PRACTICE EXAM 8: T7 SIMULATION (40 QUESTIONS)

1. R-1234yf refrigerant is classified by ASHRAE as:

A. A1 (non-flammable, low toxicity)

B. A3 (highly flammable, low toxicity)

C. A2L (mildly flammable, low toxicity)

D. B1 (non-flammable, high toxicity)

2. The transition from R-134a to R-1234yf in heavy-duty truck applications is driven primarily by:

A. Lower global warming potential (GWP) of R-1234yf

B. Higher cooling capacity of R-1234yf

C. Lower cost of R-1234yf compared to R-134a

D. Better availability of R-1234yf in the market

3. A modern heavy-duty truck with electronic expansion valve (EEV) controls refrigerant flow based on:

A. Mechanical sensing of evaporator outlet temperature only

B. High-side pressure measurement only

C. Manual setting by the driver

D. Multiple sensor inputs processed by a control module

4. Tech A says modern heavy-duty truck A/C systems may include electronic compressor clutch control. Tech B says electronic compressor clutch control allows variable engagement timing for fuel economy. 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

5. A heavy-duty hybrid or electric truck may use an electric A/C compressor that:

A. Operates independently of the engine through electric drive

B. Requires engine operation for compressor drive

C. Cannot operate during electric-only driving modes

D. Uses the same drive belt as conventional compressors

6. Tech A says electric A/C compressors typically use brushless DC motors. Tech B says these compressors include integrated control electronics for variable speed operation. 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

7. The proper diagnostic procedure for an electric A/C compressor fault includes:

A. Standard load testing at full output

B. Standard pressure testing without scan tool

C. Visual inspection only without electronic diagnostic

D. Use of OEM-specified scan tool and following manufacturer diagnostic procedures

8. A heavy-duty truck A/C system using R-1234yf requires service equipment that:

A. Is the same as R-134a equipment with adapter fittings

B. Is dedicated to R-1234yf service per EPA regulations

C. Is universal for any HFC refrigerant

D. Is not regulated by EPA for heavy-duty applications

9. Tech A says modern heavy-duty truck HVAC systems may include cabin air quality sensors. Tech B says air quality sensors can automatically activate recirculation mode when external air contains contaminants. Who is correct?

A. Both Tech A and Tech B

B. Tech A only

C. Tech B only

D. Neither Tech A nor Tech B

10. A heavy-duty truck multi-zone HVAC system provides:

A. Single temperature control for all cabin areas

B. Manual control without automatic features

C. Independent temperature control for driver and passenger zones

D. Automatic recirculation only

11. The proper diagnostic procedure for a multi-zone HVAC fault includes:

A. Replacing the HVAC controller as the primary cause

B. Replacing all blend door actuators in sequence

C. Disconnecting the battery to reset the system

D. Verifying each zone controller commands and feedback through scan tool

12. Tech A says modern heavy-duty truck A/C systems may include refrigerant level sensors. Tech B says refrigerant level sensors provide diagnostic information beyond pressure switches. 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

13. A heavy-duty truck A/C system with predictive diagnostic capability may:

A. Identify developing issues before they cause complete failure

B. Predict refrigerant prices for future service planning

C. Predict driver behavior for HVAC operation

D. Predict ambient weather conditions for system operation

14. The proper procedure for replacing an electronic expansion valve on a heavy-duty truck is:

A. Direct mechanical replacement without programming

B. Replacement and immediate return to service

C. Replacement, calibration, and verification through scan tool

D. Replacement and reflashing of the engine ECU

15. Tech A says heavy-duty truck telematics systems may transmit HVAC operating data to fleet management. Tech B says HVAC telematics data can identify maintenance needs and operational issues. 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. A heavy-duty truck A/C system designed for R-1234yf compatibility uses:

A. Specific seals, hoses, and lubricants designed for R-1234yf

B. The same components as R-134a systems

C. Components designed for R-12 systems with adapter modifications

D. Components designed for any HFC refrigerant

17. A modern heavy-duty truck cooling system may use an electronic thermostat that:

A. Operates only on coolant temperature input

B. Adjusts opening temperature based on operating conditions

C. Replaces the water pump function

D. Eliminates the need for radiator airflow

18. The proper diagnostic procedure for an electronic thermostat fault includes:

A. Replacing the thermostat as the primary cause

B. Replacing the engine ECU as the primary cause

C. Verifying control signals and thermostat response through scan tool

D. Disconnecting the battery to reset the system

19. Tech A says heavy-duty truck cooling fans may use electronic clutch control with variable engagement. Tech B says variable fan engagement improves fuel economy by reducing parasitic load. Who is correct?

