Automotive Electrical and Engine Performance 9th Edition
Chapter 19 – Narrow and Wide-Band Oxygen Sensors
Quiz B

1. What are the four basic components of a zirconia oxygen sensor?

a. Ambient electrode, Nernst cell, reference chamber, diffusion gap

b. Platinum electrodes, zirconia electrolyte, heater circuit, signal circuit

c. Pump cell, diffusion chamber, heater circuit, PCM control

d. Voltage regulator, platinum electrodes, ambient air, exhaust stream

2. What is the switching point voltage for a narrow-band oxygen sensor?

a. 0.45 V

b. 0.30 V

c. 0.70 V

d. 0.25 V

3. Which type of contamination can result in false rich indications in oxygen sensors?

a. Oil deposits

b. Excessive soot from rich mixtures

c. Antifreeze contaminants from coolant leaks

d. Silicone sealant vapors

4. What key functionality does the wide-band oxygen sensor provide over narrow-band oxygen sensors?

a. Detection of air–fuel ratios over a broader range (e.g., 10:1 to 23:1)

b. Faster response time at higher exhaust temperatures

c. Direct integration with dual-cell pump modules

d. Simplified design for post-converter monitoring

5. What does a catalytic converter efficiency test rely on from oxygen sensor data?

a. Constant signal amplitude at high voltages

b. Upstream and downstream sensor signal comparison

c. Pulse-width modulation response from the PCM

d. Direct heater circuit amperage consistency

6. How is oxygen pumped into or out of a dual-cell wide-band oxygen sensor diffusion chamber?

a. Through direct exhaust gas flow modulation

b. By reversing the Nernst cell voltage

c. By applying positive or negative current to the pump cell

d. By activating ambient air electrode polarity changes

7. What do high fuel trim numbers indicate during PCM diagnostics?

a. A rich mixture requiring additional fuel delivery

b. A lean mixture requiring increased fuel injection pulse width

c. A balanced air–fuel ratio near stoichiometry

d. Excess oxygen supply to the catalytic converter

8. What condition is required for closed-loop operation in engine systems with oxygen sensors?

a. Oxygen sensors reaching operating temperature

b. Throttle position stability within pre-determined limits

c. Exhaust temperature below catalytic efficiency thresholds

d. Fuel trim signals exceeding 800 mV voltage levels

9. Why are planar-design wide-band oxygen sensors preferred for modern engines?

a. They achieve light-off time (LOT) in less than 10 seconds

b. They utilize zirconia layers for increased durability

c. They generate precise signals without a reference chamber

d. They maintain a fixed lambda range for stoichiometric balance

10. When testing oxygen sensors with a digital multimeter, what indicates a defective sensor?

a. Voltage consistently higher than 700 mV

b. Voltage fluctuating beyond 1,000 mV at high RPM

c. Lack of fluctuation below 300 mV and above 800 mV

d. Current output exceeding 10 mA in closed-loop mode

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Correct Answers:

1. b

2. a

3. d

4. a

5. b

6. c

7. b

8. a

9. a

10. c