 1 MBTU)
Kilo= 10^3 (ex: 1000 watts/ 1 kW)

Half Life

1 1/2 1/4 1/8 1/16 1/32 1/64

Population Stuff….

Approximate population for:

The world: 7.5 billion
China: 1.3 billion
India: 1.3 billion
The US: 325 million

Per Capita = Per Person

Percent

Percent is part divided by the whole times 100!

Primary Productivity

Gross primary productivity - respiration = net primary productivity

Population Math

Population Density=
Number of individuals/ area

Growth Rate is a %
B-D/ population size * 100

Rule of 70
DT = 70/ GR

Percent Change

$$\frac{\text{Final Value - Initial Value}}{\text{Initial Value}} * 100\%$$

N-O
O

ENERGY

KWh= kilowatts * hours

Efficiency can be solved using ratios

ALWAYS! EVERYTIME!
SHOW YOUR WORK!
Numbers must be labeled in the SET-UP (Use dimensional analysis!)
Your numbers will be neat!
If you can't use scientific notation, count your zeroes when you multiply and reduce them when you divide. Double check!!
Always make sure your answer makes sense!
Label and identify your answers clearly!

Metric Conversion

King	**H**enry	**D**ied	**U**nusually	**D**rinking	**C**hocolate	**M**ilk
Kilo	Hecto	Deca	* Unit *	Deci	Centi	Milli
 **10 x 10 x 10 x LARGER than a unit**	**10 x 10 x LARGER than a unit**	**10 x LARGER than a unit**	***Meter*** *(length)* ***Liter*** *(liquid volume)* ***Gram*** *(mass/weight)* **1 unit**	**10 x SMALLER than a unit**	**10 x 10 x SMALLER than a unit**	**10 x 10 x 10 x SMALLER than a unit** 
1 kilo = 1,000 units	1 hecto = 100 units	1 deca = 10 units		10 deci = 1 unit	100 centi = 1 unit	1,000 milli = 1 unit
km = kilometer kL = kiloliter kg = kilogram	hm = hectometer hL = hectoliter hg = hectogram	dam = decameter daL = decaliter dag = decagram	m = meter L = liter g = gram	dm = decimeter dL = deciliter dg = decigram	cm = centimeter cL = centiliter cg = centigram	mm = millimeter mL = milliliter mg = milligram
Example: 5 kilo	50 hecto	500 deca	5,000 units	50,000 deci	500,000 centi	5,000,000 milli

DIVIDE numbers by 10 if you are getting bigger (same as moving decimal point one space to the left)

MULTIPLY numbers by 10 if you are getting smaller (same as moving decimal point one space to the right)

Prefixes for Powers of 10		
Prefix	**Symbol**	**Notation**
tera	T	10^{12}
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}