

Name: _____

Mrs. Schneck / Mr. Romano

AP Environmental Science
Summer Assignment

Course Overview:

A.P. Environmental Science is course designed to be the equivalent of a one-semester introductory college course in Environmental Science. The goal of this course is to provide students with the scientific principles required to understand interrelationships of the natural world and analyze environmental problems. This course provides an in depth study of the interactions between the living and non-living components of the ecosystem. An introduction to ecological community concepts and the influence of chemical, geological, atmospheric and physical factors on living systems will be considered. The course provides a study of the effect of human activities on the worldwide ecosystem and provides an examination of the issues of human over-population, atmospheric change, chemical pollution and agriculture.

Prerequisites:

Being that **students are expected to build upon knowledge acquired in previous science class experiences**, the prerequisites of this course include: Earth Science, a minimum grade of B in Chemistry and a B in Biology, 80 or higher on the Biology Regents, and a passing grade on the Chemistry Regents.

Topic Outline:

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|--|---|
| I. Sustainability and Understanding the Environment | VIII. Population Dynamics, Human Population |
| II. Systems, Matter and Energy | IX. Risk & Toxicology |
| III. Nutrient Cycles | X. Human Health and Pesticides |
| IV. Ecosystems: Structure, Function, & Interactions | XI. Geology and Mineral Resources |
| V. Evolution and Biodiversity | XII. Energy Resources |
| VI. Climate | XIII. Air Pollution |
| VII. Terrestrial Biomes and Aquatic Life Zones | XIV. Solid & Hazardous Waste |

PART 1: Review of Previously Acquired Knowledge

Many of the concepts learned previously in your Earth Science, Biology, and/or Chemistry coursework will appear in the topics listed above. The topics that are highlighted in bold print consist of a significant amount of subject matter that you have learned before. Although you are not expected to remember every detail of each of those topics, you are expected to have a working knowledge of the subject matter. To help you remember some of the prerequisite science that will enable you to be more successful in this course, you are responsible for completing the attached packet of work prior to the start of the 2017-2018 school year. To accomplish this, you can refresh your memory of the specific concepts by reading the factoids provided in the packet, or you can do your own research. Answer the questions in each section that follow. Upon your return to school in September, you will be provided the answers and then tested on the material.

PART 2: Tragedy of the Commons

Your second objective is to find, print out, read, and annotate ecologist Garrett Hardin's article "Tragedy of the Commons". Remember: to annotate does not mean to just underline. The proper way to annotate a reading is to make notes either in the margins available or on separate pages that emphasize key points in the reading. Your annotations should also include definitions of words you do not know the meaning to, or clarification of references made that you are unfamiliar with. This assignment is typical of the work expected of you at the collegiate level. When you return in September, be ready to hand in this annotated article. Also be ready, with annotated article in hand, to answer questions based on the content and terminology used in the reading.

PART 1: Review of Previously Acquired Knowledge

As you will come to experience, Environmental Science is a true synthesis of many fields of study. In order for a more smooth transition into your upcoming coursework in Environmental Science, it is essential that you reacquaint yourself with subject matter that you have learned previously so that you can better build upon that knowledge. This is not to say that we will not explore this material together. We will spend time throughout the year relearning and expanding upon the information and sample questions included in this packet, but there is an expectation that you demonstrate familiarity with the material.

