

**Student Study Questions  
for  
Principles of Environmental Economics and  
Sustainability, 4th Edition**

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## **Chapter 1**

1. Which of the following statements concerning economics' treatment of the nature environment is accurate?

- a) neoclassical economists are fully aware of the critical significance of ecosystem services to life on earth
- b) imputing the value of the contributions of ecosystem services to the human economy at the margin are less than adequate
- c) neoclassical economists assumed that the environment is completely dependent on the human economy for preservation of ecosystem services
- d) a) and b) only
- e) a) and c) only

2. Due to a scarcity of resources,

- a) every society must undertake a market-clearing approach
- b) the government must decide how to allocate available resources
- c) every society must choose among competing uses of available and scarce resources
- d) every society must use the pricing mechanism to determine the true costs of scarce resources
- e) all of the above

3. The economy is assumed to depend on the natural environment for which of the following?

- a) Non-renewable resources
- b) Renewable resources
- c) Sunlight
- d) Aesthetics
- e) All of the above

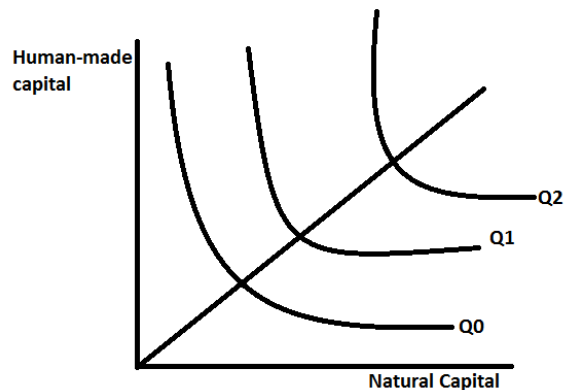
4. The opportunity cost of a particular activity

- a) is usually known with certainty
- b) is the same for everyone undertaking the activity
- c) may include both monetary costs and forgone ecosystem services
- d) stays constant as more of that activity is pursued
- e) none of the above

5. An ecosystem service, such as water purification, is dramatically reduced because of watershed destruction and the presence of pesticides. How would this influence the opportunity cost for a city that was considering giving up their water filtration plant?

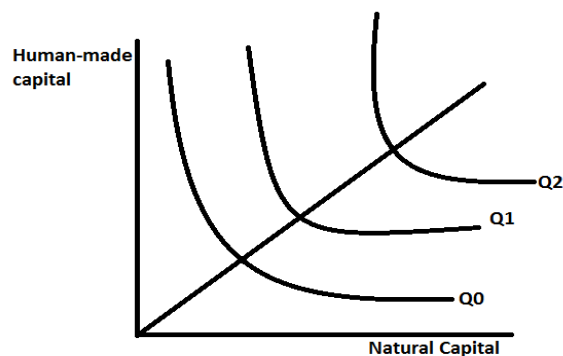
- a) it would not affect the opportunity cost of giving up their water filtration plant
- b) it would increase the opportunity cost of giving up their water filtration plant
- c) it would decrease the opportunity cost of giving up their water filtration plant
- d) it should have no bearing on the city's decision from an economic standpoint
- e) none of the above

6. Consider the following substitution possibility graph. Assume that the output level (i.e. economic production) is the same for each line ( $Q_0 = Q_1 = Q_2$ ). Which of the following statements is correct?



- a) With  $Q_0$ , technological improvements are such that resource conservation is highest relative to  $Q_1$  and  $Q_2$ .
- b) With  $Q_0$ , technological improvements are such that resource conservation is lowest relative to  $Q_1$  and  $Q_2$ .
- c) With  $Q_2$ , technological improvements are such that resource conservation is highest relative to  $Q_0$  and  $Q_1$ .
- d) Both b) and c) are correct
- e) None of the above are correct

7. Consider the following substitution possibility graph. Assume that the output level (i.e. economic production) is the same for each line ( $Q_0 = Q_1 = Q_2$ ). Which of the following statements is correct?



- a) Any point along  $Q_0$  represents a combination of resource outputs that requires more natural capital relative to any point along  $Q_1$  or  $Q_2$ .
- b) Any point along  $Q_2$  represents a combination of resource outputs that requires less natural capital relative to any point along  $Q_0$  or  $Q_1$ .
- c) Any point along  $Q_0$  represents a combination of resource outputs that requires less human-made capital relative to any point along  $Q_1$  or  $Q_2$ .
- d) Any point along  $Q_2$  represents a combination of resource outputs that requires more human-made capital relative to any point along  $Q_0$  or  $Q_1$ .
- e) None of the above

8. A free market system

- a) provides information about the scarcity values of various resources
- b) allows for the determination of relative scarcity by constructing a ratio of two market-clearing prices
- c) reaches an equilibrium price when the supply of a resources equals the demand of a resource
- d) none of the above
- e) all of the above

9. Correcting for possible market price distortions

- a) is necessary because most ecosystem services are not traded through normal market mechanisms
- b) is not required because prices deliver perfect information on absolute scarcity
- c) is easily done because it is known that that ecosystem services are valuable
- d) none of the above
- e) all of the above

10. In the factor market,

- a) demand imparts market information about firms
- b) households as regarded as resource owners
- c) households are the suppliers of labor, capital and natural resources
- d) firms produce final goods and services for the product market
- e) all of the above

### **Challenge Question**

The existing state of technology provides constraints as to how inputs are combined and used to produce goods and services. Can the same be said of the natural environment? Discuss.

## **ANSWERS**

1. d
2. c
3. e
4. c
5. b
6. a
7. c
8. e
9. a
10. e

## **Chapter 2**

1. The natural world that surrounds an organism is called the organism's:
  - a) energy
  - b) environment
  - c) biosphere
  - d) nutrients
  - e) none of the above
2. The source of energy for almost all life on Earth is:
  - a) decomposers
  - b) fossil fuels and nuclear energy
  - c) water and oxygen
  - d) sunlight
  - e) none of the above
3. An example of a biotic factor in a forest ecosystem is:
  - a) fungi
  - b) water
  - c) a tree
  - d) a rock
  - e) all of the above
4. The elements constitute 95 percent of all living organisms are as follows:
  - a) carbon, hydrogen, oxygen, nitrogen, boron and phosphorus
  - b) carbon, hydrogen, oxygen, nitrogen, sulfur and potassium
  - c) carbon, helium, oxygen, nitrogen, sulfur and potassium
  - d) carbon, hydrogen, oxygen, nitrogen, sulfur and carbon dioxide
  - e) none of the above
5. Photosynthesis:
  - a) involves synthesis of complex inorganic matter from simpler inorganic compounds
  - b) is fueled by oxygen
  - c) links only the biotic components of the ecosystem
  - d) provides stored energy in the form of organic compounds for organisms to use
  - e) all of the above

6. Which of the follow is accurate about the oxidation process?
- a) it depends on the availability of oxygen, moisture content, and temperature of an ecosystem
  - b) oxidation would takes place at a much faster rate in the artic than at the equator
  - c) in nature, oxidation results in the complete decomposition of organic matter
  - d) natural oxidation processes are the main contributor to global warming
  - e) all of the above
7. The most important biogeochemical cycle is
- a) the nitrogen cycle
  - b) the phosphorous cycle
  - c) the carbon cycle
  - d) the water cycle
  - e) all cycles are equally important
8. Human activity or global climate changes will affect which phase of ecological succession?
- a) pioneer
  - b) grassy
  - c) small shrubs
  - d) trees
  - e) all of the above
9. A natural system's stability is different than its resilience in that
- a) stability is far more important than resilience
  - b) stability can tend to reach dynamic equilibrium at the system level while resilience reaches equilibrium at the population level
  - c) resilience refers to the robustness of a natural ecosystem in the face exogenous stress, while refers to the ability of a natural ecosystem to return to its original condition after a stress
  - d) all of the above
  - e) none of the above



10. The human economy and the biosphere have which of the following characteristics in common?

- a) the human economy and the biosphere are regarded as open systems with regard to matter
- b) the human economy and the biosphere are regarded as open systems with regard to energy
- c) the human economy and biosphere are regarded as a closed system with respect to matter
- d) in the neoclassical worldview, the human economy and the biosphere are treated as an closed systems with regard to matter
- e) none of the above

### **Challenge Question**

In what respect does the ecological economist agree with the neo-classical worldview?