A. Both Tech A and Tech B

B. Tech A only

C. Tech B only

D. Neither Tech A nor Tech B

20. A heavy-duty hybrid or electric truck may use an electric water pump that:

A. Requires engine operation for pump drive

B. Cannot operate during electric-only driving modes

C. Uses the same drive belt as conventional pumps

D. Operates independently of the engine through electric drive

21. The proper PM inspection for a modern heavy-duty truck cooling system includes:

A. Coolant testing, electronic component verification, and pressure testing

B. Visual inspection only at every PM

C. Component replacement at fixed mileage intervals

D. Pressure testing only when complaints reported

22. Tech A says heavy-duty truck cooling systems may include sensor inputs to the engine ECU for coolant temperature. Tech B says ECU control of cooling fan operation depends on accurate coolant temperature input. 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

23. A heavy-duty truck cooling system with integrated diesel exhaust fluid (DEF) tank cooling may:

A. Use coolant from the engine cooling system to heat or maintain DEF temperature

B. Operate independently of the engine cooling system

C. Use refrigerant from the A/C system

D. Use compressed air from the air system

24. The proper diagnostic procedure for a cooling system communication fault is:

A. Replace the affected module as the primary cause

B. Disconnect the battery to reset the system

C. Replace the wiring harness as the primary cause

D. Verify J1939 bus integrity and module power and ground connections

25. A modern heavy-duty truck HVAC system with full multiplexed control may communicate with:

A. Multiple vehicle networks including J1939, LIN, and CAN-FD

B. Only the J1939 bus

C. Direct hardwired connections only

D. Wireless RF communication only

26. The proper diagnostic procedure for HVAC system faults on a multi-network truck is:

A. Disconnect the battery to reset the system

B. Replace the body controller as the primary cause

C. Use OEM-specified scan tool with multi-network capability

D. Replace the affected modules in sequence

27. Tech A says heavy-duty truck HVAC systems may include cabin air quality monitoring. Tech B says air quality sensors can detect particulate matter and chemical contaminants. 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. A heavy-duty truck HVAC system with predictive maintenance capability may:

A. Predict future weather conditions for HVAC operation

B. Predict driver behavior for HVAC operation

C. Predict fuel prices for HVAC operation

D. Identify component degradation before complete failure

29. The proper procedure for HVAC system software updates on a multiplexed truck is:

A. Use OEM-specified scan tool and follow manufacturer update procedures

B. Disconnect the battery to clear existing software

C. Replace the HVAC controller to install new software

D. Reflash all vehicle modules simultaneously

30. Tech A says heavy-duty truck HVAC systems may include integration with telematics for remote monitoring. Tech B says HVAC telematics data can support preventive maintenance scheduling. 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. A heavy-duty truck HVAC system with adaptive learning may:

A. Predict driver location for HVAC pre-conditioning

B. Predict route conditions for HVAC operation

C. Adjust automatic operation based on driver preferences and patterns

D. Predict ambient temperature for HVAC operation

32. The proper diagnostic procedure for an adaptive HVAC system fault is:

A. Use OEM-specified scan tool and follow manufacturer diagnostic procedures

B. Replace the HVAC controller as the primary cause

C. Disconnect the battery to reset adaptive learning

D. Replace the body controller as the primary cause

33. Tech A says heavy-duty truck cabin air filters may include HEPA filtration for improved air quality. Tech B says HEPA filters require more frequent replacement than standard filters in heavy-duty applications. 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. A heavy-duty truck sleeper auxiliary HVAC system with battery-electric operation may:

