Developing Possible Solutions

1 Some people see the benefit of wind energy as a clean alternative to fossil fuels for energy production. Others believe it is dangerous for migratory birds. These opinions best illustrate that decisions about alternate energy sources
(1) will usually favor older methods of energy production over newer methods
(2) must be made by weighing the risks and costs against the benefits
(3) must be made by taking into account the present needs of the citizens without looking toward the future
(4) should be the responsibility of each individual

2 Certain animal species that are endangered or threatened have been cloned. Closely related species have been used to carry the embryos of the endangered species. This process of increasing the population size of a species in danger of becoming extinct is an example of a
(1) natural method to decrease ecosystem stability
(2) natural method of controlling the population of an endangered species
(3) technological fix to increase habitat destruction
(4) technological fix for the problem of endangered species

3 Overfishing has depleted the rich harvests of fish from the oceans. As a solution, a large industry that cultivates shrimp and fish in warm coastal ponds has been developed. To make way for these ponds, mangrove forests are cut down. Local organisms are displaced. In order for people to decide if this new fish farming technology is a good long-term solution, they must consider
(1) the risks and costs as well as the benefits
(2) that the mangrove forests would probably die off someday anyway
(3) that food production is always more important than any other concern
(4) the number of fish produced in the first year as compared with ocean fishing

4 Scientists in Brazil have developed specific fertilizers and special breeds of soybeans and corn so crops can grow on large areas of tropical lands. This is valuable because farmers can help to feed the growing human population and strengthen the economy. However, trade-offs must be considered because farming on tropical lands can also
(1) add helpful microorganisms to the soil
(2) remove oxygen from the atmosphere
(3) reduce populations of native species
(4) reduce mutations and disease in wildlife populations

5 Traditional lightbulbs are only 10% efficient. Ninety percent of the energy they use is converted to heat. Modern lightbulbs are much more efficient, but may cost three times as much as traditional lightbulbs. Consumers who switch to modern lightbulbs are most likely
(1) spending more money for no good reason
(2) trying to stop pollution of the oceans
(3) trading a short-term cost for long-term savings
(4) helping traditional lightbulb factories employ people

Base your answer to question 6 on the information below and on your knowledge of biology.

In China, farmers switched from growing conventional cotton, which required spraying with insecticides 15 times each year, to a genetically modified cotton variety called Bt cotton. The Bt cotton produces a protein toxic to the insects that destroy the cotton crop. Since the switch to Bt cotton, the use of chemical insecticides has decreased by 60%.

6 An advantage of growing the genetically modified Bt cotton instead of conventional cotton is that growing Bt cotton could
(1) result in an increase in populations of insects that are beneficial
(2) result in an increase in the size of insect populations that are resistant to the Bt protein
(3) lead to an increase in the survival rates of insects that eat cotton
(4) lead to an increase in the use of insecticides that protect cotton from insects

7 A company that produces paint is planning to build a small factory in a rural community. The factory would provide many needed jobs. Before the community agrees to allow the factory to be built, the community should
(1) investigate the use of paint as a method of biological control
(2) consider just the economic advantages of building the new factory
(3) assess the risks of the new factory and compare these to the benefits
(4) insist the factory use finite resources located in the community

8 When deciding on new environmental policies and laws, which term is used to describe the comparison between benefits and costs of human activities?
(1) technology
(2) trade-off
(3) climate change
(4) industrialization

Base your answer to question 9-12 on the information below and on your knowledge of biology.

Environmentalists and public health experts are warning the public about some chemicals that they come in contact with daily, such as PBDEs and phthalates. PBDEs are used to make children's clothing flame retardant and phthalates are used to manufacture many plastic bottles, toys, and cosmetics. Both of these chemicals accumulate in the body and endanger health.

In one family tested, the young children had PBDE levels seven times that of their parents. These levels were two to three times the levels that caused thyroid problems in animals. Animal studies have shown that phthalates cause reproductive defects. Even at low levels, phthalates may contribute to infertility and impaired testes in males. Both chemicals can cause nervous system damage.

Biomonitoring is a technology used to test for levels of industrial chemicals found in the body. The technology is less than ten years old, but results from animal studies led some countries to ban PBDEs in 2004.

Presently, the United States EPA (Environmental Protection Agency) does not require chemical manufacturers to conduct human toxicity studies prior to approval for use. If concerns regarding risk or exposure arise during the approval process, the EPA can ask for additional testing. Additional testing occurs for approximately 10 percent of the new chemicals submitted each year. The EPA has also set up voluntary testing programs with major chemical manufacturers to rate some of the 3,000 most widely used chemicals.