## **ANSWERS**

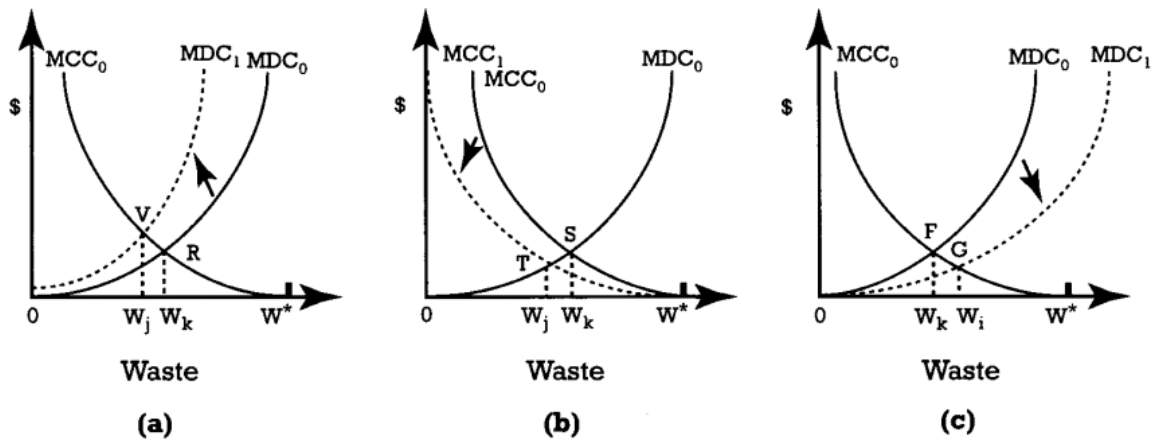
1. b
2. d
3. a
4. e
5. d
6. a
7. e
8. e
9. c
10. b

## **Chapter 3**

1. What are the two characteristics of a common property resource?
  - a) Nonexcludable and rival
  - b) Excludable and nonrival
  - c) Nonexcludable and nonrival
  - d) Excludable and rival
  - e) None of the above
2. The “tragedy of the commons” is most likely to occur with which of the following goods?
  - a) National defense
  - b) Trains
  - c) Music being broadcast for free in your area
  - d) A pasture
  - e) All of the above
3. If a good is nonrival that means...
  - a) it can be consumed by more than one people at any given time.
  - b) it cannot be consumed by more than one people at any given time
  - c) its owner can prevent others from consuming the good.
  - d) its owner cannot prevent others from consuming the good.
  - e) None of the above
4. Which of the following is not a good example of a common property resource?
  - a) Open pasture for grazing
  - b) Ocean fisheries
  - c) National defense
  - d) The atmosphere
  - e) All of the above

5. In large cities, traffic often slows to a virtual standstill during rush hour. This is an example of...
- a) A social bad
  - b) A social good
  - c) the tragedy of the commons.
  - d) An optimal solution
  - e) None of the above
6. Unregulated free markets always fail to provide the efficient level of ...
- a) common property resources
  - b) public goods
  - c) equilibrium pricing
  - d) Both a) and c)
  - e) Both a) and b)
7. Which one of the following statements about positive externalities is true?
- a) A positive externality is a third-party benefit from an economic transaction.
  - b) Positive externalities represent an additional benefit to society not captured by the private benefits to consumers.
  - c) Perfectly competitive free markets underproduce goods associated with positive externalities.
  - d) All of the above are true.
  - e) None of the above are true.
8. From the perspective of economic efficiency, an perfectly competitive market that is unregulated by government that generates a negative externality results in
- a) a price that is too high and a quantity that is too low.
  - b) a price that is too low and a quantity that is too high.
  - c) a price and quantity that are both too low.
  - d) a price and quantity that are both too high.
  - e) None of the above

Figure 3A



9. Refer to Figure 3A. Assume that one starts at any point that indicates an optimal pollution level. Further assume that there is a campaign of ignorance that results in a change in social preference such that environmental services are no longer believed to be of importance. Which panel or panels would indicate a movement in the curves reflecting this social preference change?

- a) Panel (a) only
- b) Panel (b) only
- c) Panel (c) only
- d) Panels (a) and (c)
- e) Panel (a) and (b)

10. Refer to Figure 3A. Assume that one starts at any point that indicates an optimal pollution level. Further assume that there is an improvement in technology that would allow society to reduce its level of pollution or improve its environmental quality. Moreover, the improvement would be accomplished without an additional increase in the total disposal cost. Which panel or panels would indicate a movement in the curves reflecting this technological change?

- a) Panel (a) only
- b) Panel (b) only
- c) Panel (c) only
- d) Panels (a) and (c)
- e) Panel (a) and (b)

### **Challenge Question**

How are social media platforms such as Facebook subject to “the tragedy of the commons”?  
Who are the ‘polluters’ in this context?

## **ANSWERS**

1. d
2. d
3. a
4. c
5. c
6. e
7. d
8. b
9. c
10. b

## Chapter 4

1. From an economic viewpoint, it makes most sense when

- a) expenditure on pollution control technology is less than society's realized benefits from pollution avoidance
- b) expenditure on pollution control technology is more than society's realized benefits from pollution avoidance
- c) Waste disposal costs are high
- d) All of the above are correct
- e) None of the above are correct

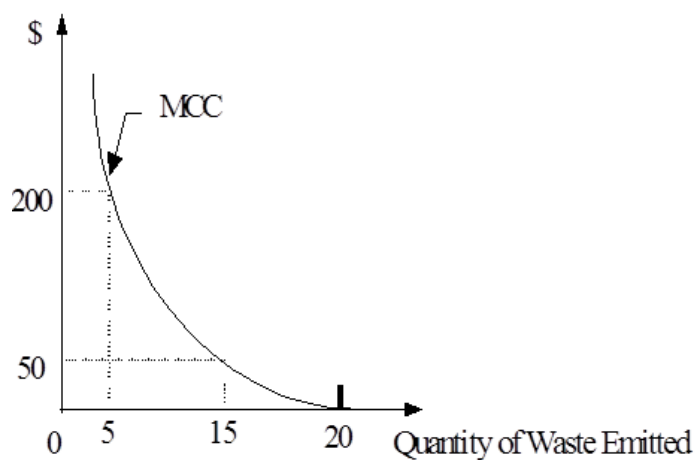
2. Examples of pollution control costs include:

- a) Cleaning of hazardous waste sites
- b) Adding filters to screening out solid wastes that flow into a river
- c) Reintroducing species in a lake that was polluted
- d) Only a) and b)
- e) All of the above

3. The marginal pollution control cost

- a) shifts down when we increase the price (damage cost)
- b) shifts up when we increase the price (damage cost)
- c) decreases with increased environmental quality or cleanup activities
- d) Does not change with increased environmental quality or cleanup activities
- e) None of the above

Figure 4A





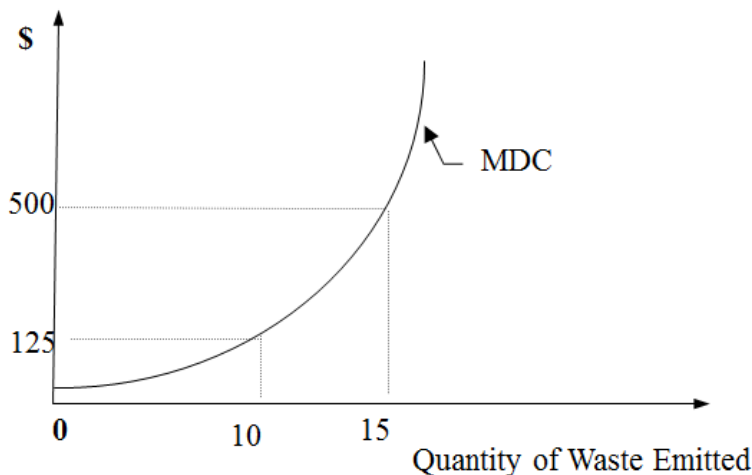
4. Refer to Figure 4a. As we emit more waste,

- a) we move from 15 to 0 on the x-axis
- b) we move from 20 to 15 on the x-axis
- c) we move from 0 to 200 on the y-axis
- d) we move from 50 to 0 on the y-axis
- e) none of the above

5. Pollution damage costs

- a) are the total monetary values of all the various damages resulting from the discharge of untreated waste into the environment
- b) depend directly on the amount and the nature of the untreated waste
- c) can arise from biodegradable and non-biodegradable pollutants
- d) include deterioration to physical infrastructures
- e) all of the above

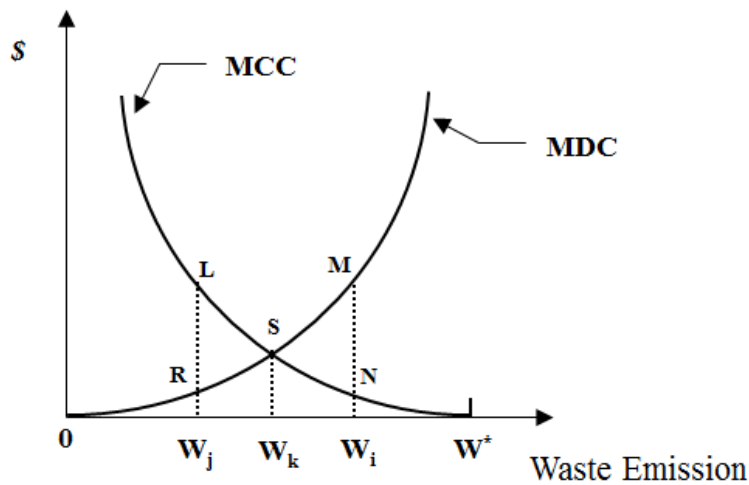
Figure 4B



6. Refer to Figure 4B. The marginal pollution-damage cost curve

- a) is an decreasing function of pollution emissions
- b) shows that the damage caused by a unit of pollution increases progressively as the amount of pollution emitted decreases
- c) the marginal damage cost decreases from \$125 to \$500 as the amount of waste emissions increases from 10 to 15 units
- d) the marginal damage cost increases from nearly \$0 to over \$500 as the amount of waste emissions increases
- e) none of the above

Figure 4C



7. Refer to Figure 4C. If waste emission is greater than  $W_k$ , then
  - a) The total waste disposal cost can be reduced by further controlling emissions
  - b) The total waste disposal cost can be reduced by allowing for more emissions
  - c) Movement in either direction along any curve would not be cost effective
  - d) The marginal damage curve must shift to the right
  - e) None of the above
8. Refer to Figure 4C. If waste emission is less than  $W_k$ , then
  - a) The marginal damage curve must shift to the left
  - b) Waste emissions can be increased until the optimal level of pollution is reached
  - c) The total waste disposal cost can be reduced by allowing for more emissions
  - d) Movement in either direction along any curve would not be cost effective
  - e) None of the above
9. From an ecological economics perspective, the optimal level of pollution
  - a) is always zero.
  - b) should be based on the intersection of the mdc and mcc curves
  - c) should imply that more emphasis is put on pollution cleanup than pollution prevention
  - d) always shows that the economic and ecological resolutions for it are consistent
  - e) none of the above

10. Which of the following is least accurate?

- a) in estimating the damage function, only human preferences are considered
- b) in estimating in estimating the damage function, both human preferences and ecological services are considered
- c) the economic estimate of the damage function is likely to understate the welfare of the future generations
- d) the economic estimate of the damage function is likely to understate the welfare of the value of maintaining diversity and resilience of the natural ecosystem
- e) the above statements are all inaccurate

### **Challenge Question**

A coal-burning power plant will produce emissions of sulfur dioxide, which is harmful to the environment. How then can someone argue in favor of some level of harmful sulfur dioxide emissions?

