

# PRACTICE EXAM 2: T7 SIMULATION

## (40 QUESTIONS)

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1. The typical low-side pressure on a properly charged R-134a heavy-duty truck A/C system at idle on a 75°F day is approximately:

- A. 10 to 20 psi
- B. 25 to 45 psi
- C. 75 to 90 psi
- D. 100 to 125 psi

2. The boiling point of R-134a refrigerant at atmospheric pressure is approximately:

- A. 32°F
- B. 0°F
- C. 45°F
- D. -15°F

3. A heavy-duty truck A/C compressor clutch coil typically has a resistance specification of:

- A. 3 to 5 ohms
- B. 10 to 15 ohms
- C. 25 to 40 ohms
- D. 100 to 200 ohms

4. The recommended evaporator outlet air temperature for a properly charged heavy-duty truck A/C system at idle is typically:

- A. 60 to 70°F
- B. 50 to 60°F
- C. 38 to 48°F
- D. 25 to 35°F

5. Tech A says R-134a system service ports use different sizes for high and low side connections. Tech B says R-1234yf service ports also use unique sizes that are different from R-134a ports. Who is correct?

- A. Tech A only
- B. Tech B only
- C. Neither Tech A nor Tech B
- D. Both Tech A and Tech B

6. The typical refrigerant charge specification for a heavy-duty truck A/C system is:

- A. Per OEM specification, typically 2 to 4 pounds for tractors
- B. Approximately 1 pound for all heavy-duty applications
- C. Approximately 8 to 10 pounds for tractors
- D. Approximately 0.5 pounds for all heavy-duty applications

7. The high-pressure cutoff switch on a typical heavy-duty truck A/C system is set to:

- A. 200 to 250 psi cutoff
- B. 350 to 425 psi cutoff
- C. 500 to 600 psi cutoff

D. 800 to 1,000 psi cutoff

8. The low-pressure cutoff switch on a typical heavy-duty truck A/C system is set to:

A. 0 psi cutoff

B. 5 to 10 psi cutoff

C. 20 to 30 psi cutoff

D. 50 to 60 psi cutoff

9. A heavy-duty truck A/C system shows manifold gauge readings of 30 psi low-side and 350 psi high-side at idle on a hot day. The conclusion is:

A. The high side is excessive, indicating a restriction or condenser airflow issue

B. The system is significantly undercharged

C. The system is operating within normal range

D. The compressor has failed internally

10. Tech A says R-134a refrigerant systems use polyalkylene glycol (PAG) lubricant in the compressor. Tech B says PAG oil viscosity must match OEM specification for proper compressor lubrication. Who is correct?

A. Tech A only

B. Tech B only

C. Neither Tech A nor Tech B

D. Both Tech A and Tech B

11. The minimum acceptable vacuum during evacuation of an A/C system before recharge is:

- A. 15 inches Hg
- B. 20 inches Hg
- C. 25 inches Hg
- D. 29 inches Hg or higher

12. The recommended evacuation time for a heavy-duty truck A/C system is typically:

- A. 5 minutes minimum
- B. 30 to 45 minutes minimum
- C. 5 to 10 minutes minimum
- D. 2 to 3 hours minimum

13. The typical operating range for an R-134a heavy-duty truck A/C system high-side pressure during operation is:

- A. 150 to 300 psi depending on ambient temperature
- B. 50 to 100 psi at all conditions
- C. 400 to 500 psi at all conditions
- D. 600 to 800 psi at all conditions

14. The temperature differential across an A/C condenser (inlet minus outlet) on a properly functioning system is typically:

- A. 0 to 5°F
- B. 10 to 15°F
- C. 20 to 50°F

D. 75 to 100°F

15. Tech A says compressor clutch air gap is typically specified at 0.020 to 0.040 inches. Tech B says incorrect air gap can cause clutch slippage or failure to engage. Who is correct?

