Self Test
Energy and Optimal Pollution

Created by Sami Kamel, Alex Lombardia, Harianto Tarigan,

Serhat Altun, Greta Goto, Tyler Hodge, Sofia Morales, Kevin DeGeorge.

Click on True or False to test your knowledge of the chapter.

1. True False In the combustion of methane gas, the only two elements released are energy and carbon dioxide.

2. True False Sulfur dioxide (SO_2), which is released from the combustion of some hydrocarbons, reacts with water and oxygen in the atmosphere, forming sulfurous and sulfuric acid (H_2SO_3 and H_2SO_4) and returns to the earth's surface in precipitation called 'acid rain'.

3. True False The only pollutant released in the combustion of hydrocarbon fuels is CO_2.

4. True False There is a positive relationship between the amount of carbon in the hydrocarbon molecules, the state of the hydrocarbon compound (gaseous, liquid or solid), the energy content, and the amount of carbon emissions.

5. True False Many corporations endorse a set of environmental principles called CERES after the Coalition for Environmentally Responsible Economies.

6. True False The pollution generated by energy production is called an externality because it is released to the external environment.

7. True False Externalities are always negative.

8. True False. If we can internalize an externality through taxation, we will attain the social optimum amount of energy production and the social optimum amount of pollution.

9. True False According to Coase, zero transaction costs are required for a market to achieve an optimal level of pollution.

10. True False A tax on pollution is a form of 'command and control' policy.

11. True False Having the victims of pollution pay to clean up is encouraged by economists because they are more likely to understand the true damages and it is more likely to result in a social optimum.

12. True False Uniform pollution regulation standards assume that pollution costs and benefits are the same for all regions.

13. True False A method of marketable permits is preferred by economists because it allows the market to allocate the resources more efficiently.

14. True False A system of tradable permits has yet to be successfully implemented in the energy sector.

15. True False. There are direct and indirect methods of measuring non-market costs caused by pollution.

16. True False If a cement factory is polluting the air as a result of its industrial processes, the social marginal cost will have no relationship to the private marginal cost.

17. <u>True</u> <u>False</u> If the total cost of pollution is TC = $(1/2)E^2$ and the total benefits of pollution are TB = $21E - 0.5E^2$, the optimal level of pollution is 14.

18. <u>True</u> <u>False</u> For a uranium mill that is polluting the environment, subsidizing the consumption of uranium, so they have the money to clean up, is an incentive to reduce the negative externality of the pollution.

19. <u>True</u> <u>False</u> To reach an economically efficient output level of a good, the size of an excise tax imposed by the government on the firm producing a good which causes pollution should be equal to the difference between the social marginal cost and the firm's marginal cost.

20. <u>True</u> <u>False</u> It is difficult to measure the costs of externalities.

21. <u>True</u> <u>False</u> Dispatch curves which are used to determine which power plants will be allowed to operate takes into consideration the environmental efficiency associated with each facility.

22. <u>True</u> <u>False</u> If energy production is causing pollution where supply is equal to $Q_s = -5 + 8P$ and demand is equal to $Q_d = 6 - 2P$ and external costs are 0.30 per BTU, market price and quantity would be Q = 3.8, and P = 1.1; and optimal social price and quantity would be Q = 3.875, and P = 0.95.

23. <u>True</u> <u>False</u> Given a relatively flat MB curve and a risk of higher than expected marginal cost of abatement, it would be more socially optimal to have a tax policy rather than quota policy for abatement? (Contributed by Shane Mather)

24. <u>True</u> <u>False</u> An externality between two firms can be internalized if the marginal costs for both firms are equal.

25. <u>True</u> <u>False</u> Suppose marginal costs of pollution emissions in Denver are

> $MC_D = 0$ for $E < 7.5$
>
> $MC_D = -15 + 2E$ for $E \geq 7.5$

Similarly, marginal costs of pollution in Golden are

> $MC_G = 0$ for E < 12
>
> $MC_G = -12 + E$ for ≥ 12

Let the marginal benefits of pollution be the same in both places

> $MB = 30 - E$.

The optimal pollution levels in Denver and in Golden are respectively, 15 and 21.