## **ANSWERS**

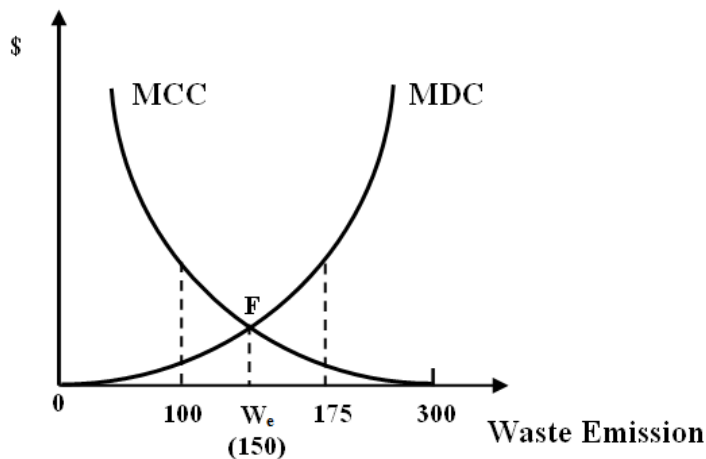
1. a
2. d
3. e
4. d
5. c
6. d
7. a
8. b
9. e
10. b

## Chapter 5

1. Emission permits create a market price for pollution and therefore can be traded between firms. In order to maintain low transaction costs, such permits be...

- a. Provided by government fiat
- b. Agreed upon by government and firms
- c. Homogeneous, perfectly divisible, and exchangeable.
- d. Homogeneous, nonrival, and excludable.
- e. Homogeneous, not divisible, and excludable.

Figure 5A



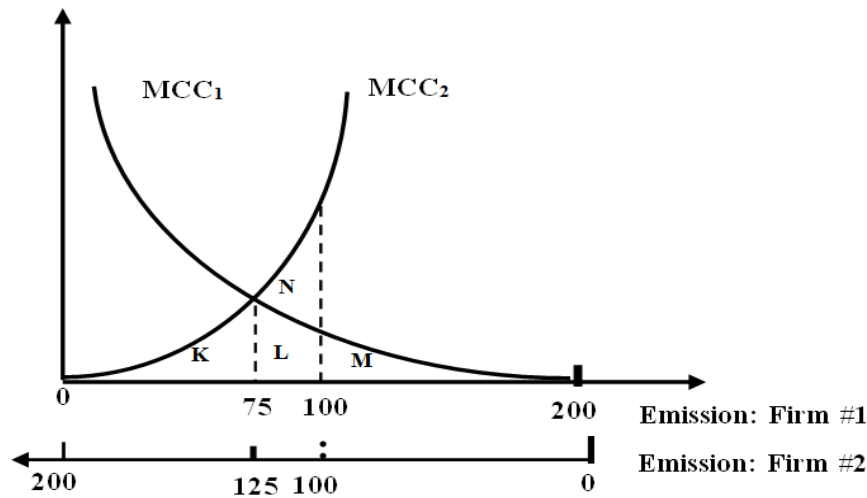
2. Refer to Figure 5A. Assume that the emission standard is initially set at 175. This implies which of the following?

- a) The standard is stricter than the socially optimal level.
- b) Eventually, this initial standard will be judged to be too lenient.
- c) The socially optimal level of pollution is preserved.
- d) Polluters will be forced to internalize the cost of controlling pollution emissions up to the socially optimal level.
- e) All of the above.

3. Which of the following is a weakness of emission standards?

- a) Emission standards can be simple.
- b) Emission standards are solely set by government fiat.
- c) Emission standards adhere to the polluter pays principles.
- d) They can be effectively used to keep extremely harmful pollution below dangerous levels.
- e) All of the above are weaknesses.

Figure 5B



4. Refer to Figure 5B. Which of the following is correct?

- a) If the emission standard is set at 100, the total waste control cost for these two firms would be represented by area  $K + L + N + M$ .
- b) If the emission standard is set at 100, the total waste control cost for these two firms would be represented by area  $K + L + M$ .
- c) If the emission standard is set at 100, the total waste control costs of Firm 1 is area N.
- d) If the emission standard is set at 100, the total waste control costs of Firm 2 is area  $K + L + M$ .

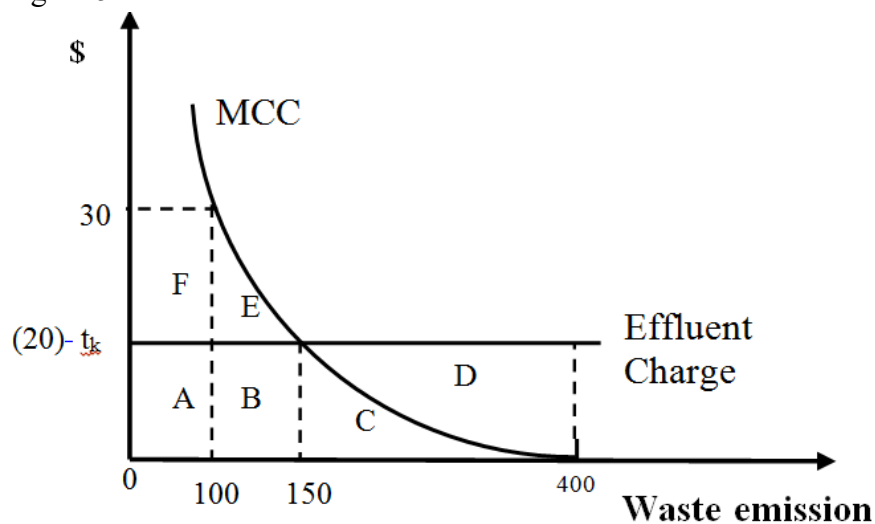
5. Refer to Figure 5B. Which of the following are correct?

- a) If the emission standard is set at 75, the total waste control cost for these two firms would be represented by area  $K + L + M$ .
- b) If the emission standard is set at 75, the total waste control cost for these two firms would be represented by area  $K + L + N$ .
- c) If the emission standard is set at 75, the total waste control costs of Firm 1 is area K.
- d) If the emission standard is set at 75, the total waste control costs of Firm 2 is area  $K + L$ .

6. Refer to Figure 5B. Which of the following is correct?

- a) When a uniform emission standard is applied, the total cost of waste control is area  $K + L + M$ .
- b) When a non-uniform emission standard is applied, the total cost of waste control is area  $K + L + M$ .
- c) When a uniform emission standard is applied, the total cost of waste control is area  $K + L + N$ .
- d) When a non-uniform emission standard is applied, the total cost of waste control is area  $K + L + M + N$ .

Figure 5C



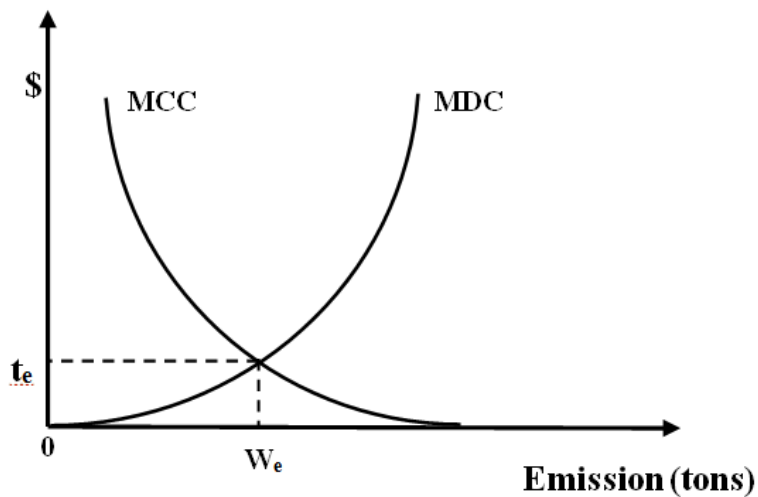
7. Refer to Figure 5C. Assume that the initial effluent tax in the amount of  $t_k$ , or \$20 per unit of waste discharged and that the MCC curve represents the nature of the pollution control technology of this firm. Which of the following is incorrect?

- a) A private firm interested in minimizing its cost would discharge 150 units of waste.
- b) A private firm interested in minimizing its cost would control 250 units of waste using its technology to clean the waste.
- c) The firm's marginal control cost is equal to \$20.
- d) A private firm interested in minimizing its cost would control 400 units of waste using its technology to clean the waste.

8. Refer to Figure 5C. Assume that the initial effluent tax in the amount of  $t_k$ , or \$20 per unit of waste discharged and that the MCC curve represents the nature of the pollution control technology of this firm. Which of the following is correct?

- a) At \$20 per unit of waste, the total expenditure by the firm at 400 units of waste is \$3000.
- b) At \$20 per unit of waste, the total expenditure by the firm at 400 units of waste is \$8000.
- c) At \$20 per unit of waste, the total expenditure by the firm at 0 units of waste is \$3000.
- d) At \$20 per unit of waste, the total expenditure by the firm at 0 units of waste is \$8000.