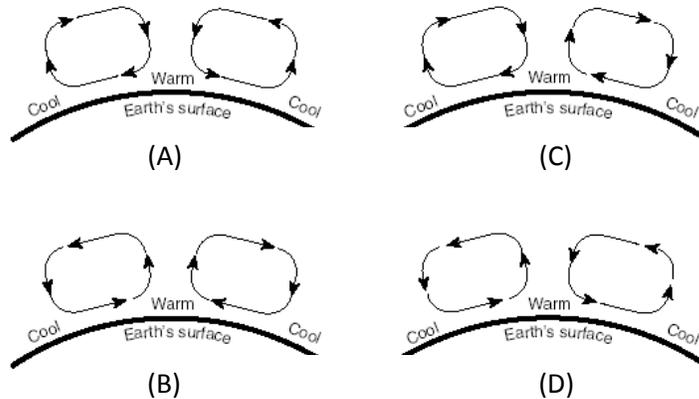
So... with that being said, the first part of your summer assignment is to learn the bolded factoids related to Earth Science, Biology, and Chemistry. Then, by using the factoids, your prior knowledge, and in some cases, further research of your own, you will answer the questions that follow. The lists and questions provided in this packet are not all-inclusive of prior knowledge that you will be asked to call upon, but it will help get a jumpstart on next year's work. When we return in September, you will be given the answers to the questions and then tested on the material. Good luck getting started!

EARTH SCIENCE

- 1. Layers and composition of the atmosphere, the hydrosphere, and the lithosphere**
- 2. Greenhouse gases (example: CO₂) from burning of fossil fuels trap outgoing heat energy causing Earth to warm**
- 3. Parts of the hydrologic cycle: evaporation, transpiration, runoff, condensation, precipitation, infiltration**
- 4. The Earth's tilt and revolution around the Sun cause seasonal changes**
- 5. Factors affecting climate include, but are not limited to: latitude, altitude, nearness to a large body of water, planetary winds, ocean currents, and mountain barriers.**
- 6. Planetary wind belts create wet and dry belts at specific latitudes - the locations of deserts and rainforests correlate well with these moisture belts.**
- 7. Planetary winds and ocean currents bend as a result of the Earth's rotation. This is known as the Coriolis Effect.**
- 8. El Niño: Know what occurs under normal climate conditions and during an El Niño event**
- 9. Mountain barriers create distinct climates on windward (cool and wet) and leeward (warm and dry) sides as a result of the orographic effect**
- 10. Rocks are classified as igneous, sedimentary, or metamorphic based on how they were formed.**
- 11. Plate boundaries are zones of crustal activity where the lithospheric plates have divergent, convergent, and transform motions.**

9. The ozone layer helps life on Earth because ozone
- (A) modifies the normal El Niño weather pattern
 - (B) reflects insolation from the Sun
 - (C) absorbs damaging ultraviolet radiation from the Sun
 - (D) deflects winds from a straight line to a curved path
10. The cross sections below show different patterns of air movement in Earth's atmosphere. Air temperatures at Earth's surface are indicated in each cross section.

Which cross section shows the most likely pattern of air movement in Earth's atmosphere that would result from the surface air temperatures shown?

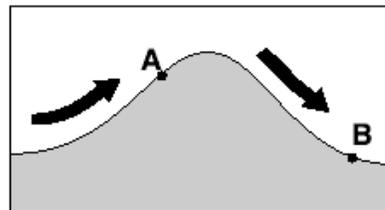


11. In New York State, summer is warmer than winter because in summer New York State has
- (A) fewer hours of daylight and receives low-angle insolation
 - (B) fewer hours of daylight and receives high-angle insolation
 - (C) more hours of daylight and receives low-angle insolation
 - (D) more hours of daylight and receives high-angle insolation

12. The arrows on the cross section below show the prevailing wind that flows over a mountain. Points A and B represent locations on opposite sides of the mountain.

Which statement correctly describes the differences in the climates of locations A and B?

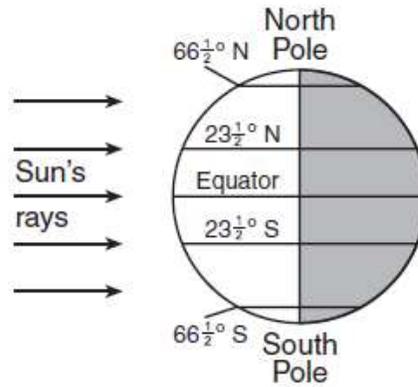
- (A) Location A is warmer and drier than location B.
- (B) Location A is cooler and wetter than location B.
- (C) Location B is warmer and wetter than location A.
- (D) Location B is cooler and drier than location A.