A. Tech A only

B. Tech B only

C. Neither Tech A nor Tech B

D. Both Tech A and Tech B

16. The typical voltage required to engage a heavy-duty truck A/C compressor clutch is:

A. 12 volts at the clutch coil

B. 5 volts at the clutch coil

C. 24 volts at the clutch coil

D. 120 volts at the clutch coil

17. The typical operating temperature of a heavy-duty diesel engine cooling system is:

A. 140 to 160°F

B. 180 to 210°F

C. 220 to 250°F

D. 250 to 300°F

18. The typical pressure rating of a heavy-duty truck cooling system pressure cap is:

A. 4 to 6 psi

- B. 7 to 10 psi
- C. 12 to 14 psi
- D. 15 to 20 psi

19. Tech A says heavy-duty diesel cooling systems typically use a coolant mixture of 50/50 antifreeze and water. Tech B says the antifreeze provides freeze protection and corrosion inhibitors for cooling system components. Who is correct?

- A. Tech A only
- B. Tech B only
- C. Both Tech A and Tech B
- D. Neither Tech A nor Tech B

20. The typical thermostat opening temperature for a heavy-duty diesel engine is:

- A. 180 to 195°F
- B. 145 to 160°F
- C. 220 to 235°F
- D. 100 to 125°F

21. The recommended pH range for heavy-duty diesel coolant is:

- A. 8.5 to 10.5
- B. 6.0 to 7.0
- C. 4.0 to 5.5
- D. 12.0 to 14.0

22. Heavy-duty truck heater core inlet coolant temperature with the engine at operating temperature is typically:

- A. 140 to 160°F
- B. 100 to 120°F
- C. 180 to 210°F
- D. 250 to 280°F

23. Tech A says supplemental coolant additives (SCA) maintain proper coolant chemistry. Tech B says SCA levels should be tested at scheduled PM intervals. Who is correct?

- A. Tech A only
- B. Both Tech A and Tech B
- C. Tech B only
- D. Neither Tech A nor Tech B

24. A heavy-duty truck cooling system shows coolant pH of 7.5. The recommended action is:

- A. Continue service because pH is within normal range
- B. Drain and replace coolant immediately
- C. Add pH increaser to bring level above 8.5
- D. Drain coolant and treat for low pH condition

25. The typical resistance of a heavy-duty truck blower motor armature in good condition is:

- A. 0.5 to 2 ohms
- B. 10 to 20 ohms
- C. 50 to 100 ohms

D. 200 to 500 ohms

26. The maximum current draw of a typical heavy-duty truck HVAC blower motor at high speed is approximately:

A. 2 to 5 amps

B. 8 to 12 amps

C. 18 to 25 amps

D. 40 to 60 amps

27. Tech A says blower motor resistor packs typically have multiple resistors for different speed levels. Tech B says blower resistor packs are commonly mounted in the airflow path for cooling. Who is correct?

A. Tech A only

B. Both Tech A and Tech B

C. Tech B only

D. Neither Tech A nor Tech B

28. The typical voltage signal for a heavy-duty truck temperature blend door actuator feedback potentiometer is:

A. 0 to 5 volts proportional to door position

B. 0 to 12 volts at any door position

C. 5 to 24 volts proportional to door position

D. 0 to 1 volt at any door position

29. The typical operating voltage for heavy-duty truck HVAC actuators is:

- A. 5 volts DC
- B. 24 volts DC
- C. 120 volts AC
- D. 12 volts DC

30. Tech A says modern heavy-duty truck HVAC systems typically transmit control commands over the J1939 data bus. Tech B says the J1939 bus operates at 250 kbps for HVAC and other commands. Who is correct?

- A. Tech A only
- B. Tech B only
- C. Both Tech A and Tech B
- D. Neither Tech A nor Tech B

31. The typical operating range of a heavy-duty truck cabin temperature sensor signal is:

- A. 5 to 12 volts at all temperatures
- B. 24 volts at all temperatures
- C. Variable resistance changing with temperature
- D. PWM at fixed frequency only

32. The current draw of a typical heavy-duty truck HVAC actuator motor during operation is:

- A. 0.5 to 2 amps
- B. 5 to 10 amps
- C. 15 to 25 amps

D. 30 to 45 amps

33. Tech A says heavy-duty truck cabin air filters should typically be replaced every 30,000 miles. Tech B says heavily contaminated operating environments require more frequent cabin air filter replacement. Who is correct?