Figure 5D

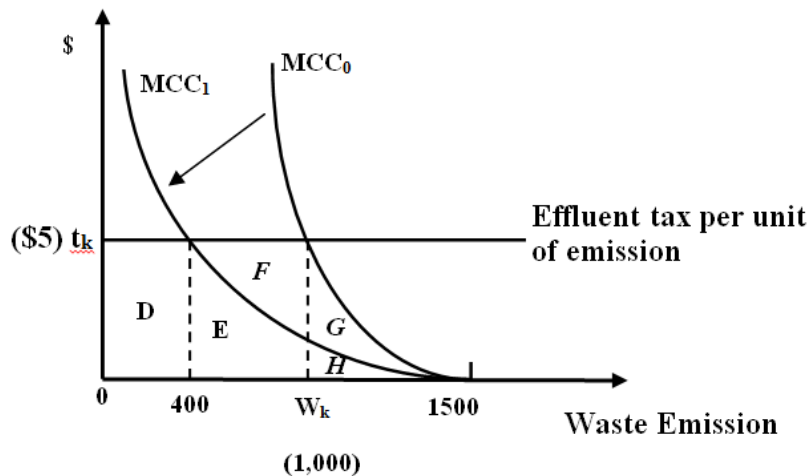


9. Refer to Figure 5D. In Figure 5D, the MCC curve represents the aggregate of the marginal control costs for all the relevant polluting firms. Which of the following statements does not apply to Figure 5D?

- a) The optimal effluent charge,  $t_e$ , is attained at the point where  $MCC = MDC$ .
- b) If  $t_e$  is the uniform tax per unit of waste discharged, then total emission beyond  $W_e$  will be marginally less costly to firms than the tax.
- c) If  $t_e$  is the uniform tax per unit of waste discharged, then total emission beyond  $W_e$  will not be socially optimal.
- d) If  $t_e$  is the uniform tax per unit of waste discharged, then total emission beyond  $W_e$  will be marginally more costly to firms than the tax.
- e) None of the above statements apply.



Figure 5E



10. Refer to Figure 5E. In Figure 5E, a polluting firm is subjected to an effluent charge of  $t_k$  per unit of emission. Assume that the shift of this firm's marginal control cost curve from  $MCC_0$  to  $MCC_1$  is caused by an introduction of a new and improved method of pollution control. Which of the following statements does not apply to Figure 5E?

- The ability to shift from  $MCC_0$  to  $MCC_1$  implies that firms can be provided with lower costs to reduce their pollution through improved technological.
- When compared to emission standards, a policy based on effluent charge will provide greater financial incentives to investors in pollution control technology.
- Before the introduction of the new technology, for discharging 1,000 units, the regulatory agency would be able to collect effluent tax equal to area  $D+E+F$ .
- Before the introduction of the new technology, the firm is discharging 1,500 units of its waste.

### Challenge Question

Consider neighboring countries where one country has higher pollution-control standards than one or more of the other neighboring countries. What are the advantages and disadvantages from an economic standpoint to have all countries having the same standards?

## **ANSWERS**

1. c
2. b
3. b
4. a
5. c
6. b
7. d
8. b
9. d
10. d

## **Chapter 6**

1. Which one of following attributes does not apply to a system of transferrable emission credits?

- a) The government decrees the number of permits.
- b) The price of permits is set by a government.
- c) Firms can trade credits in an open market.
- d) Emission credits create a market for pollution rights.
- e) All of the above are attributes of the system.

2. Which of the following is a (are) characteristic(s) of the US acid rain program?

- a) It is a system of emissions trading.
- b) The EPA holds the power to set the upper limits on the annual levels of sulfur dioxide emissions for the nation.
- c) The market holds the power to set the upper limits on the annual levels of sulfur dioxide emissions for the nation.
- d) Both a) and b).
- e) Both a) and c).

3. Which of the following is not a characteristic of the US acid rain program?

- a) It is a system of emissions trading.
- b) Each allowance is worth one ton of sulfur dioxide released from the smokestack.
- c) Each allowance is worth one ton of nitric dioxide released from the smokestack.
- d) The number of allowances declines yearly.
- e) Both c) and d) are not characteristics of the program.

4. Which of the following embodies the idea that firms will move from countries with strong environmental standards to those with weaker standards?

- a) The Coase Theorem.
- b) Tradeable emission credits.
- c) Relocation effects.
- d) Hot spots.
- e) The Porter Hypothesis.

5. Which of the following is not correct about transferable credits?

- a) They can be used as a public policy instrument.
- b) The allocation of credits among competing users is based entirely on the market system.
- c) The allocation of credits among competing users is based entirely on a command and control system.
- d) A transferable credit system works better when the number of parties involved in the exchange of credit increases.
- e) None of the above are correct.

6. Which of the following is not a type of emissions trading policy?

- a) Bubble policy.
- b) Banking policy.
- c) Porter Hypothesis policy.
- d) Offset policy.
- e) The above are all emissions trading policies.

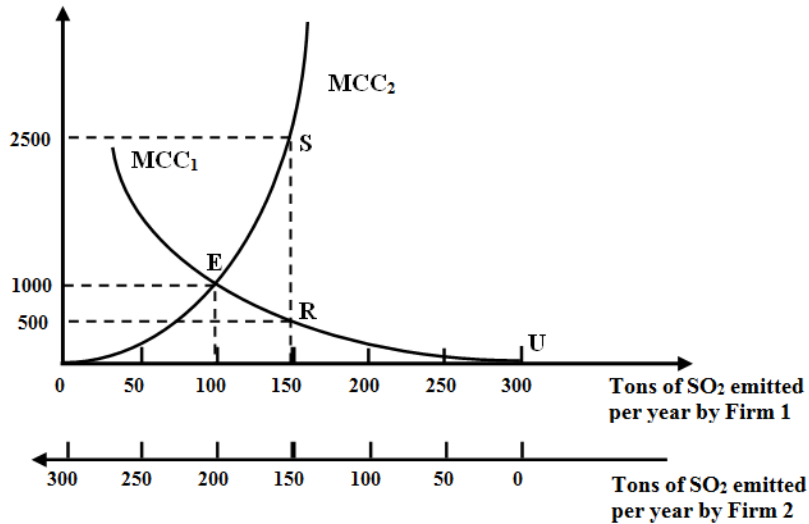
7. Which of the following would allow a polluter save pollution credits for later use?

- a) Bubble policy.
- b) Banking policy.
- c) Porter Hypothesis policy.
- d) Offset policy.
- e) All of the above.

8. Which of the following would be used when consideration is made to add new sources into a given areas or regions that is already under environmental?

- a) Bubble policy.
- b) Banking policy.
- c) Porter Hypothesis policy.
- d) Offset policy.
- e) All of the above.

Figure 6A



9. Refer to Figure 6A. Assume that government regulation limits sulfur dioxide emissions to 150 tons per year. Also assume that Firm 1 cannot reduce its emissions below 100 tons per year. Which of the following would apply in this situation?

- The government would shut firm 1 down.
- The marginal control costs for firm 1 will be \$2500.
- It would be in the best interest of Firm 2 to buy an emission credit from Firm 1.
- It would be in the best interest of Firm 1 to buy an emission credit from Firm 2.
- The marginal control costs for firm 2 will be \$500.

10. Refer to Figure 6A. If firm 1 is emitting 100 tons of sulfur dioxide per year and firm 2 is emitting 150 tons of sulfur dioxide per year, then the total pollution control costs are...

- Area OESRU.
- Area ERS.
- Area OEU.
- More than Area OESRU.
- Less than Area OESRU.

### Challenge Question

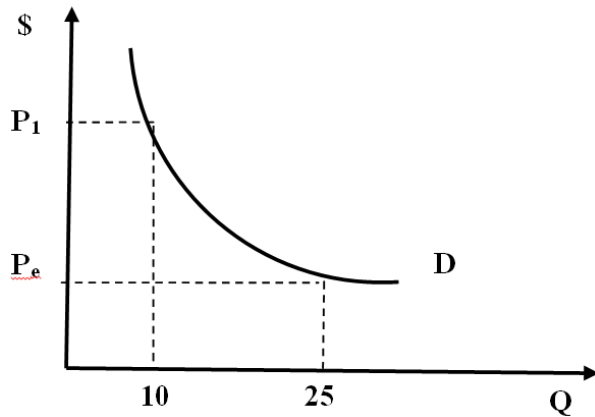
Consider two emission control policies: banking of pollution credits and cap-and-trade. Does one, the other, or neither work best for: (i) carbon dioxide and (ii) nuclear waste?