9-12 The use of industrial chemicals, such as PBDEs and phthalates, provides both advantages and disadvantages. Discuss the disadvantages of using these chemicals. In your answer, be sure to:

• state one specific reason why public health officials are concerned about the use of these chemicals [1]

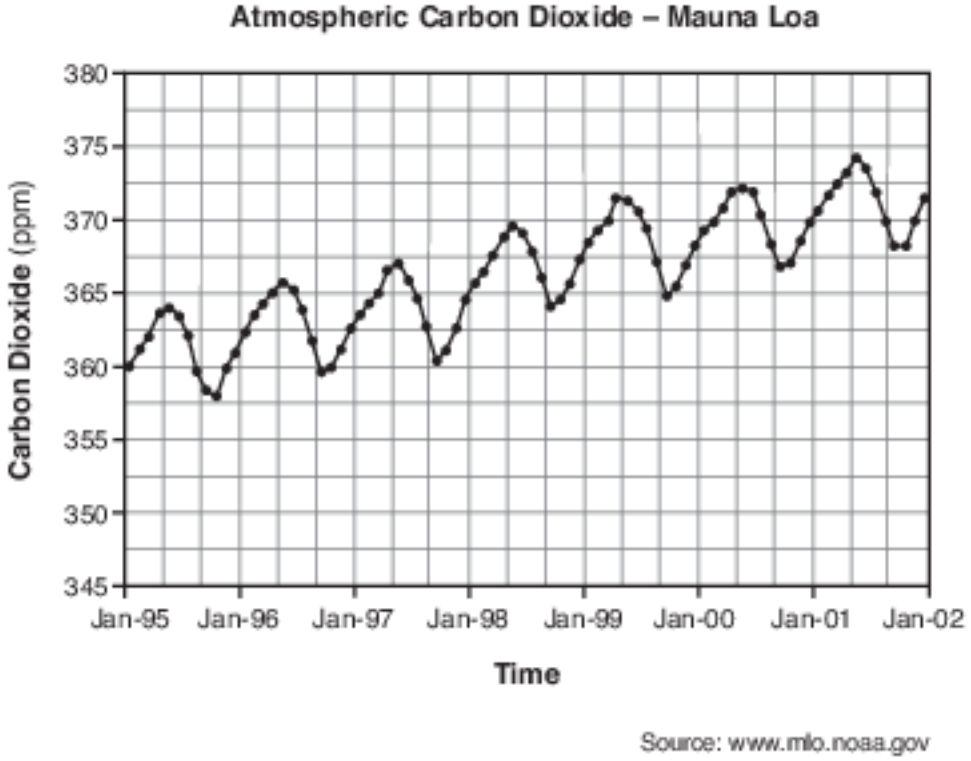
• identify the technique used to determine exposure levels to these chemicals in humans [1]

• state one possible reason why young children might have higher levels of exposure to these chemicals than do adults [1]

• state one possible reason why chemical manufacturers might participate in the voluntary testing programs set up by the EPA [1]

Base your answer to question 13-16 on the information and graph below and on your knowledge of biology.

At an observatory in Mauna Loa, Hawaii, scientists have been measuring and collecting data related to changes in the atmosphere since the 1950s. The remote location of the observatory makes it ideal for studying atmospheric conditions that can cause climate change. One specific measurement taken is the amount of atmospheric carbon dioxide. Information for a 7-year period is shown in the graph below.



13-16 Analyze the data shown in the graph. In your answer, be sure to:

- state the overall relationship between time and carbon dioxide levels [1]
- state one possible cause for the overall change in the carbon dioxide levels shown in the graph [1]
- identify the biological process that might account for the decreases in carbon dioxide levels [1]
- identify two actions carried out by humans that could lower carbon dioxide levels [1]

Base your answer to question 17 on the information below and on your knowledge of biology.

Bisphenol-A (BPA), is an industrial chemical commonly added to disposable, plastic water bottles to make them sturdier. BPA has been shown to inhibit the development of tadpoles into frogs. Some tadpoles exposed to high levels of BPA develop into frogs without legs. Others, when exposed to the chemical as tadpoles, fail to reabsorb their tails and thus grow into frogs with significantly long tails.

17 State one specific way humans can help decrease the exposure of animals to bisphenol-A. [1]

18 State one possible negative impact of importing a natural predator to control a pest. [1]

Base your answers to questions 19 on the information below and on your knowledge of biology.

New York State relies on natural gas for 24% of its energy supply. It is estimated that large deposits of natural gas are located in New York State. It is possible to extract the gas via high-volume hydraulic fracturing (hydrofracking). Hydrofracking involves freeing the natural gas by using a large amount of water treated with chemicals, which produces large quantities of waste products. Some people are in favor of hydrofracking, while others are against it. One side is concerned about the negative effect it will have on the environment. The other side points out the potential benefits it might provide.

19 Describe a trade-off that must be considered in the decision whether to move forward with hydrofracking. [1]

Base your answers to questions 20 on the information below and on your knowledge of biology.

Mosquito Technologies of New York, Inc., has developed a Mosquito Killing System (MKS) to help control the mosquito population and reduce the transmission of West Nile Virus. The MKS works by taking advantage of the natural hunting strategies of mosquitoes, such as heat sensing and carbon dioxide detection. Beneficial insects do not use the same hunting strategies. The MKS unit produces heat and releases carbon dioxide in cycles, mimicking the breathing and body temperatures of humans, pets, and other warm-blooded animals. This attracts the mosquitoes to the device and, once inside, a vacuum pulls them in, where they pass through an electrocution grid, killing them. The mosquito remains are then returned to the environment through the bottom of the unit.