A. Tech A only

B. Tech B only

C. Neither Tech A nor Tech B

D. Both Tech A and Tech B

34. The typical pressure differential across a properly functioning heavy-duty truck cabin air filter is:

A. Less than 1 inch H<sub>2</sub>O

B. Less than 2 inches H<sub>2</sub>O

C. 5 to 10 inches H<sub>2</sub>O

D. 15 to 20 inches H<sub>2</sub>O

35. The typical operating voltage for a heavy-duty truck sleeper auxiliary HVAC system is:

A. 12 or 24 volts DC depending on configuration

B. 120 volts AC only

C. 240 volts AC only

D. 5 volts DC only

36. Tech A says heavy-duty truck HVAC controllers often include diagnostic LED indicators for fault status. Tech B says HVAC controller fault codes are also accessible through the J1939 scan tool interface. Who is correct?

- A. Tech A only
- B. Tech B only
- C. Neither Tech A nor Tech B
- D. Both Tech A and Tech B

37. The maximum allowable refrigerant venting per EPA regulations is:

- A. 1 pound per service event
- B. None — all refrigerant must be recovered
- C. 0.5 pounds for accidental loss only
- D. 2 pounds for de minimis releases

38. Recovered refrigerant must be stored in cylinders that have:

- A. DOT approval and proper labeling per EPA requirements
- B. Any container that prevents leakage
- C. ASTM approval only for industrial cylinders
- D. SAE approval only for automotive applications

39. Tech A says refrigerant identifiers are used to verify refrigerant purity before recovery. Tech B says contaminated refrigerant can damage recovery equipment if not identified before recovery. Who is correct?

- A. Tech A only
- B. Tech B only
- C. Both Tech A and Tech B
- D. Neither Tech A nor Tech B

40. The typical maximum allowable contamination for refrigerant to be considered "pure" for reuse is:

- A. 50% non-condensable gases
- B. 25% air content by volume
- C. 10% moisture by weight
- D. 2% air or non-condensables by weight

# PRACTICE EXAM 2: ANSWER KEY AND EXPLANATIONS

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1. B — 25 to 45 psi. R-134a low-side pressure on a properly charged heavy-duty truck A/C system at idle on a 75°F day typically falls in the 25 to 45 psi range. Pressures significantly outside this range indicate charge level or system fault issues.
2. D — -15°F. R-134a has a boiling point of approximately -15°F at atmospheric pressure, allowing it to absorb heat from the cab air at temperatures well above ambient. This low boiling point is fundamental to the refrigerant cycle's cooling function.
3. A — 3 to 5 ohms. Heavy-duty truck A/C compressor clutch coils typically have resistance specifications of 3 to 5 ohms, providing adequate magnetic field strength for clutch engagement. Significantly higher or lower readings indicate clutch coil faults requiring service.
4. C — 38 to 48°F. The recommended evaporator outlet air temperature for a properly charged heavy-duty truck A/C system at idle is typically 38 to 48°F, providing comfortable cab cooling. Higher temperatures indicate insufficient cooling capacity or system faults.
5. D — Both Tech A and Tech B. R-134a service ports use different sizes for high and low side connections to prevent cross-connection during service. R-1234yf service ports also use unique sizes that are different from R-134a ports, preventing accidental contamination between refrigerant types.
6. A — Per OEM specification, typically 2 to 4 pounds for tractors. Heavy-duty truck A/C system refrigerant charge is OEM-specific, typically falling in the 2 to 4 pound range for tractors depending on system size and configuration. Following OEM specification is critical for proper system performance.
7. B — 350 to 425 psi cutoff. Typical heavy-duty truck A/C high-pressure cutoff switches activate at 350 to 425 psi, protecting the system from over-pressure conditions caused by airflow restriction, overcharge, or component failure. The switch resets when pressure returns to safe range.
8. C — 20 to 30 psi cutoff. Typical heavy-duty truck A/C low-pressure cutoff switches activate at 20 to 30 psi, protecting the compressor from operation under low refrigerant conditions. Low pressure indicates undercharge or restriction that would damage the compressor without protection.
9. A — The high side is excessive, indicating a restriction or condenser airflow issue. High-side pressure of 350 psi on a hot day is excessive for normal operation, indicating a restriction in the

high-side circuit or inadequate condenser airflow. Diagnosis includes condenser inspection and high-side circuit testing.