A. Eliminate the need for any engine operation

B. Operate from auxiliary batteries with charging during engine operation

C. Replace the main HVAC system entirely

D. Operate only when the truck is connected to shore power

35. The proper diagnostic procedure for a sleeper HVAC system fault is:

A. Verify auxiliary power supply, control circuit, and HVAC system operation

B. Replace the auxiliary HVAC system as the primary cause

C. Replace the auxiliary batteries as the primary cause

D. Disconnect the battery to reset the system

36. Tech A says modern heavy-duty truck HVAC systems may include electronic compressor displacement control. Tech B says variable displacement provides better fuel economy and refrigerant cycle efficiency than fixed displacement. 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 proper handling of R-1234yf refrigerant during recovery includes:

A. Use of R-134a recovery equipment with adapter fittings

B. Use of dedicated R-1234yf recovery equipment per EPA regulations

C. Use of universal HFC recovery equipment

D. Use of any available recovery equipment in the shop

38. Tech A says R-1234yf flammability classification (A2L) requires specific service procedures and ventilation. Tech B says proper service training is required for technicians handling R-1234yf. Who is correct?

A. Both Tech A and Tech B

B. Tech A only

C. Tech B only

D. Neither Tech A nor Tech B

39. The proper storage of recovered R-1234yf refrigerant requires:

A. Mixing with R-134a for combined storage

B. Standard pressurized cylinders for any refrigerant

C. DOT-approved cylinders specifically labeled for R-1234yf

D. Open containers with proper ventilation

40. Per EPA regulations, R-1234yf recovery equipment must:

A. Operate at any rate without efficiency requirements

B. Recover refrigerant only when system leaks are present

C. Operate without requiring certification

D. Meet SAE J2843 standards for R-1234yf recovery efficiency

PRACTICE EXAM 8: ANSWER KEY AND EXPLANATIONS

1. C — A2L (mildly flammable, low toxicity). R-1234yf is classified by ASHRAE as A2L (mildly flammable, low toxicity), with the A2L classification requiring specific service procedures and equipment compared to non-flammable R-134a (A1). Service technicians must understand the flammability implications.

2. A — Lower global warming potential (GWP) of R-1234yf. The transition from R-134a to R-1234yf is driven primarily by the lower GWP of R-1234yf (less than 1 vs. 1,430 for R-134a), supporting environmental regulations to reduce greenhouse gas emissions. Cost and availability are not the primary drivers.

3. D — Multiple sensor inputs processed by a control module. Electronic expansion valves (EEVs) control refrigerant flow based on multiple sensor inputs (temperature, pressure, system load) processed by a control module, providing more precise control than mechanical TXVs. This enables system optimization across operating conditions.

4. B — Both Tech A and Tech B. Modern heavy-duty truck A/C systems may include electronic compressor clutch control through the body controller, providing precise engagement timing. Electronic control allows variable engagement timing for fuel economy by coordinating with engine operating conditions.

5. A — Operates independently of the engine through electric drive. Electric A/C compressors operate independently of the engine through electric drive, allowing operation during electric-only driving modes and at any time without engine operation. This supports hybrid and electric truck operation requirements.

6. C — Both Tech A and Tech B. Electric A/C compressors typically use brushless DC motors for high efficiency and long life without brush wear maintenance. These compressors include integrated control electronics for variable speed operation, providing capacity matching to load demand.

7. D — Use of OEM-specified scan tool and following manufacturer diagnostic procedures. Electric A/C compressor diagnosis requires OEM-specified scan tools and manufacturer procedures because these compressors use proprietary electronic control. Standard testing methods are inadequate for electronic compressor diagnosis.

8. B — Is dedicated to R-1234yf service per EPA regulations. R-1234yf service requires dedicated equipment per EPA regulations because the refrigerant has different chemistry, handling

requirements, and flammability characteristics than R-134a. Cross-equipment use is prohibited and creates safety risks.

9. A — Both Tech A and Tech B. Modern heavy-duty truck HVAC systems may include cabin air quality sensors that monitor cabin air conditions. Air quality sensors can automatically activate recirculation mode when external air contains contaminants (smoke, exhaust, dust), improving driver comfort and health.

10. C — Independent temperature control for driver and passenger zones. Multi-zone HVAC systems provide independent temperature control for driver and passenger zones (and sometimes additional zones), allowing different temperature settings for occupants in the same cabin. This is a comfort feature for sleeper applications.