## **ANSWERS**

- 1.b
- 2.d
- 3.c
- 4.e
- 5.c
- 6.c
- 7.b
- 8.d
- 9. c
- 10. e

## Chapter 7

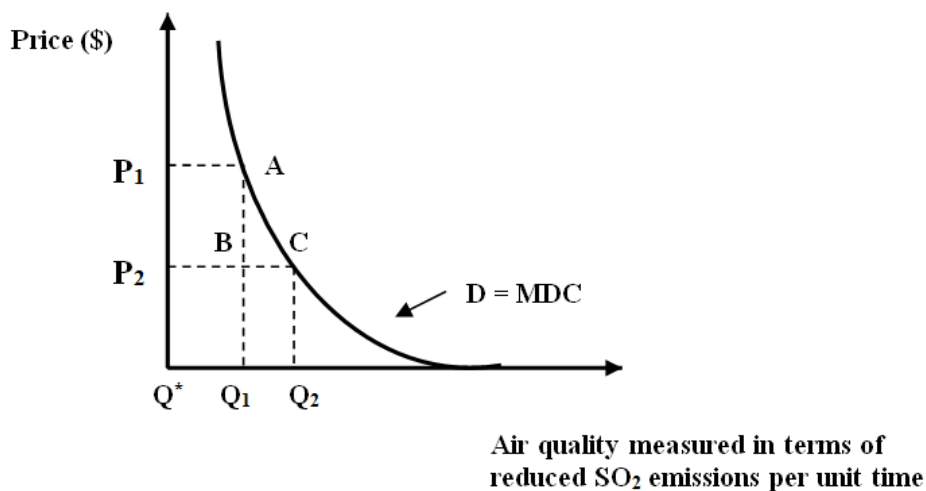
Figure 7A



1. Refer to Figure 7A. Which of the following statements can apply to Figure 7A?

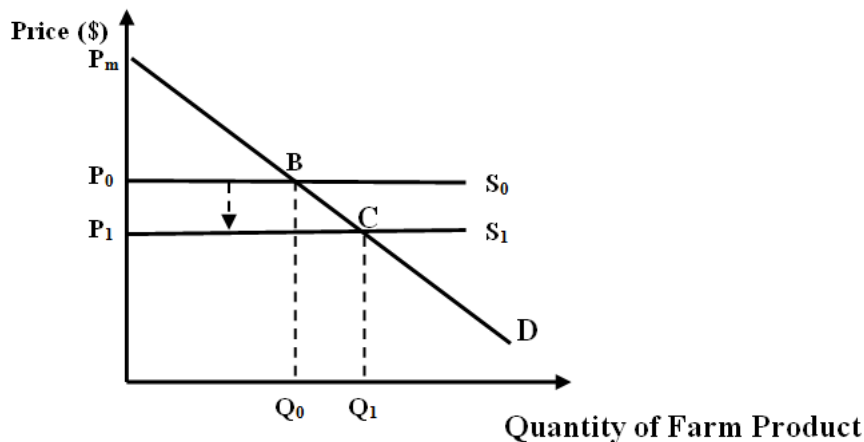
- a)  $P_1$  represents what consumers' are willing to pay for the 10<sup>th</sup> unit of a given good or service, Q.
- b)  $P_e$  represents what consumers' are willing to accept for the 10<sup>th</sup> unit of a given good or service, Q.
- c)  $P_e$  represents what consumers' are willing to pay for the 25<sup>th</sup> unit of a given good or service, Q.
- d) Both a) and c).

Figure 7B



2. Refer to Figure 7B. The reason the curve depicted in the figure is negatively sloped is that it...
- Represents the demand for environmental quality.
  - Reflects society's WTP for environmental quality.
  - Indicates that the WTP for environmental quality declines as higher levels of environmental quality are pursued.
  - All of the above are correct.
  - All of the above are incorrect.
3. Refer to Figure 7B. The marginal damage cost curve implies that ...
- At the origin, society's WTP for the first incremental increase in environmental improvement is extremely high.
  - At the origin, society's WTP for the first incremental increase in environmental improvement is extremely low.
  - At  $Q_1$ , society's WTP is optimized.
  - At  $Q_2$ , society's WTP is optimized.
  - None of the above.

Figure 7C



4. Refer to Figure 7C. Assume that the farm product is grapes for wine-making. Which of the following reason(s) can result in a shift of the supply curve as illustrated in the figure?
- Grape farms are hit by droughts.
  - New, stricter environmental regulations improve soil quality.
  - New, lax environmental regulations reduce soil quality.
  - Both a) and b)
  - Both a) and c)



5. Refer to Figure 7C. Assume that the farm product is grapes for wine-making. Also assume that the market for grapes is defined by the demand curve,  $D$ , and the supply curve,  $S_1$ . Which of the following areas represents consumer surplus for this market?

- a) Triangle  $P_mCP_1$ .
- b) Triangle  $P_mBP_0$ .
- c) Area  $P_1BCP_0$ .
- d) None of these areas.

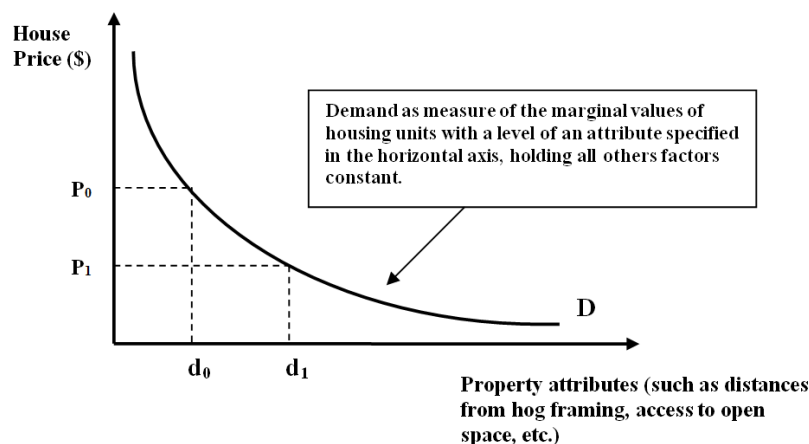
6. Refer to Figure 7C. Assume that the farm product is grapes for wine-making. Also assume that the market for grapes is defined by the demand curve,  $D$ , and the supply curve,  $S_1$ . If the supply curve shifts to  $S_0$ , which of the following areas represents the gain in consumer surplus for this market?

- a) Triangle  $P_mCP_1$ .
- b) Triangle  $P_mBP_0$ .
- c) Area  $P_1BCP_0$ .
- d) There is no gain in consumer surplus.
- e) There is only a change in producer surplus.

7. Which of the following is not a limitation of the replacement cost approach measure of people's WTP?

- a) It reflects people's WTP to avoid environmental damage.
- b) It assumes that there is a one-to-one tradeoff between a unit of services lost due to damage and a unit of service gained due to restoration.
- c) It is possible not to completely repair environmental damage.
- d) Environmental or other replicas can be relatively worthless compared to the original.
- e) All of the above are limitations.

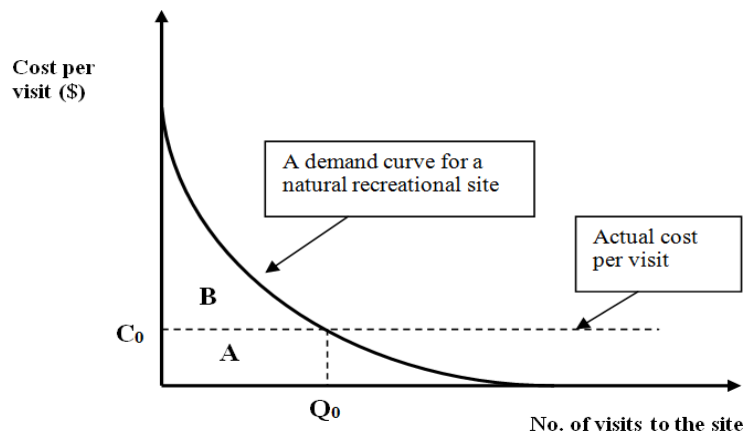
Figure 7D



8. Refer to Figure 7D. Given the hedonic demand function in the figure, if distance from a chemical production facility is the attribute on the x-axis, then a house with very close proximity to the facility will likely be priced...

- a) Closer to  $P_1$  than to  $P_0$ .
- b) Closer to  $P_0$  than to  $P_0$ .
- c) Exactly at  $P_1$ .
- d) Exactly at  $P_0$ .
- e) There would be no house built near dangerous areas.

Figure 7E



9. Refer to Figure 7E. Assume that the function in the figure measures WTP for visits to a national park. If the actual cost per visit is set at  $C_0$ , then it must be that consumer surplus is...

- a) Equal to producer surplus.
- b) Greater than producer surplus.
- c) Equal to area A.
- d) Equal to area B.
- e) Equal to area B minus area A.

10. The travel-cost-method...

- a) Originated in the 1990s, and it has been used infrequently to estimate WTP for recreational sites.
- b) Assumes that the services of a recreation site can be adequately measured by the gate or entrance price.
- c) Assumes that the gate price is smaller than the travel cost.
- d) Assumes one site; this is, that individuals are not able to make trips to alternative recreational sites.
- e) All of the above.

### **Challenge Question**

Assume that you are an economist and you wish to elicit the compensation required by farmers to switch from one land-use system to another land-use system that will lower carbon emissions. You decide to use the contingent valuation method (CVM) to estimate the compensation required. However, you have not yet decided whether to approach the valuation calculation via the perspectives of willingness-to-pay (WTP) or willingness-to-accept (WTA) or both. Which do you choose and why? If you choose both estimating methods, do you expect to get the same valuation result? Why or why not?