13. Large oceans moderate the climatic temperatures of surrounding coastal land areas because the temperature of ocean water changes
- (A) rapidly, due to water's low specific heat
 - (B) rapidly, due to water's high specific heat
 - (C) slowly, due to water's low specific heat
 - (D) slowly, due to water's high specific heat

14. Most insolation striking a smooth, light-colored, solid surface is
 (A) refracted (C) reflected
 (B) transmitted (D) absorbed

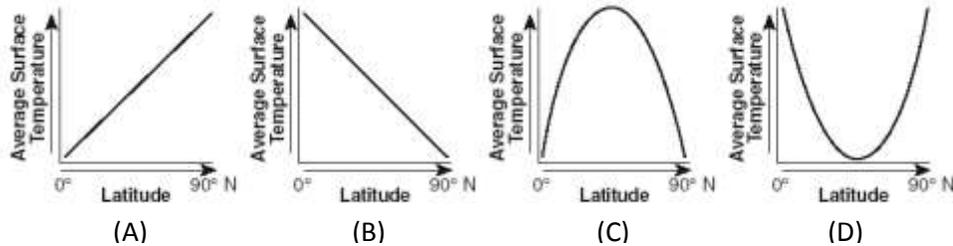
15. The diagram to the right represents Earth at a specific position in its orbit as viewed from space. The shaded area represents nighttime.



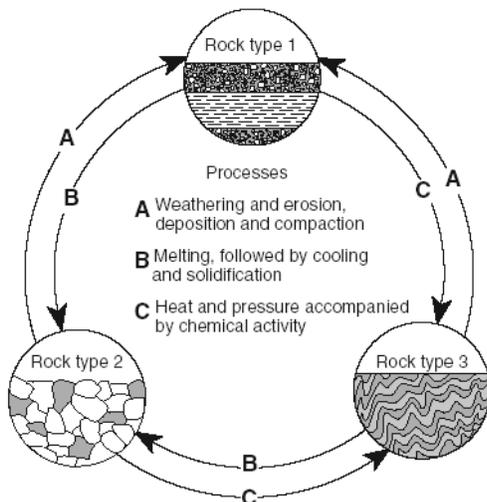
Which Earth latitude receives the greatest intensity of insolation when Earth is at the position shown in the diagram?

- (A) 0° (C) 66° N
 (B) 23° N (D) 90° N

16. Which graph best represents the general relationship between latitude and average surface temperature?



17. The diagram below represents geological processes that act continuously on Earth to form different rock types.



Which table correctly classifies each rock type?

Rock Type	Classification
1	sedimentary
2	metamorphic
3	igneous

(A)

Rock Type	Classification
1	metamorphic
2	igneous
3	sedimentary

(C)

Rock Type	Classification
1	sedimentary
2	igneous
3	metamorphic

(B)

Rock Type	Classification
1	igneous
2	metamorphic
3	sedimentary

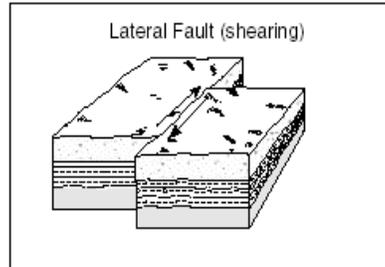
(D)

18. Earth's crust is composed mainly of the elements
 (A) silicon and oxygen (C) iron and nickel
 (B) hydrogen and helium (D) nitrogen and phosphorus

