

Automotive Electrical and Engine Performance 9th Edition
Chapter 23 – Gasoline Direct-Injection (GDI) Systems
Quiz A

1. Which fuel injection mode involves two injections during the intake and compression strokes to reduce spark knock?
 - a. Homogeneous mode
 - b. Homogeneous knock protection mode
 - c. Stratified mode
 - d. Catalyst heating mode

2. What is the primary advantage of the tumble combustion design in GDI systems?
 - a. Reduces engine knock
 - b. Increases swirl turbulence for better atomization
 - c. Optimizes the air-fuel mixture for combustion efficiency
 - d. Minimizes injector maintenance requirements

3. How does the PCM control the high-pressure pump in a GDI system?
 - a. Using a vacuum-controlled regulator
 - b. With an electric pressure-control valve
 - c. By directly altering the pump's mechanical pressure
 - d. Through injector timing synchronization

4. Why do GDI systems typically require a NOX storage catalyst in some applications?
 - a. To meet strict European emissions standards
 - b. To regulate high-pressure fuel flow
 - c. To reduce injector noise during operation
 - d. To improve cold-start performance

5. Which type of sensor is crucial for determining fuel rail pressure in a GDI system?
- a. MAP sensor
 - b. Low-pressure sensor
 - c. Rail pressure sensor
 - d. Intake air temperature sensor
6. What is a significant challenge faced by GDI systems compared to port injection systems?
- a. Increased fuel consumption at high loads
 - b. Inefficiency at low speeds
 - c. Inability to use low-octane fuel
 - d. Carbon buildup on intake valves
7. In which mode does the PCM inject fuel during the compression stroke to warm the catalytic converter?
- a. Homogeneous mode
 - b. Stratified mode
 - c. Knock protection mode
 - d. Catalyst heating mode
8. How are high-pressure fuel lines on GDI systems designed to ensure safety?
- a. Made of deformable ball-end fittings for secure seals
 - b. Integrated with the high-pressure pump for easy replacement
 - c. Coated with carbon-resistant material
 - d. Installed with reusable torque fittings
9. Which feature of GDI injectors helps maintain proper spray patterns despite high temperatures?
- a. Extended tips cooled by water jackets
 - b. Precision-machined six-hole designs
 - c. Single-slit openings for reduced clogging
 - d. High-voltage pulse operation

10. What differentiates homogeneous lean mode from standard homogeneous mode in GDI systems?

- a. Richer air-fuel mixture
- b. Leaner overall mixture for fuel efficiency
- c. Lower compression ratios during operation
- d. Dual injections per combustion cycle

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Correct Answers:

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