

Chapter 1 Emissions and Engine Performance Overview

True / False

1. The EPA regulates eight principal pollutants.

- a. True
- b. False

ANSWER: False

2. The ASM 25/25 test is an enhanced inspection and maintenance program performed in lieu of the full I/M240 test.

- a. True
- b. False

ANSWER: True

3. ASM 50/50 test is an enhanced inspection and maintenance program performed in lieu of the full I/M240 test.

- a. True
- b. False

ANSWER: False

4. Particulate matter (PM) is a microscopic form of gaseous air pollution.

- a. True
- b. False

ANSWER: False

5. Volatile organic compounds are biodegradable and will not harm the environment.

- a. True
- b. False

ANSWER: False

6. One of the six principal air pollutants regulated by the EPA is nitrogen dioxide.

- a. True
- b. False

ANSWER: True

7. Under ideal combustion, all the oxygen and all the hydrocarbons are chemically recombined to produce carbon monoxide and water.

- a. True
- b. False

ANSWER: False

8. The I/M240 testing readings of HC, CO, and NOX are provided in grams per mile.

- a. True
- b. False

ANSWER: True

9. Particulate matter (PM) is generally referred to as soot and smoke.

- a. True
- b. False

ANSWER: True

10. The least progress has been made on reducing ground-level ozone of the six major pollutants tracked by the EPA.

- a. True
- b. False

ANSWER: True

Multiple Choice

Technician A says that nitrogen can combine in the combustion chamber with oxygen to form nitrogen oxides, a regulated air pollutant. Technician B says that nitrogen makes up 78 percent of the air that we breathe every day. Who is correct?

11. Technician A says that nitrogen can combine in the combustion chamber with oxygen to form nitrogen o...

- a. A only
- b. B only
- c. both A and B
- d. neither A nor B

ANSWER: c

12. When unburned hydrocarbons are exposed to oxides of nitrogen and sunlight, what is produced?

- a. particulate matter
- b. carbon monoxide
- c. both A and B
- d. photochemical smog

ANSWER: d

13. If the fuel filler cap leaks, what emissions gas will be allowed to enter the atmosphere?

- a. HC
- b. CO
- c. CO₂
- d. NO_x

ANSWER: a

14. During perfect combustion in an internal combustion engine, the only output would be:

- a. H₂O and CO₂
- b. HC and CO
- c. H₂O and CO
- d. CO₂ and HC

ANSWER: a

15. Carbon deposits in the combustion chamber can:

- a. act like a sponge
- b. absorb fuel vapors on the intake stroke
- c. release fuel vapors on the exhaust stroke
- d. all of the above

ANSWER: d

Technician A says FTP is a test that measures emissions of HCs and CO₂. Technician B says EPA is a federal agency in charge of writing and implementing policies related to environmental protection. Who is correct?

16. Technician A says FTP is a test that measures emissions of HCs and CO₂. Technician B says EPA is a federal....

- a. A only
- b. B only
- c. both A and B
- d. neither A nor B

ANSWER: c

Technician A says one of the six principal air pollutants regulated by the EPA is nitrogen. Technician B says carbon dioxide contributes to global warming. Who is correct?

17. Technician A says one of the six principal air pollutants regulated by the EPA is nitrogen. Technici...

- a. A only
- b. B only
- c. both A and B
- d. neither A nor B

ANSWER: b

18. Photochemical smog is produced when:

- a. oxides of nitrogen and carbon dioxide are exposed to sunlight together
- b. oxides of nitrogen and unburned hydrocarbons are exposed to sunlight together.
- c. oxides of nitrogen and carbon monoxide are exposed to sunlight together
- d. carbon monoxide and unburned hydrocarbons are exposed to sunlight together

ANSWER: b

Technician A says under ideal combustion, all the nitrogen entering the combustion chamber will leave the combustion chamber unchanged. Technician B says under ideal combustion, all the oxygen and all the hydrocarbons are chemically recombined to produce carbon dioxide and water. Who is correct?