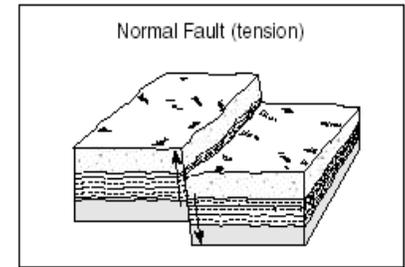
19. Compared to the continental crust, the oceanic crust is
 (A) less dense and thinner (C) more dense and thinner
 (B) less dense and thicker (D) more dense and thicker

20. The diagrams show four major types of fault motion occurring in Earth's crust.

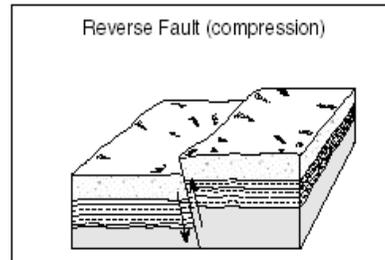
Which type of fault motion best matches the general pattern of crustal movement at California's San Andreas fault?



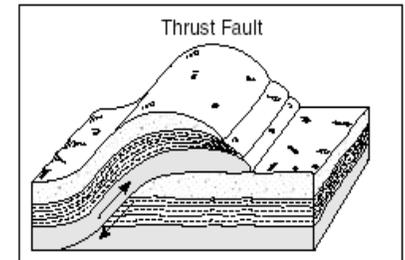
(A)



(C)



(B)

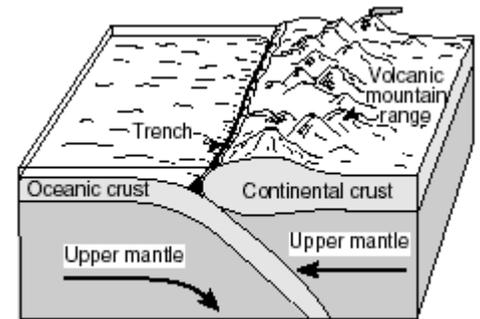


(D)

21. The block diagram below shows the boundary between two tectonic plates.

Which type of plate boundary is shown?

- (A) divergent (C) transform
 (B) convergent (D) complex



(Not drawn to scale)

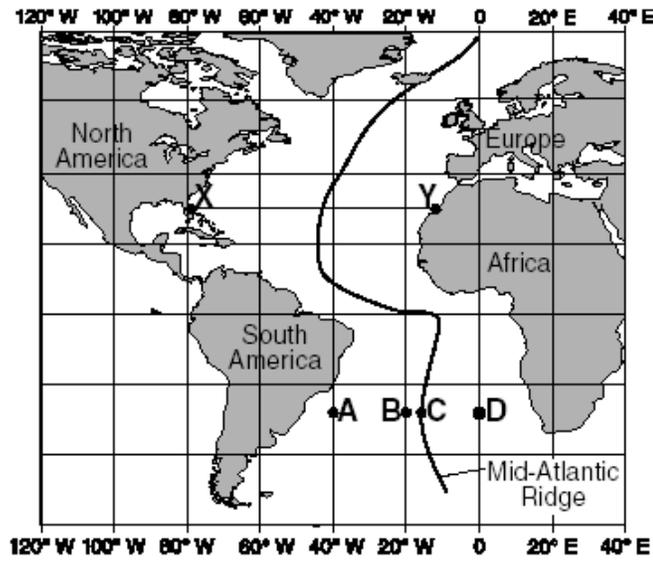
22. The time line below represents the entire geologic history of Earth.



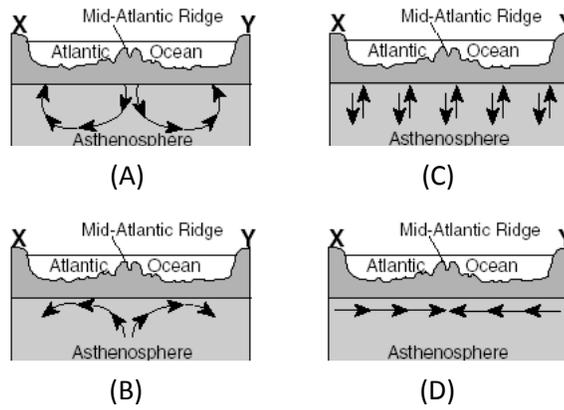
Which letter best represents the first appearance of humans on Earth?