26. <u>True</u> <u>False</u> Again assume marginal costs of pollution in Denver and Golden are

> $MC_D = 0$ for $Q < 7$
>
> $MC_D = -15 + 2Q$ for $Q > 7$
>
> $MC_G = 0$ for $Q < 12$
>
> $MC_G = -12 + Q$ for > 12

and the marginal benefits of pollution are the same in both places

> $MB = 30 - Q$.

The total social losses will be 80 if the environmental protection agency, EPA, sets the standard at 18 in both places.

27. **True** **False** There are two ways to get to a socially optimal level of pollution, that is to set "a tax for pollution" or to set "a pollution standard". Economists often tend to favor setting "a tax for pollution".

28. **True** **False** The value of life can be measured by the implicit value people place on their lives in the market place. For example, suppose Carol was willing to increase the risk of her death in a particular year by 1 in 10,000 for a $500 increase in annual salary. The value she implicitly gives to her life is $ 5,000,000.

29. **True** **False** Suppose that marginal pollution costs are uncertain. When the slope of the marginal benefits curve increases, the social losses from a standard under uncertain marginal pollution cost would increase.

30. **True** **False** Both costs and benefits of CO2 abatement are uncertain MB1 = 50 - 0.3A and MB2 = 100 - 0.8A the first has a 60% probability and the second has 40% probability. MC1 = 20 + 0.1A. MC2 = 10 + 0.15A. MC3 = 30 + 0.2A. Their separate probabilities are 0.3, 0.2, and 0.5. The optimal level of abatement is 78.79.

31. **True** **False** Throughout 1980s and 1990s, opposition to nuclear energy has increased because of nuclear power accidents (Contributed by Ganna Bielenka)

32. **True** **False** If two firms have MB from pollution of MB1=20-Qp and MB2 = 10-1/4Qp, the unregulated Qp will be 60 units of pollution.

33. **True** **False** (From the previous question). If the EPA decides they want to reduce pollution to Qp total =50, and they limit each firm to 25 units, the pollution emitted by each firm will be 25 for a total of 50.

34. **True** **False** In the above question, the EPA caves in to political pressure and issues 50 tradable pollution permits. This results in a more economically efficient distribution of benefits, but also results in more pollution.

35. **True** **False** A country is faced with the problem of abating pollution. Its marginal benefit curve is MB = 65 - A. There are three different abatement costs scenarios:

$MC1 = 5 + (1/10)A$ with 55% probability;

$MC2 = 10 + (1/8)A$ with 15% probability;

$MC3 = 7 + (1/9)A$.

The expected marginal cost is E[MC] = 6.35 + 0.107A.

36. **True** **False** If the marginal benefits of abatement is $MB = 65 - A$ and the expected marginal cost of abatement is E(MC) = $6.35+ 0.107A$. Then the expected socially optimal pollution abatement will be 52.98.

37. **True** **False** Suppose there are two refineries in a particular country. The government wants to reduce the emissions of volatile organic compounds (VOCs) by 20. The marginal cost of abatement for refinery 1 is $9A_1$ and the marginal cost of abatement for firm 2 is $3A_2$. Then the optimal level of abatement for A_1 is 5 and for A_2 is 15.

38: True False Valuing non-marketed goods can be difficult. One way of doing so is the hedonic valuation method involves conducting surveys in which individuals state either their willingness to pay to reduce pollution, or their willingness to accept the negative effects of pollution. (Contributed by Matt Adkins)

39. True False Kazakhstan as well as other Former Soviet Union (FSU) countries have a relatively clean environment because socialism was interested in the welfare of its people rather than capitalistic profits. (Contributed by Oksana Chernenko)

40. True False Negative externality leads to inefficient production allocation, because marginal social costs are higher than marginal private costs. (Contributed by Oksana Chernenko)

41. True False Suppose that a refinery wants to use a local river for cooling and cleaning equipment and local inhabitants wants to use the river for fishing and swimming. Water used and discharged by the refinery is not toxic but has an odor that makes fishing and boating less pleasant. The income distribution effects of an optimal pollution tax will depend on who initially has the property rights to the river. (Contributed by John Kelly)