The unit contains a solar-powered photocell that turns the device on at dusk and turns it off at dawn.

20 A town wants to buy a number of MKS devices to solve their mosquito problem. One individual is concerned that this device could have a negative effect on insects that are beneficial to the environment. Based on the information given, is this a valid concern? Support your answer. [1]

Base your answers to questions 21 on the information below and on your knowledge of biology.

Solid Waste Management Act of 1988

In the Solid Waste Management Act of 1988, the New York State legislature established our State Solid Waste Management Policy. The solid waste management priorities in New York State are:

(a) first, to reduce the amount of solid waste generated; (b) second, to reuse material for the purpose for which it was originally intended or to

recycle material that cannot be reused; (c) third, to recover, in an environmentally acceptable manner, energy from solid waste

that can not be economically and technically reused or recycled; and (d) fourth, to dispose of solid waste that is not being reused, recycled or from which

energy is not being recovered, by land burial or other methods approved by the department.

21 Identify one factor that would hinder recycling efforts within a community and state how it could be corrected. [1]

Factor:

Correction:

Answer Keys

1 2

2 4

3 1

4 3

5 3

6 1

7 3

8 2

9-12 The student's response to the bulleted items in the question need not appear in the following order.

- 9. Allow 1 credit for stating one specific reason why public health officials are concerned about the use of these chemicals. Acceptable responses include, but are not limited to:
- — These chemicals have been found to cause health problems in animals and in humans.
- — PBDEs have been found to cause thyroid problems and nervous system damage in animals.
- — Phthalates may contribute to infertility.
- 10. Allow 1 credit for identifying the technique used to determine exposure levels to these chemicals in humans as biomonitoring.
- 11. Allow 1 credit for stating one possible reason why young children might have higher levels of exposure to these chemicals than do adults. Acceptable responses include, but are not limited to:
- — Young children have more contact with the products that contain these chemicals.
- — Young children play with more toys/use baby bottles.
- — Children wear flame-retardant clothing.
- 12. Allow 1 credit for stating one possible reason why chemical manufacturers might participate in the voluntary testing programs set up by the EPA. Acceptable responses include, but are not limited to:
- — They may participate to prevent being sued in the future.
- — They may participate because it improves their public image.
- — They may participate to make sure their product is safe.

13-16 The student's response to the bulleted items in the question need not appear in the following order.

- 13. Allow 1 credit for stating the overall relationship between time and carbon dioxide levels.
- Acceptable responses include, but are not limited to:
- — As time increased, the levels of carbon dioxide increased.
- — As time went by, the amount of carbon dioxide increased.
- — Carbon dioxide production fluctuated with the seasons.
- 14. Allow 1 credit for stating one possible cause for the overall change in the carbon dioxide levels
- shown in the graph. Acceptable responses include, but are not limited to:
- — increase in human population
- — fewer photosynthetic organisms
- — deforestation
- — increased use of fossil fuels
- — increased volcanic activity
- Note: Do not accept just "pollution" without a source or explanation.
- 15. Allow 1 credit for identifying the biological process that might account for the decreases in carbon
- dioxide levels. Acceptable responses include, but are not limited to:
- — photosynthesis
- — autotrophic nutrition
- 16. Allow 1 credit for identifying two actions carried out by humans that could lower carbon dioxide
- levels. Acceptable responses include, but are not limited to:
- — planting more trees
- — reducing the use of fossil fuels
- — car pool/use public transportation/reduce driving
- — recycling
- — using alternative energy sources

17 Allow 1 credit. Acceptable responses include, but are not limited to:

- — use reusable water bottles not made with BPA
- — pass legislation that outlaws the manufacturing of products with BPA
- — ensure that water bottles are not littered in the environment
- — recycle disposable water bottles
- — use metal/glass containers
- — control the disposal of industrial waste

18 Allow 1 credit. Acceptable responses include, but are not limited to:

- — The predator might feed on beneficial organisms.
- — might outcompete other species of predators
- — might become a pest
- — They might overpopulate and wipe out prey species.
- — might bring in a disease
- — could alter the existing ecosystem

19 Allow 1 credit. Acceptable responses include, but are not limited to:

- — The decision involves balancing the economic gains and the possible environmental damage.
- — Fracking will provide people with more natural gas but might damage the environment.
- — There might be more jobs, but there is a possibility for increased water pollution.

20 Allow 1 credit for stating whether or not this is a valid concern and supporting the answer.

- Acceptable responses include, but are not limited to:
- — No. This is not a valid concern. The MKS device uses heat and carbon dioxide to attract
- only insects that prey on people and other warm-blooded animals.
- — No. Environmentally beneficial insects would not be attracted to the device.
- — Yes. Some beneficial insects might accidentally enter the device.
- — No. Beneficial insects use different hunting strategies.

21 Allow 1 credit. Acceptable responses include, but are not limited to:

- Factor: People won’t recycle.Correction: Fine individuals who put recyclables in their garbage.
- Factor: lack of education about recyclingCorrection: Distribute recycling information or sponsor television and radio ads.
- Factor: too time consumingCorrection: Companies can collect unsorted recyclables.