- A B C D

Base your answer on the map of the Mid-Atlantic Ridge shown below.
 Points A through D are locations on the ocean floor. Line XY connects locations in North America and Africa.

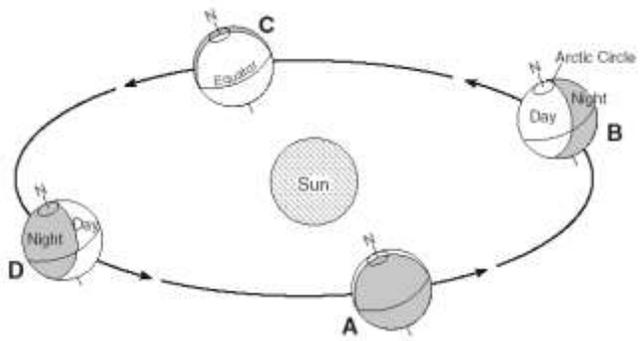


23. In which cross section do the arrows best show the convection occurring within the asthenosphere beneath line XY?



24. Which lettered position indicates the time when Earth's Northern Hemisphere is experiencing the beginning of the summer season?

- A B C D

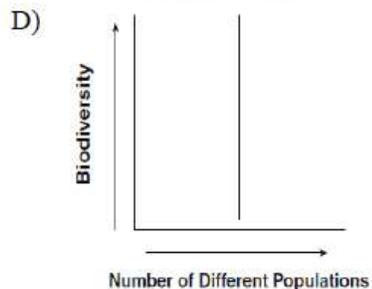
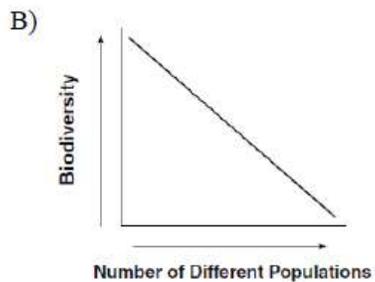
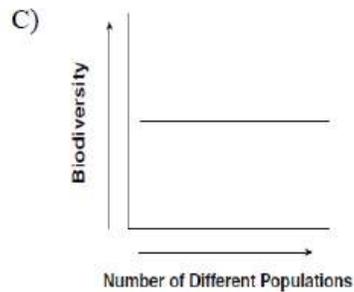
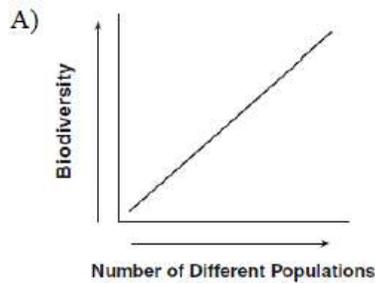