19. Technician A says under ideal combustion, all the nitrogen entering the combustion chamber will leave...

- a. A only
- b. B only
- c. both A and B
- d. neither A nor B

ANSWER: c

Technician A says in 1996 the EPA mandated the use of OBD testing as a replacement for tailpipe and dynamometer testing of emissions. Technician B says in 2001 the EPA ruled that OBD testing be performed in lieu of testing tailpipe emissions on vehicles produced beginning in 1996. Who is correct?

20. Technician A says in 1996 the EPA mandated the use of OBD testing as a replacement for tailpipe and dynamometer....

- a. A only
- b. B only
- c. both A and B
- d. neither A nor B

ANSWER: b

Subjective Short Answer

21. What is a microscopic form of solid air pollution that can be either solid or atomized liquid matter and that is generally referred to as soot and smoke?

ANSWER: Particulate matter (PM)

22. Of the six major pollutants tracked by the EPA, which has had the least progress made on reducing ground level amounts?

ANSWER: Ozone

23. What are the two enhanced inspection and maintenance programs performed in lieu of the full I/M240 test?

ANSWER: ASM 25/25 and ASM 15/50

24. How are the emission levels recorded during the I/M240 test?

ANSWER: Grams per mile (gpm)

25. What is the term for the point (having an air-fuel ratio range of 0.9 to 1.1) at which the fuel mixture burns the most efficiently?

ANSWER: Lambda

26. What federal agency has required that an inspection and maintenance (I/M) program be implemented for areas of the country that are considered non-attainment zones?

ANSWER: EPA

27. What emission in the exhaust stream is the result of unburned fuel leaving the combustion chamber?

ANSWER: Hydrocarbons

28. NOX begins to form in the combustion chamber when temperatures rise above what level?

ANSWER: 2500°F (1371.1°C)

29. The ideal relationship of gases in the internal combustion gasoline engine is 14.7:1. What term is used to describe this?

ANSWER: Stoichiometric

30. What is the generic term given to a group of highly reactive gases that contain nitrogen and oxygen in varying amounts?

ANSWER: Nitrogen oxides (NOX)

Essay

31. What are the by-products of ideal combustion in the internal combustion gasoline engine?

ANSWER: Under ideal combustion, all the oxygen and all the hydrocarbons are chemically recombined to produce carbon dioxide and water.

32. What are the negative consequences of CO₂ emissions from an internal combustion engine?

ANSWER: Some scientists are pointing at rising levels of CO₂ as a reason for global warming.

33. States may perform what other emission test besides the I/M240 test?

ANSWER: The ASM 25/25 and ASM 15/50 testing are both enhanced inspection and maintenance programs performed in lieu of the full I/M240 test.

34. CO can have what physical effect on the human body?

ANSWER: As you breathe air containing high levels of CO, your lungs convert this CO into carboxyhemoglobin, which is a compound that inhibits the blood's ability to carry oxygen through your body to organs and tissue.

35. The United States emits what volume of air pollution annually?

ANSWER: The United States emits 160 million tons of pollution into the air each year.

36. The I/M240 test evolved from what federal test procedure?

ANSWER: The I/M240 test evolved from the Federal Test Procedure (FTP), which lasts for 505 seconds.

37. On what vehicle model year and when did the EPA authorize the use of OBD testing as a replacement for tailpipe and dynamometer testing of emissions?

ANSWER: The EPA authorized the use of OBD testing as a replacement for tailpipe and dynamometer testing of emissions output beginning in 2001 on 1996 and newer model year vehicles.

38. What are volatile organic compounds, and how are they emitted from a motor vehicle?

ANSWER: They are emitted from the evaporative emissions and may include benzene, acetaldehyde, formaldehyde, toluene, xylene, and 1-3-butadiene. VOCs react with sunlight to form smog and other air pollutants.

39. The EPA regulates what six major pollutants?

ANSWER: The six principal air pollutants regulated by the EPA are carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM), and sulfur dioxide (SO₂), and lead (Pb).

40. What is particulate matter, and what other names are used to describe it?

ANSWER: Particulate matter (PM) is a microscopic form of solid air pollution; it can be either solid or atomized liquid matter and is generally referred to as soot and smoke.