## **ANSWERS**

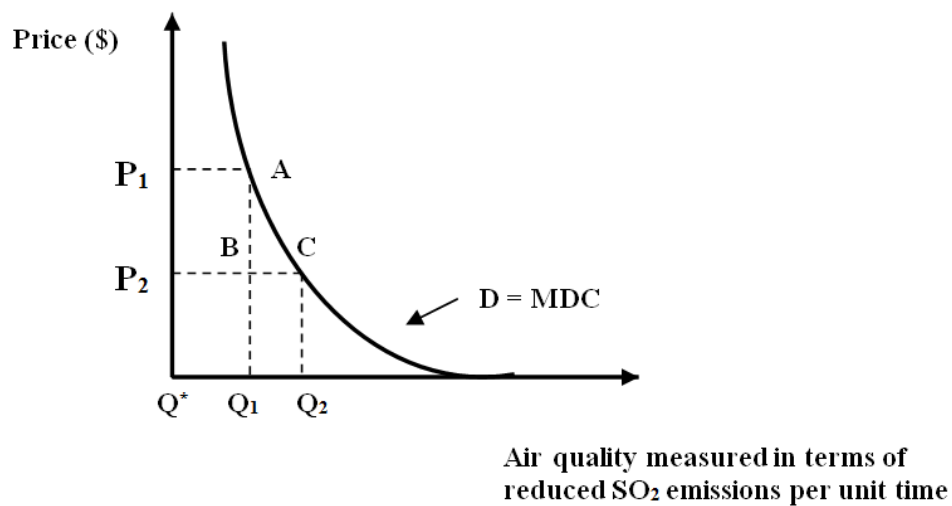
- 1.d
- 2.d
- 3.a
- 4.b
- 5.a
- 6.d
- 7.a
- 8.a
- 9.d
- 10.c

## **Chapter 8**

1. In evaluating benefits and costs of a public environmental project, one should consider the...
  - a) private perspective
  - b) social perspective
  - c) both the private and social perspective
  - d) none of the above perspectives
2. Which procedure is least prone to nonresponse to willingness to pay question?
  - a) Open-ended question
  - b) Referendum technique
  - c) Neither a) or b)
  - d) Both a) and b)
3. A polluting firm closes its operations because losses would have been higher if it has to comply with a recently enforced environmental regulation. Consequently, 100 workers have been laid off. Does one include the value of the loss of jobs in the cost of the environmental regulation?
  - a) Yes, always.
  - b) No.
  - c) Yes, but only if the laid-off workers are likely to find alternative employment.
  - d) No, because they are a result of secondary effects.
4. A firm has a net income of \$100,000. Next year's net income is expected to increase to \$150,000. However, a new environmental regulation increases the firm's operating cost such that the new net income is \$125,000 instead of \$150,000. Assuming no social costs, what is the cost of the new environmental regulation?
  - a) \$100,000
  - b) \$125,000
  - c) \$150,000
  - d) \$25,000
  - e) \$50,000
5. Which of the following apply(ies) to cost-benefit analyses?
  - a) CBA guidelines are useful for determining public expenditure decisions.

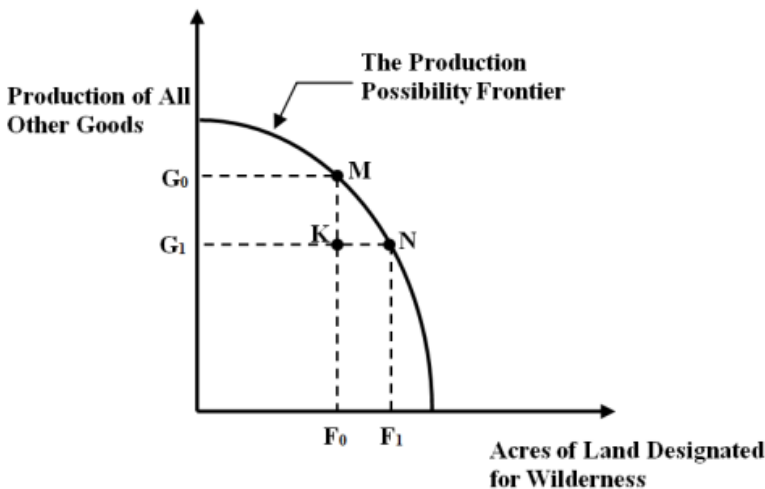
- b) CBA guidelines are useful for determining whether private sector projects should be undertaken.
  - c) CBA analyses consider changes over time.
  - d) CBA analyses are challenging when evaluating non-market values.
  - e) All of the above apply.
6. The value of a human life...
- a) can be estimated by current earnings.
  - b) can be used in a CBA.
  - c) is usually straightforward to calculate.
  - d) all of the above.
7. The value that society places on forfeited current consumption is called the...
- a) marginal cost.
  - b) social marginal cost.
  - c) social discount rate.
  - d) marginal damage.
  - e) social marginal damage.

Figure 8A



8. Refer to Figure 8A. In a CBA, the objective is to move from state C to state A implies which of the following?
- a) Status quo to status quo.
  - b) A move that results in no difference in environmental quality because the price has increased.
  - c) A change in position to “better” that is attained after implementation of sulfur emission control technology.
  - d) A change in position to “worse” that is attained after implementation of sulfur emission control technology.
  - e) None of the above.

Figure 8B



9. Refer to Figure 8B. Suppose point N on the production possibility frontier represents the status quo. Recently, a relaxation of environmental standards allows a country to move to point M. Which of the following best described the results from this move?
- a) There is no change because one is moving along the PPF.
  - b) No one is made worse off because it is a move along the PPF.
  - c) Everyone is made worse off.
  - d) Pareto improvement occurs.
  - e) Pareto improvement does not occur.

10. Refer to Figure 8B. Suppose point K on the production possibility frontier represents the status quo. Recently, new environmental standards allow a country to move to point N. Which of the following best described the results from this move?

- a) Everyone is made better off.
- b) Everyone is made worse off.
- c) Pareto improvement occurs.
- d) This situation can never occur in reality.
- e) None of the above.

### **Challenge Question**

What would a discount rate of zero imply? What are the implications of a zero percent discount rate for public policy?



## **ANSWERS**

- 1.b
- 2.b
- 3.c
- 4.a
- 5.e
- 6.b
- 7.c
- 8.e
- 9.e
- 10.c

## Chapter 9

1. Which gas below is a greenhouse gas, but does not have a Global Warming Potential?
  - a) Water vapor.
  - b) Carbon dioxide.
  - c) Nitrogen.
  - d) Oxygen.
  - e) Methane.
  
2. When was the Kyoto Protocol adopted?
  - a) On December 11, 1997 in Montreal, Canada.
  - b) On December 11, 1997 in Kyoto, Japan.
  - c) On December 11, 1997 in Quebec, Canada.
  - d) On December 11, 1998 in Kyoto, Japan.
  - e) On November 11, 1998 in Washington, DC, USA.
  
3. Which of the following correctly characterizes a GHG's warming potential?
  - a) All GHGs have the same warming potentials.
  - b) The longer a greenhouse compound persists in the atmosphere, the greater its warming potential.
  - c) Atmospheric concentration of a GHG does not affect its warming potential; only the molecular structure is of importance.
  - d) With relative warming potential, methane is always set to unity. The total atmospheric amount of a particular compound in terms of molecular mass. Other things equal, the more abundant a greenhouse compound, the greater its effect on atmospheric warming.
  - e) Carbon dioxide will have a relative warming effectiveness of approximately twenty-three times that of methane.
  
4. Which of the following define market incentives to lower greenhouse gas emissions?
  - a) Through regulation, government bans the emissions of greenhouse gases (GHGs).
  - b) Government imposes command and control regulations on GHG emissions.
  - c) Government uses price and quantity mechanisms to internalize the externalities.
  - d) All of these are market incentives.
  - e) None of these are market incentives.

5. What are the problems of appealing to ethics for reducing greenhouse gases?

- a) Economic agents are too short-sighted.
- b) Economic agents overly discount the future.
- c) Economic agents want to address the environment, but do not want to pay the cost for doing so.
- d) Economic agents always buy at the lowest price and thus ignore the long-term impacts of climate change.
- e) All of the answers above are correct.

6. What does the experience with the Kyoto Protocol teach policymakers?

- a) Full participation of the nations of the world is necessary to address climate change.
- b) Binding emission targets need to be implemented.
- c) Countries should not be allowed to trade emission credits.
- d) Developing countries must take on most of the GHG reduction burden.
- e) Developed countries should take on all of the GHG reduction burden.

7. In a theoretical construct of the GHG damage cost function that shows the relationship between expected future warming and projected future damages to the economy, one can conclude which of the following?

- a) Loss in future global output increases with an increase in warming.
- b) The damage function is affected by the current level of GHG emissions.
- c) The damage function is affected by the cumulative effect of past emissions.
- d) Tipping points in any damage function would represent catastrophic changes.
- e) All of the above are correct.

8. What role do oceans play in global warming?

- a) Oceans absorb heat, thus slowing down global warming.
- b) Ocean absorbs energy to become water vapor, which leads to increases ocean acidification.
- c) The warmer waters release their stored carbon dioxide, increasing atmospheric carbon dioxide.
- d) The warmer waters absorb and store more carbon dioxide, decreasing atmospheric carbon dioxide.
- e) None of the answers above is correct.

9. Economic studies by Dr. Nordhaus and colleagues recommend which of the following actions?

- a) A business as usual approach to climate change.
- b) No action on climate change.
- c) Immediate and drastic action on climate change.
- d) Gradually increasing reductions in GHG emissions.
- e) Any of the above.

10. Which of the following states the stark difference between the Nordhaus and Stern analyses of climate change?

- a) The choice of the real interest rate.
- b) The choice of the discount rate.
- c) The choice of the nominal interest rate.
- d) The choice of the value of a human life.
- e) The probability of increases in global temperatures.

### **Challenge Question**

The uninformed may confuse global climate change with ozone depletion. How are the two issues different? In what respect(s) are they similar?

## **ANSWERS**

- 1.a
- 2.a
- 3.b
- 4.c
- 5.e
- 6.a
- 7.e
- 8.c
- 9.d
- 10.b

## **Chapter 10**

1. In his book, *The Population Bomb*, Ehrlich

- a) Was critical of Malthus.
- b) Contends that continued resource depletion and environmental degradation are a result of human population.
- c) Believes technology will solve the Malthusian paradox.
- d) None of the above.
- e) All of the above.

2. The current annual rate of global population growth is...

- a) 10.5%.
- b) 6.6%.
- c) 4.1%.
- d) 2.1%.
- e) 1.1%.