25. Earth's seasons are caused by
 (A) Earth's tilt and rotation
 (B) Earth's tilt and revolution

(C) the wobbling of the Earth's axis
 (D) the distance between Earth and the Sun

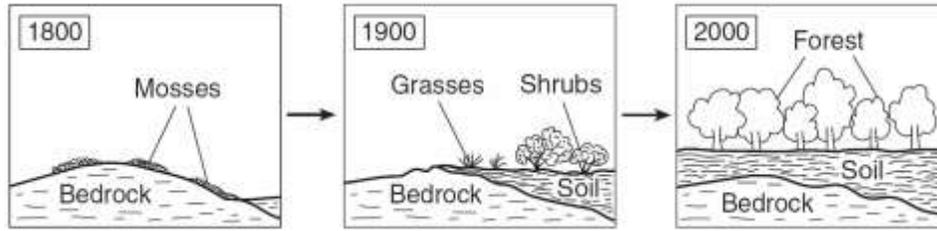
29. The abiotic factors of a given area include the
 (A) animals (C) plants
 (B) climatic conditions (D) decomposers
30. Which term refers to the behavior of two species attempting to use the same living space, food source, and water source?
 (A) saprophytic (C) predatory
 (B) competitive (D) symbiotic
31. During its annual migration, the red knot, a medium-size shorebird, flies the entire length of North and South America. During one critical stop to feed on the eggs of horseshoe crabs, the birds nearly double their body mass. The relationship between the red knot and the horseshoe crab is that of
 (A) parasite–host (C) scavenger–producer
 (B) consumer–producer (D) predator–prey

32. Which graph best shows the relationship between the amount of biodiversity and the number of different populations in an ecosystem?



33. Which relationship best describes the interactions between lettuce and a rabbit?
 (A) predator — prey (C) parasite — host
 (B) producer — consumer (D) decomposer — scavenger

34. This diagram below represents a process that occurs in nature.



The diagram can be used to illustrate the

- (A) effects of reduced competition between different types of plant life
- (B) effect of human intervention on a stable ecosystem
- (C) ecological succession from bare rock to stable ecosystem
- (D) evolution of mosses to trees over 200 years

35. Two interactions between organisms are shown in the table below. X and Y do *not* represent the same organisms in the two interactions

	Organism X	Organism Y
Interaction 1	predator	prey
Interaction 2	parasite	host

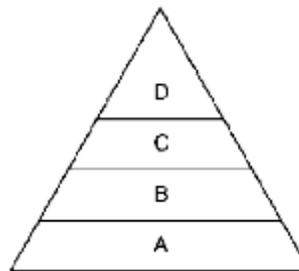
Which statement best describes the relationship between organism X and organism Y in each interaction?

- (A) Organism X is positively affected by the relationship and organism Y is negatively affected.
- (B) Organism X is negatively affected by the relationship and organism Y is positively affected.
- (C) Both organisms are positively affected by the relationship.
- (D) Both organisms are negatively affected by the relationship

The diagram below represents an energy pyramid.

36. Which organisms would *most likely* be found at level A?

- (A) birds
- (B) worms
- (C) algae
- (D) mammals



37. Which represents the correct flow of energy through an ecosystem?

- (A) consumer, decomposer, producer, Sun
- (B) producer, consumer, decomposer, Sun
- (C) Sun, decomposer, consumer, producer
- (D) Sun, producer, consumer, decomposer

38. Desert plants have long root systems to be able to absorb as much water as possible in the dry desert. This description is an example of

- (A) natural selection
- (B) homeostasis
- (C) adaptation
- (D) symbiosis

Use the diagram to the right to answer questions 39 through 41.

39. Which of the following combinations are all consumers?

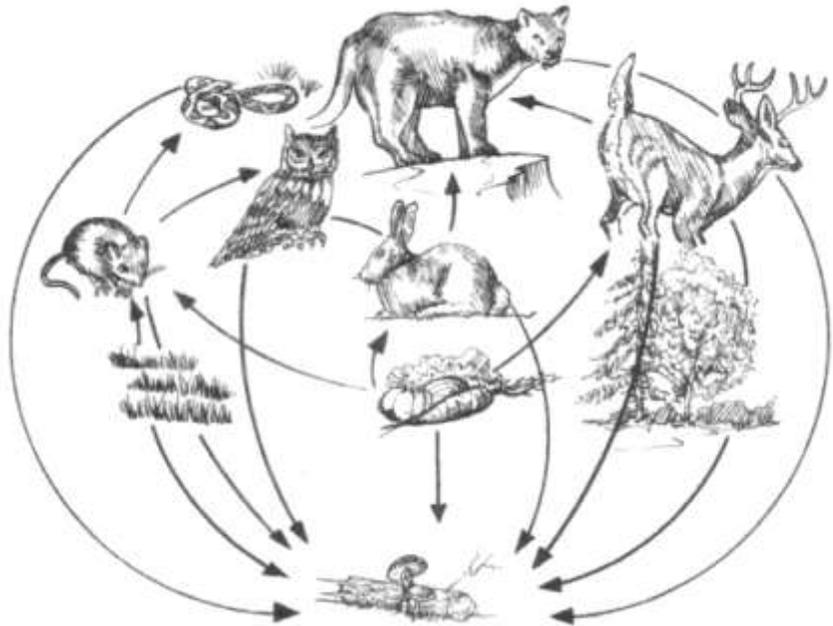
- (A) deer, rabbit, owl
- (B) grass, snake, mouse
- (C) vegetables, rabbit, owl
- (D) tree, vegetables, grass