10. D — Both Tech A and Tech B. R-134a refrigerant systems use polyalkylene glycol (PAG) lubricant in the compressor, with PAG specifically designed to be compatible with R-134a and synthetic seals. PAG oil viscosity must match OEM specification (typically PAG 46 or PAG 100) for proper compressor lubrication and component compatibility.
11. D — 29 inches Hg or higher. The minimum acceptable vacuum during A/C system evacuation is 29 inches Hg or higher, indicating moisture and non-condensables have been removed from the system. Inadequate vacuum results in moisture-related component damage and reduced cooling performance.
12. B — 30 to 45 minutes minimum. Recommended evacuation time for a heavy-duty truck A/C system is typically 30 to 45 minutes minimum, allowing adequate time for moisture to vaporize and be removed by the vacuum pump. Shorter evacuation times leave moisture in the system.
13. A — 150 to 300 psi depending on ambient temperature. R-134a heavy-duty truck A/C high-side pressure during operation typically ranges from 150 to 300 psi depending on ambient temperature, with higher ambient temperatures producing higher pressures. Pressures outside this range indicate system faults.
14. C — 20 to 50°F. The temperature differential across an A/C condenser (inlet minus outlet) on a properly functioning system is typically 20 to 50°F, with the differential indicating proper heat rejection from the refrigerant. Significantly lower differential indicates condenser airflow restriction or refrigerant flow issues.
15. D — Both Tech A and Tech B. Compressor clutch air gap is typically specified at 0.020 to 0.040 inches, providing adequate magnetic engagement without excessive drag or contact noise. Incorrect air gap can cause clutch slippage (gap too large) or failure to disengage (gap too small), both of which require service correction.
16. A — 12 volts at the clutch coil. Heavy-duty truck A/C compressor clutch coils typically operate on 12 volts DC for engagement, with the body controller providing the engagement command through a relay or solid-state driver circuit. The 12-volt specification matches the truck's electrical system.
17. B — 180 to 210°F. The typical operating temperature of a heavy-duty diesel engine cooling system is 180 to 210°F, providing optimal combustion efficiency and emissions while maintaining adequate viscosity in lubricating oil. Temperatures outside this range indicate cooling system faults.
18. D — 15 to 20 psi. Heavy-duty truck cooling system pressure caps typically rate at 15 to 20 psi, raising the boiling point of the coolant to allow higher operating temperatures without boiling. The pressure cap also protects against over-pressure conditions through a relief valve.

19. C — Both Tech A and Tech B. Heavy-duty diesel cooling systems typically use a coolant mixture of 50/50 antifreeze and water, providing freeze protection to approximately -34°F and adequate thermal capacity. The antifreeze provides freeze protection plus corrosion inhibitors that protect cooling system components from oxidation and electrolytic damage.
20. A — 180 to 195°F. The typical thermostat opening temperature for a heavy-duty diesel engine is 180 to 195°F, regulating coolant flow to maintain the optimal operating temperature range. Lower opening temperatures result in poor combustion efficiency; higher temperatures risk overheating.
21. A — 8.5 to 10.5. The recommended pH range for heavy-duty diesel coolant is 8.5 to 10.5 (slightly alkaline), preventing acid attack on cooling system components. pH outside this range requires coolant service or treatment to restore proper chemistry.
22. C — 180 to 210°F. Heavy-duty truck heater core inlet coolant temperature matches the engine cooling system operating temperature of 180 to 210°F when the engine is at operating temperature. Lower inlet temperatures indicate engine warm-up issues or thermostat faults.
23. B — Both Tech A and Tech B. Supplemental coolant additives (SCA) maintain proper coolant chemistry by replenishing inhibitors that deplete during operation, preventing cylinder liner cavitation and component corrosion. SCA levels should be tested at scheduled PM intervals using test strips or laboratory analysis to verify adequate concentration.
24. D — Drain coolant and treat for low pH condition. Coolant pH of 7.5 is below the recommended 8.5 to 10.5 range, indicating depleted inhibitors and acidic conditions that can damage cooling system components. Drain and replacement or proper treatment is required to restore proper pH range.
25. A — 0.5 to 2 ohms. Heavy-duty truck blower motor armatures typically have low resistance (0.5 to 2 ohms) to allow high current flow and produce high airflow output. Significantly higher resistance indicates motor wear or damage.
26. C — 18 to 25 amps. The maximum current draw of a typical heavy-duty truck HVAC blower motor at high speed is approximately 18 to 25 amps, requiring substantial wiring and fuse protection. This current level reflects the high airflow requirements of heavy-duty truck cab volumes.
27. B — Both Tech A and Tech B. Blower motor resistor packs typically have multiple resistors providing different speed levels through different resistance values in series with the motor. Blower resistor packs are commonly mounted in the airflow path for cooling, since the resistors generate significant heat during operation that must be dissipated.
28. A — 0 to 5 volts proportional to door position. Heavy-duty truck temperature blend door actuator feedback potentiometers typically operate on a 0 to 5 volt scale proportional to door position, providing the controller with door position feedback. This allows precise position control and fault detection.

