

## **ANSWERS --CHAPTER 2 PREPARING FOR THE AP EXAM**

### **MULTIPLE CHOICE QUESTIONS**

- Which of the following statements about atoms and molecules is correct?
  - The mass number of an element is always less than its atomic number.
  - Isotopes are the result of varying numbers of neutrons in atoms of the same element.**
  - Ionic bonds involve electrons while covalent bonds involve protons.
  - Inorganic compounds never contain the element carbon.
  - Protons and electrons have roughly the same mass.
- Which of the following does not demonstrate the law of conservation of matter?
  - $\text{CH}_4 + 2 \text{O}_2 \rightarrow \text{CO}_2 + 2 \text{H}_2\text{O}$
  - $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
  - $2 \text{NO}_2 + \text{H}_2\text{O} \rightarrow \text{HNO}_3 + \text{HNO}_2$
  - $\text{PbO} + \text{C} \rightarrow 2 \text{Pb} + \text{CO}_2$**
  - $\text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O}$
- Pure water has a pH of 7 because
  - its surface tension equally attracts acids and bases.
  - its polarity results in a molecule with a positive and a negative end.
  - its ability to dissolve carbon dioxide adjusts its natural pH.
  - its capillary action attracts it to the surfaces of solid substances.
  - its  $\text{H}^+$  concentration is equal to its  $\text{OH}^-$  concentration.**
- Which of the following is not a type of organic biological molecule?
  - Lipids
  - Carbohydrates
  - Salts**
  - Nucleic acids
  - Proteins
- A wooden log that weighs 1.00 kg is placed in a fireplace. Once lit, it is allowed to burn until there are only traces of ash, weighing 0.04 kg, left. Which of the following best describes the flow of energy?
  - The potential energy of the wooden log was converted into the kinetic energy of heat and light.**
  - The kinetic energy of the wooden log was converted into 0.04 kg of ash.
  - The potential energy of the wooden log was converted into 1.00 J of heat.
  - Since the ash weighs less than the wooden log, matter was converted directly into energy.
  - The burning of the 1.00 kg wooden log produced 0.96 kg of gases and 0.04 kg of ash. 40 *Friedland & Relyea Environmental Science for AP\** © BFW Publishers

6. Consider a power plant that uses natural gas as a fuel to generate electricity. If there are 10,000 J of chemical energy contained in a specified amount of natural gas, then the amount of electricity that could be produced would be

(a) greater than 10,000 J because electricity has a higher energy quality than natural gas.

**(b) something less than 10,000 J, depending on the efficiency of the generator.**

(c) greater than 10,000 J when energy demands are highest; less than 10,000 J when energy demands are lowest.

(d) greater than 10,000 J because of the positive feedback loop of waste heat.

(e) equal to 10,000 J because energy cannot be created or destroyed.

7. A lake that has been affected by acid rain can have a pH of 4. How many more times acidic is the lake than seawater? (See Figure 2.8 on page 34.)

(a) 4

(b) 10

(c) 100

(d) 1,000

**(e) 10,000**

8. An automobile with an internal combustion engine converts the potential energy of gasoline (44 MJ/kg) into the kinetic energy of the moving pistons. If the average internal combustion engine is 10 percent efficient and 1 kg of gasoline is combusted, how much potential energy is converted into energy to run the pistons?

(a) 39.6 MJ

(b) 20.0 MJ

**(c) 4.4 MJ**

(d) Depends on the capacity of the gas tank

(e) Depends on the size of the engine

9. If the average adult woman consumes approximately 2,000 kcal per day, how long would she need to run in order to utilize 25 percent of her caloric intake, given that the energy requirement for running is 42,000 J per minute?

(a) 200 minutes

**(b) 50 minutes** (c) 5 minutes

(d) 0.05 minutes

(e) 0.012 minutes

10. The National Hurricane Center studies the origins and intensities of hurricanes over the Atlantic and Pacific oceans and attempts to forecast their tracks, predict where they will make landfall, and assess what damage will result. Its systems analysis involves

(a) changes within a closed system.

(b) inputs and outputs within a closed system.

(c) outputs only within an open system.

(d) inputs from a closed system and outputs in an open system.

**(e) inputs, outputs, and changes within an open system.** © BFW Publishers Chapter 2: Environmental Systems 41

11. Based on the graph on page 50 of your text, which of the following is the best interpretation of the data?

- (a) The atmospheric carbon dioxide concentration is in steady state.
- (b) The output of carbon dioxide from the atmosphere is greater than the input into the atmosphere.
- (c) The atmospheric carbon dioxide concentration appears to be decreasing.
- (d) The input of carbon dioxide into the atmosphere is greater than the output from the atmosphere.**
- (e) The atmospheric carbon dioxide concentration will level off due to the annual cycle.

12. The diagram on page 50 of your text represents which of the following concepts?

- (a) A negative feedback loop, because melting of permafrost has a negative effect on the environment by increasing the amounts of carbon dioxide and methane in the atmosphere.
- (b) A closed system, because only the concentrations of carbon dioxide and methane in the atmosphere contribute to the permafrost thaw.
- (c) A positive feedback loop, because more carbon dioxide and methane in the atmosphere result in greater permafrost thaw, which releases more carbon dioxide and methane into the atmosphere.**
- (d) An open system that resists change and regulates global temperatures.
- (e) Steady state, because inputs and outputs are equal.

13. Which of the following statements about the Comprehensive Everglades Restoration Plan is not correct?

- (a) Human and natural systems interact because feedback loops lead to adaptations and changes in both systems.
- (b) Water conservation will alter land uses and restore populations of aquatic and marsh organisms.
- (c) Improvements in waste treatment facilities and restrictions on agricultural chemicals will reduce the nutrients and toxins in the water that reaches the Everglades.
- (d) Adaptive management will allow for the modification of strategies as changes occur in this complex system.
- (e) The Florida Everglades is a closed system that includes positive and negative feedback loops and is regulated as such.**

14. Which of the following would represent a system in steady state?

I The birth rate of chameleons on the island of Madagascar equals their death rate.

II Evaporation from a lake is greater than precipitation and runoff flowing into the lake.

III The steady flow of the Colorado River results in more erosion than deposition of rock particles.

- (a) I only**
- (b) II only
- (c) III only
- (d) I and II
- (e) I and III