40. Which organisms are in competition for the vegetables?

- (A) snakes and mice
- (B) rabbits and owls
- (C) deer and rabbits
- (D) mountain lions and deer

41. If the number of owls was to increase, the number of mice would

- (A) increase
- (B) decrease
- (C) remain the same



42. The reason that producers are at the base of almost all energy pyramids and food chains is

- (A) most organisms build their homes on or near producers
- (B) plants are the least abundant organisms on Earth
- (C) producers are strong and form a good base for the food chain or pyramid
- (D) most organisms use food, directly or indirectly, made by the producers

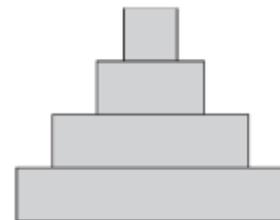
43. A food chain represents

- (A) a list of what one organism eats
- (B) links of what animals live together
- (C) the flow of energy from one organism to another
- (D) the way that food is produced in an ecosystem

44. A diagram frequently used in ecological studies is shown to the right.

This diagram can be used to represent the

- (A) dependency of animal survival on physical conditions in an ecosystem
- (B) loss of energy from various groups of organisms in an ecosystem
- (C) competition among species in an ecosystem
- (D) mechanisms that maintain homeostasis in the plants in an ecosystem



45. Carbon dioxide makes up less than 1 percent of Earth's atmosphere, and oxygen makes up about 21 percent. These percentages are maintained most directly by

- (A) the ozone shield
- (B) synthesis and digestion
- (C) energy recycling in ecosystems
- (D) photosynthesis and respiration

CHEMISTRY

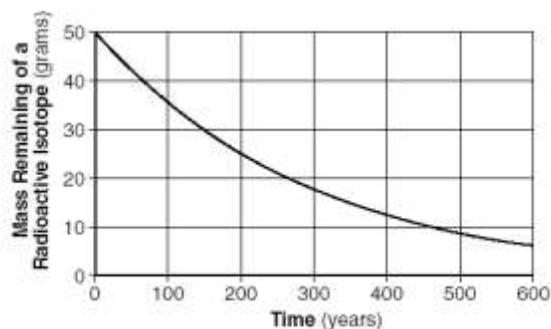
- 1. First Law of Thermodynamics: energy is neither created nor destroyed, but may be converted from one form to another**
 - 2. Second Law of Thermodynamics: when energy is changed from one form to another, some useful energy is always degraded into lower quality energy (usually heat)**
 - 3. pH (potential of hydrogen) is a numeric scale used to specify the acidity or basicity of an aqueous solution. Solutions with a pH less than 7 are acidic and solutions with a pH greater than 7 are basic. A pH of 7 is considered neutral.**
 - 4. Radioactive elements undergo nuclear decay at a predictable rate.**
 - 5. Dimensional Analysis / Unit Cancellation: Be able to handle mathematical problems using this organized technique.**
-
46. During all chemical reactions, mass, energy, and charge are
 - (A) absorbed
 - (B) conserved
 - (C) formed
 - (D) released
 47. Which element is present in every organic compound?
 - (A) carbon
 - (B) fluorine
 - (C) nitrogen
 - (D) oxygen
 48. Which of the following pH values indicates the most acidic substance?
 - (A) 4.2
 - (B) 5.6
 - (C) 7.0
 - (D) 9.5
 49. Which change in pH represents a hundredfold increase in the concentration of hydrogen ions in a solution?
 - (A) pH 1 to pH 2
 - (B) pH 1 to pH 3
 - (C) pH 2 to pH 1
 - (D) pH 3 to pH 1
 50. Methane has the chemical formula
 - (A) CO_2
 - (B) CH_4
 - (C) $\text{C}_6\text{H}_{12}\text{O}_6$
 - (D) NH_3
 51. Which is the correct formula for sulfuric acid?
 - (A) HS
 - (B) HSO_3
 - (C) H_2SO_4
 - (D) H_2S