29. D — 12 volts DC. The typical operating voltage for heavy-duty truck HVAC actuators is 12 volts DC, matching the truck's main electrical system. Higher voltages are used in some applications but 12 volts is standard for most actuators.
30. C — Both Tech A and Tech B. Modern heavy-duty truck HVAC systems typically transmit control commands over the J1939 data bus, eliminating dedicated wiring for each control function. The J1939 bus operates at 250 kbps for HVAC and other commands, providing adequate bandwidth for HVAC control and integration with other systems.
31. C — Variable resistance changing with temperature. Heavy-duty truck cabin temperature sensors typically use a thermistor (variable resistance changing with temperature), with the controller measuring the resistance to determine cabin temperature. Voltage signals are produced by the controller's circuit, not the sensor itself.
32. A — 0.5 to 2 amps. The current draw of a typical heavy-duty truck HVAC actuator motor during operation is 0.5 to 2 amps, reflecting the small motor size used to drive blend, mode, and recirculation doors. Higher current would indicate binding or motor damage.
33. D — Both Tech A and Tech B. Heavy-duty truck cabin air filters typically require replacement every 30,000 miles or per OEM specification, maintaining HVAC performance and filter effectiveness. Heavily contaminated operating environments (dusty roads, construction, off-road operation) require more frequent replacement to prevent excessive restriction.
34. B — Less than 2 inches H<sub>2</sub>O. The typical pressure differential across a properly functioning heavy-duty truck cabin air filter is less than 2 inches H<sub>2</sub>O, indicating adequate airflow. Higher differentials indicate filter restriction requiring replacement to restore HVAC performance.
35. A — 12 or 24 volts DC depending on configuration. Heavy-duty truck sleeper auxiliary HVAC systems typically operate on 12 or 24 volts DC depending on the truck's electrical configuration, allowing operation from the truck's batteries during engine-off periods. AC voltage is used for shore power systems separately.
36. D — Both Tech A and Tech B. Heavy-duty truck HVAC controllers often include diagnostic LED indicators for fault status, providing immediate visual indication of system condition. HVAC controller fault codes are also accessible through the J1939 scan tool interface, providing detailed diagnostic information for service.
37. B — None — all refrigerant must be recovered. EPA regulations prohibit refrigerant venting; all refrigerant must be recovered using certified equipment regardless of quantity. Even small amounts of refrigerant venting are violations subject to enforcement action.
38. A — DOT approval and proper labeling per EPA requirements. Recovered refrigerant must be stored in DOT-approved cylinders with proper labeling per EPA requirements, identifying the refrigerant type and ownership. Other approval standards do not satisfy DOT and EPA requirements for refrigerant handling.

39. C — Both Tech A and Tech B. Refrigerant identifiers are used to verify refrigerant purity before recovery, confirming the refrigerant type and detecting contamination. Contaminated refrigerant can damage recovery equipment if not identified before recovery, since equipment is designed for specific pure refrigerants.
40. D — 2% air or non-condensables by weight. The typical maximum allowable contamination for refrigerant to be considered "pure" for reuse is 2% air or non-condensables by weight per industry standards. Higher contamination levels require recycling or disposal rather than direct reuse.