3. What is expected to happen to the global population over the next few decades?

- a) Remain at 2018 levels.
- b) Population growth will continue to increase exponentially
- c) Population levels may likely revert to pre-Industrial levels.
- d) The population growth rate will likely remain constant.
- e) Population levels will continue to increase at a decreasing rate.

4. According to ecological principles, biophysical carrying capacity is ultimately determined by which of the following?

- a) Technological efficiency.
- b) Non-renewable resources.
- c) Solar energy.
- d) Renewables such as water and fertile soil.
- e) Human capital.

5. The Ehrlich-Commoner model of population, affluence, and technology implies which of the following?

- a) Population pressure plays the most important role in environmental damage.
- b) There is an explicit recognition of technology as an independent explanatory variable that explains total environmental impact.
- c) Technology's effect on the environment is dependent on population growth.
- d) All of the above.
- e) None of the above.

6. Commoner's view of modern technology implies which of the following?

- a) Modern technology is ill-conceived because it does not consider its effects on the environment.
- b) Modern technology is poorly designed because its design is motivated solely by profits.
- c) The continuous goal of increases in productivity leads excessive use of inputs and excessive production of outputs.
- d) All of the above.
- e) None of the above.

7. Which of the following makes predictions of future population levels carry some uncertainty?

- a) Stock of non-renewal resources.
- b) Stock of Human capital.
- c) Fertility growth rates.
- d) GDP growth rates.
- e) All of the above.

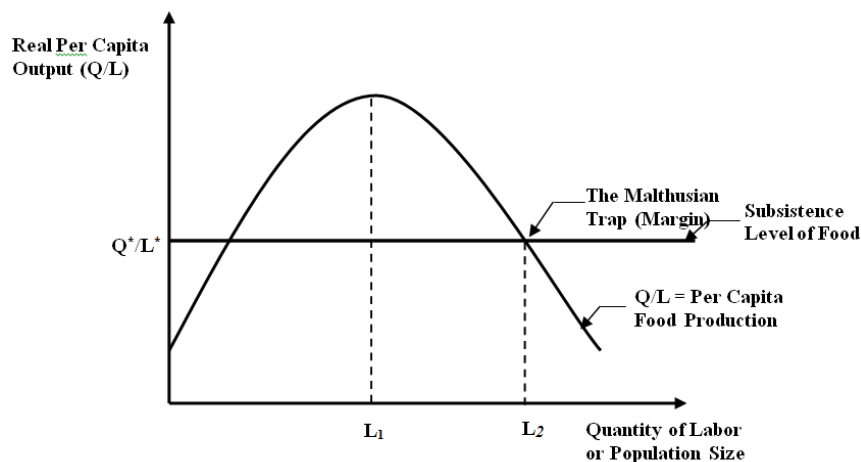
8. Using Commoners' environmental impact equation, which variable is expected to see the largest increase in its growth rate over the next several decades?

- a) Affluence
- b) Renewal resources
- c) Technology
- d) Energy
- e) Population

9. A large group of individuals get lost and end up stranded on a small island isolated from the rest of the world. Which of the following statements would be mostly like a neo-Malthusian argument?

- a) The individuals will begin reproducing at an exponential rate.
- b) The standard of living would decrease and this cause strife amongst the individuals.
- c) New methods (technology) would be developed to acquire and use island resources more efficiently.
- d) The individuals would all die of mass starvation.
- e) All of these statements are neo-Malthusian.

Figure A



10. Refer to Figure A. Assume a society initially is at the point of the Malthusian trap. Which of the following is correct concerning the evolution of this society?

- a) Per capita food output continues to fall indefinitely.
- b) Per capita food output continues to rise until it reaches  $L_1$ .
- c) Population will necessary decrease over time.
- d) Both a) and c)
- e) The society ceases to evolve.

### Challenge Question

Some climate experts believe that 25% of the Earth will become drier in the near-to medium-future. If these dryer conditions affect farmlands, explain in detail how the simple Malthusian growth model (Figure 11.1) changes graphically and how these changes affect per capita food production.



## **ANSWERS**

1. b
2. d
3. e
4. c
5. b
6. d
7. c
8. a
9. b
10. e

## **Chapter 11**

1. Which of the following describes the Environmental Kuznets Curve hypothesis?
  - a) There is no association between environmental impacts and economic growth
  - b) Environmental impacts first increase, then decrease, with increasing levels of economic development.
  - c) Environmental impacts first decrease, then increase, with increasing levels of economic development.
  - d) Environmental impacts steadily decrease with increasing levels of GDP.
  - e) Increasing levels of economic development will always lead to increasing environmental damage.
  
2. Which of the following is a possible shape for the Environmental Kuznets Curve?
  - a) An S shape.
  - b) A U shape.
  - c) An inverted U shape.
  - d) An exponential curve.
  - e) A step-function.
  
3. Fertility decreases with which of the following?
  - a) Economic development.
  - b) Urbanization.
  - c) Literacy.
  - d) Reduced income inequality.
  - e) All of the above.
  
4. Why does microeconomics theory of fertility gives an explanation for a seemingly paradoxical negative relationship between household income and family size?
  - a) This is paradoxical because the theory suggests that children are inferior consumption goods.
  - b) This is paradoxical because the theory suggests that children are normal consumption goods.
  - c) This is paradoxical because this theory suggests that children are luxury consumption goods Children can only be viewed as a source of benefits.
  - d) This is paradoxical because the theory suggests that children are inelastic consumption goods.

- e) This is paradoxical because the theory suggests that higher household income leads to increase in fertility.

5. Malthus's predictions that population would outgrow food supply were incorrect because...

- a) He did not foresee the role of technological change in maintaining a safe food and population balance.
- b) He did not foresee the role of capital accumulation in maintaining a safe food and population balance.
- c) He did not foresee the role of voluntary birth control in maintaining a safe food and population balance.
- d) All of the above.
- e) None of the above.

6. What is the relationship between human capital and fertility rates?

- a) There is no relationship.
- b) Countries' economic growth and fertility is slowed when human capital is abundant.
- c) Countries' fertility rates increase when the stock of human capital is low.
- d) The rates of return on investment in human capital decline as the stock of human capital increases.
- e) The relationship is always positive.

7. Which of the following is accurate in describing a consequence of wage differentials?

- a) Moving from an industrial to a service economy, the wage differential between men and women tends to increase.
- b) An increase in the relative wage rates of women induces a decrease in labor force participation.
- c) An increase in the relative wage rates of women increases the opportunity costs of having children.
- d) An increase in the relative wage rates of women decreases the opportunity costs of having children.
- e) An increase in the relative wage rates of women induces an increase in fertility.

8. The first stage of the demographic cycle is represented by a \_\_\_\_, and a \_\_\_\_.

- a) low birth rate; low death rate
- b) high birth rate; low death rate
- c) high birth rate; high death rate
- d) low birth rate; high death rate

9. Using the following cubic model specification to show the relationships between pollution and income,  $E_{it} = \beta_0 + \beta_1 Y_{it} + \beta_2 Y_{it}^2 + \beta_3 Y_{it}^3 + \beta_4 Z_{it} + \varepsilon$ , which of the following is accurate concerning the parameters  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$ ?

- a) An EKC or inverted U-shaped relationship is implied when  $\beta_1 > 0$ ,  $\beta_2 > 0$ , and  $\beta_3 > 0$ .
- b) An EKC or inverted U-shaped relationship is implied when  $\beta_1 > 0$ ,  $\beta_2 > 0$ , and  $\beta_3 = 0$ .
- c) An N-shaped relationship between income and pollution is obtained when  $\beta_1 = 0$ ,  $\beta_2 < 0$ , and  $\beta_3 > 0$ .
- d) An N-shaped relationship between income and pollution is obtained when  $\beta_1 > 0$ ,  $\beta_2 = 0$ , and  $\beta_3 > 0$ .
- e) An N-shaped relationship between income and pollution is obtained when  $\beta_1 < 0$ ,  $\beta_2 < 0$ , and  $\beta_3 > 0$ .

10. A country with a crude birth rate of 50 and a crude death rate of 25, would be in which stage of the demographic cycle?

- a) Stage 1
- b) Stage 2
- c) Stage 3
- d) Stage 4
- e) Stage 5

### Challenge Question

Currently, the United States does not have an official domestic population policy. Should it have an official population policy? Perhaps one can think about particular demographics in answering such questions - teenage pregnancies - or, whether increasing the country's population runs counter to meeting any carbon emission targets.

## **ANSWERS**

1. b
2. c
3. e
4. a
5. d
6. c
7. c
8. c
9. b
10. b

## **Chapter 12**

Which one of the following is an example of natural capital?

- a) A bridge.
- b) Pesticides.
- c) A railroad.
- d) Pollen.
- e) All of the above.

2. When income is defined as that amount which can be spent while keeping capital intact, then which of the following are correct?

- a) When your capital is \$1000 and return on it is 10%, you can spend up to \$100.
- b) When your capital is \$1000 and return on it is 10%, you can spend up to \$1000.
- c) When your capital is \$1000 and return on it is 10%, you can spend up to \$10.
- d) When your capital is \$1000 and return on it is 10%, you can spend more than \$100, but less than \$1000.
- e) All of the above.

3. Which one of the following economists has argued that the ecosystem is the limiting factor for the human economic system?

- a) Herman Daly
- b) John Hicks
- c) David Ricardo
- d) Thomas Malthus
- e) William Jevons

4. Which of the following is associated with standard economic theory?

- a) Steady-state sustainability.
- b) Semi-strong sustainability.
- c) Weak sustainability.
- d) Optimal-path sustainability.
- e) Strong sustainability.