52. Which of the following is an example of potential energy?
- (A) moving masses of air flowing from high concentration to low concentration
 - (B) electrons moving across a wire
 - (C) heat flowing from a body of high temperature to a body low temperature
 - (D) chemical bonds of gasoline molecules
53. According to the First Law of Thermodynamics,
- (A) energy can neither be created nor destroyed, only changed in form
 - (B) energy can be destroyed but not created
 - (C) the entropy of the universe is continually fluctuating between zero and infinity
 - (D) the entropy of the universe tends to increase
54. According to the Second Law of Thermodynamics,
- (A) energy can neither be created nor destroyed, only changed in form
 - (B) energy can be destroyed but not created
 - (C) the entropy of the universe is continually fluctuating between zero and infinity
 - (D) the entropy of the universe tends to increase

55. The graph below shows the radioactive decay of a 50-gram sample of a radioactive isotope.

According to the graph, what is the half-life of this isotope?

- (A) 100 years
- (B) 150 years
- (C) 200 years
- (D) 300 years



56. A whalebone that originally contained 200 grams of radioactive carbon-14 now contains 25 grams of carbon-14. How many carbon-14 half-lives have passed since this whale was alive?
- (A) 1
 - (B) 2
 - (C) 3
 - (D) 4
57. An original sample of the radioisotope fluorine-21 had a mass of 80.0 milligrams. Only 20.0 milligrams of this original sample remain unchanged after 8.32 seconds. What is the half-life of fluorine-21?
- (A) 1.04 sec
 - (B) 2.08 sec
 - (C) 4.16 sec
 - (D) 8.32 sec
58. Which risk is associated with using nuclear fission to produce energy in a power plant?
- (A) depletion of hydrocarbons
 - (B) depletion of atmospheric oxygen
 - (C) exposure of workers to radiation
 - (D) exposure of workers to sulfur dioxide

For each of the following questions, show all work done to reach the answer. If there is a formula: write the formula, substitute data, and solve with correct units. If dimensional analysis or proportion work is required, clearly show all the steps that lead to the answer.

59. Using dimensional analysis (or by at least showing your work), determine the average fuel consumption in gallons (per year) of the average car given the following:

Given: The average car is driven 15,000 miles per year.

The mileage rate for the average car is 20 miles per gallon of gasoline.

60. How many ppm (parts per million) of salt are found in a 2.0% salt solution?

61. If you were the manager of a sewage treatment plant, you might be responsible for diluting treated sewage to safe levels in order to discharge them legally. If a one liter sample of the treated sewage had a concentration of 5000ppm, what would be the volume of the solution when diluted to an acceptable concentration of 5 ppm?

Formula: Concentration 1 x Volume 1 = Concentration 2 x Volume 2 ($C_1V_1 = C_2V_2$)

62. 2 milliliters of ink can print 100 pages of text. If you had 20 gallons of ink then how many pages could you print?
Given: 1 gallon = 3.79 liters