

**Automotive Electrical and Engine Performance 8th 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?
- Constant signal amplitude at high voltages
  - Upstream and downstream sensor signal comparison
  - Pulse-width modulation response from the PCM
  - Direct heater circuit amperage consistency
6. How is oxygen pumped into or out of a dual-cell wide-band oxygen sensor diffusion chamber?
- Through direct exhaust gas flow modulation
  - By reversing the Nernst cell voltage
  - By applying positive or negative current to the pump cell
  - By activating ambient air electrode polarity changes
7. What do high fuel trim numbers indicate during PCM diagnostics?
- A rich mixture requiring additional fuel delivery
  - A lean mixture requiring increased fuel injection pulse width
  - A balanced air–fuel ratio near stoichiometry
  - Excess oxygen supply to the catalytic converter
8. What condition is required for closed-loop operation in engine systems with oxygen sensors?
- Oxygen sensors reaching operating temperature
  - Throttle position stability within pre-determined limits
  - Exhaust temperature below catalytic efficiency thresholds
  - Fuel trim signals exceeding 800 mV voltage levels
9. Why are planar-design wide-band oxygen sensors preferred for modern engines?
- They achieve light-off time (LOT) in less than 10 seconds
  - They utilize zirconia layers for increased durability
  - They generate precise signals without a reference chamber
  - 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