5. Which of the following types of sustainability assumes that substitutability among different resources is limited?

- a) Steady-state sustainability.
- b) Semi-strong sustainability.
- c) Weak sustainability.
- d) Optimal-path sustainability.
- e) Strong sustainability.

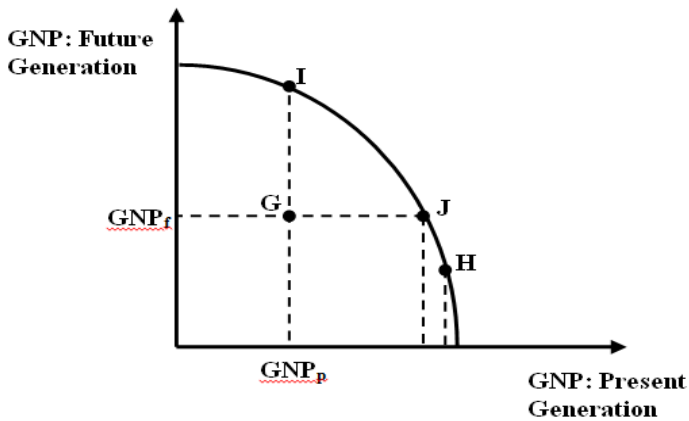
6. Which of the following is not a criticism of weak sustainability?

- a) It does not fully appreciate the uncertainty associated with long-term natural resource assessment and management.
- b) It does not fully appreciate that beyond a certain threshold the scale of human economic activities could cause irreversible damage to the natural environment.
- c) It does not fully appreciate the efficient allocation of resources via the market system.
- d) Both a) and b).
- e) Both b) and c).

7. A 'general' rule of sustainability criterion is to achieve which of the following?

- a) Nominal income.
- b) Intergenerational equity.
- c) Substitutability of exhaustible resources.
- d) The stock of capital assets.
- e) None of the above.

Figure A



8. Refer to Figure A. Which of the following is correct?

- a) A move from point G to point H would not be desirable on efficiency grounds.
- b) A move from point G to point H entails a lower level of income to future generations.
- c) A move from point G to point J entails a lower level of income to future generations.
- d) A move from point G to point I entails a lower level of income to future generations.
- e) None of the above.

9. Refer to Figure A. Which of the following is NOT correct?

- a) A move from point G to point I would lead to 'Pareto' improved outcomes.
- b) A move from point G to point J would lead to 'Pareto' improved outcomes.
- c) A move from point G to point H would lead to 'Pareto' improved outcomes.
- d) A move from point G to point H would be desirable on efficiency grounds.
- e) All of the above are incorrect.

10. Refer to Figure A. Which of the following is correct concerning a move from point G to point H?

- a) The move decreases efficiency.
- b) The move is Pareto optimal.
- c) The move to point H makes the future generation worse off.
- d) The move to point H makes the current generation worse off.
- e) The move to point H makes both the current and future generations worse off.

### Challenge Question

Support or challenge the notion that weak sustainability is easier to achieve than strong sustainability.



## **ANSWERS**

1. d
2. a
3. a
4. c
5. e
6. c
7. b
8. b
9. c
10. c

## **Chapter 13**

1. Which one of the following is a limitation of GDP?
  - a) GDP does not include part-time work.
  - b) GDP does not include daycare services.
  - c) GDP does not consider environmental degradation.
  - d) GDP does not include government services.
  - e) GDP does not account for international trade.
  
2. Which one of the following measures is obtained by adjusting GDP?
  - a) Net Domestic Product
  - b) the Index of Sustainable Economic Welfare (ISEW)
  - c) the Genuine Net Savings (GS)
  - d) Gini Coefficient
  - e) environmentally adjusted net domestic product (EDP)
  
3. Comparing GDP to environmentally adjusted net domestic product (EDP), one will most likely note which of the following?
  - a) Only GDP is expressed in monetary terms.
  - b) Comparisons cannot be made using these two different measures.
  - c) GDP will have a larger value.
  - d) EDP will have a larger value.
  - e) GDP and EDP are usually equal to each other.
  
4. Which of the following assets will have no valuation problem when one needs to account for capital depreciation?
  - a) Airplanes.
  - b) Coral reefs.
  - c) Milking equipment.
  - d) Bridges.
  - e) High-speed trains.
  
5. An oil rig is an example of what type of capital?
  - a) Expensive capital
  - b) Physical capital
  - c) Natural capital

d) Critical capital

6. Which of the follow is not an indicator of sustainable income?

- a) Environmentally Adjusted Net Domestic Product (EDP).
- b) Genuine Net Savings (GS).
- c) Index of Sustainable Economic Welfare (ISEW).
- d) System of National Accounts.
- e) Both a) and b) are not indicators of sustainable income.

7. Which of the follow is a physical indicator of sustainability?

- a) Gross domestic Product.
- b) Net domestic Product.
- c) Index of Sustainable Economic Welfare.
- d) System of National Accounts.
- e) Ecological Footprint.

8. Which of the following does not comprise one of the four major categories of the System of integrated Environmental and Economic Accounting (SEEA)?

- a) Flow accounts for pollution, energy and materials.
- b) Environmental protection and resource expenditure accounts.
- c) Natural resource asset accounts.
- d) Valuation of non-market flow and environmentally adjusted aggregates.
- e) Stock accounts of greenhouse gases (GHGs).

9. What would an increase in EDP per capita over time suggest?

- a) A rising in the standard of living that is associated with economic growth after accounting for environmental costs and the normal wear and tear of human-made capital.
- b) A decline in the standard of living that is associated with economic growth after accounting for environmental costs and the normal wear and tear of human-made capital.
- c) A rising in the standard of living that is associated with economic growth before accounting for environmental costs and the normal wear and tear of human-made capital.

- d) A decline in the standard of living that associated with economic growth without accounting for environmental costs and the normal wear and tear of human-made capital.

10. Genuine Net Savings (GS) does not include which of the following?

- a) Depreciation of human-made capital.
- b) Depletion of resources.
- c) Investments in human capital.
- d) Damages from local and global air pollutants are taken into account.
- e) Negative effects of crime rates.

### **Challenge Question**

What policies should a resource-dependent country like Saudi Arabia pursue if their net genuine savings is persistently negative?

## **ANSWERS**

1. c
2. a
3. c
4. b
5. b
6. d
7. e
8. e
9. a
10. e

## **Chapter 14**

1. Which one of the following is not an example of Design for the Environment (DfE)?
  - a) Pollution avoidance.
  - b) Pollution treatment.
  - c) Imitation of nature.
  - d) Energy efficiency.
  - e) All of the above are examples of DfE.
  
2. In order for corporations to embrace eco-efficiency, they must do which of the following?
  - a) Consider short-term costs.
  - b) Consider long-term opportunities.
  - c) Reduce their investment in short-term capital.
  - d) Promote short-term profitability in order to have funds for the future.
  - e) They must do all of the above.
  
3. Coca Cola's commitment to environmentally sustainable resource use is different from that of 3M's in what way?
  - a) Coca Cola's commitment to environmental sustainability goes beyond water conservation.
  - b) They have no desire to change their corporate culture.
  - c) Coca Cola's commitment to environmentally sustainable resource use is pursued with a focus on the conservation of a single resource.
  - d) 3M is regularly accused by environmental groups of ethical violations.
  - e) All of the above.
  
4. Which of the following is not one of the four Rs that are the guiding principles of eco-efficiency?
  - a) Reduce.
  - b) Recycle.
  - c) Regulation.
  - d) Reuse.
  - e) Reclaim.

5. In which way does the linear industrial system differ from a closed-loop cyclical system?

- a) In the former system, organized processes or activities damaging wastes are discharged into the environment.
- b) In the former system, production processes are designed such that they are dependent on each other.
- c) In the former system, the role of industrial ecology is more significant.
- d) In the former system, products must be designed in such a way that byproduct and wastes are minimized.
- e) The two systems are analogous.

6. What practical steps can be taken to eliminate the use of synthetic substances that are either suspected or known to be toxic to the environment and human health?

- a) Find substitutes for toxins.
- b) Legislate and enforce environmental laws to make the penalty for releasing toxic wastes into the environment expensive
- c) Increase consumption taxes so that less toxic substances are consumed.
- d) “a” and “b”
- e) “a” and “c”

7. Which of the following is not one of the six criteria (questions) laid out by Dr. Karl-Henrik Robert used to identify substances that are persistent toxins?

- a) Is the substance natural?
- b) Is it stable?
- c) Does it degrade into harmless substances?
- d) Does it accumulate in bodily tissues?
- e) Is it harmful to animals, but not humans?

8. Over-reliance on fossil fuels for some industries can lead to which of the following?

- a) Firms can operate, on average, at a higher energy efficiency level.
- b) Firms can operate, on average, at a lower energy efficiency level.
- c) Increases in carbon dioxide emissions.
- d) Both “a” and “b”.
- e) Both “b” and “c”.

9. Which of the following should be a lesson to human industrial systems based on nature as model?

- a) Symbiotic cooperation is most advantageous when diverse firms are within close geographic proximity.
- b) Today, we have a problem of shortages of raw materials.
- c) Use innovations that consume more energy.
- d) Today, we have a problem of consumerism.
- e) Keep away from biomimicry as it increases pressure on resource use.

10. What is implied by someone who states, “development should be eco-effective rather than eco-efficient”?

- a) Any industrial development process should be as efficient as possible.
- b) One should avoid fossil fuels, if possible.
- c) Process development should rely entirely on nature as its best guide.
- d) All of the above.
- e) None of the above.



## ***ANSWERS***

- 1.b
- 2.b
- 3.d
- 4.e
- 5.a
- 6.d
- 7.e
- 8.e
- 9.a
- 10.c