11. D — Verifying each zone controller commands and feedback through scan tool. Multi-zone HVAC fault diagnosis uses scan tool verification of each zone controller's commands and feedback, isolating which zone or component has the fault. Component replacement without zone isolation is inefficient.

12. B — Both Tech A and Tech B. Modern heavy-duty truck A/C systems may include refrigerant level sensors that monitor refrigerant quantity, providing real-time data on system condition. Refrigerant level sensors provide diagnostic information beyond pressure switches, enabling more precise diagnosis and earlier fault detection.

13. A — Identify developing issues before they cause complete failure. Predictive diagnostic capability identifies developing issues (degrading components, reduced performance) before they cause complete failure, supporting preventive maintenance. This differs from reactive diagnosis after failure occurs.

14. C — Replacement, calibration, and verification through scan tool. Electronic expansion valve replacement requires calibration and verification through scan tool because the valve uses electronic control and proper calibration is required for system operation. Direct replacement without calibration is incomplete service.

15. D — Both Tech A and Tech B. Heavy-duty truck telematics systems may transmit HVAC operating data to fleet management for remote monitoring. HVAC telematics data can identify maintenance needs (developing faults, performance degradation) and operational issues (improper use, system failures), supporting fleet operations.

16. A — Specific seals, hoses, and lubricants designed for R-1234yf. R-1234yf-compatible A/C systems use specific seals, hoses, and lubricants designed for R-1234yf chemistry. Using R-134a components with R-1234yf can cause seal damage, refrigerant loss, and system contamination.

17. B — Adjusts opening temperature based on operating conditions. Electronic thermostats adjust opening temperature based on operating conditions, providing optimization across engine load and

ambient conditions. This differs from mechanical thermostats that have a fixed opening temperature.

18. C — Verifying control signals and thermostat response through scan tool. Electronic thermostat fault diagnosis uses scan tool verification of control signals and thermostat response, isolating the cause before component replacement. Standard testing methods are inadequate for electronic thermostats.

19. A — Both Tech A and Tech B. Heavy-duty truck cooling fans may use electronic clutch control with variable engagement, providing precise fan operation matching to cooling demand. Variable fan engagement improves fuel economy by reducing parasitic load when full fan operation is not required.

20. D — Operates independently of the engine through electric drive. Electric water pumps operate independently of the engine through electric drive, providing coolant circulation during electric-only driving modes and at variable speeds independent of engine RPM. This supports hybrid and electric truck operation.

21. A — Coolant testing, electronic component verification, and pressure testing. Modern heavy-duty truck cooling system PM includes coolant testing (chemistry verification), electronic component verification (sensors, controllers, electric components), and pressure testing (leak detection). This comprehensive approach identifies issues across all system aspects.

22. C — Both Tech A and Tech B. Heavy-duty truck cooling systems include sensor inputs to the engine ECU for coolant temperature, providing data for engine management functions. ECU control of cooling fan operation depends on accurate coolant temperature input, with sensor faults producing fan operation issues.

23. A — Use coolant from the engine cooling system to heat or maintain DEF temperature. Integrated DEF tank cooling uses engine coolant to heat or maintain DEF temperature, preventing DEF freezing in cold weather and optimizing emissions system performance. The coolant connection provides controlled temperature management.

24. D — Verify J1939 bus integrity and module power and ground connections. Cooling system communication fault diagnosis requires verification of J1939 bus integrity and module power and ground connections, isolating the specific fault location. Component replacement without verification is inefficient.

25. A — Multiple vehicle networks including J1939, LIN, and CAN-FD. Modern heavy-duty truck HVAC systems with full multiplexed control may communicate with multiple vehicle networks including J1939 (main backbone), LIN (low-bandwidth components), and CAN-FD (high-bandwidth subsystems). This multi-network architecture is standard on current trucks.

26. C — Use OEM-specified scan tool with multi-network capability. Multi-network HVAC fault diagnosis requires OEM-specified scan tools with multi-network capability, since fault information may be on different networks. Standard scan tools may not access all relevant network data.

27. B — Both Tech A and Tech B. Heavy-duty truck HVAC systems may include cabin air quality monitoring with sensors that detect air conditions. Air quality sensors can detect particulate matter (dust, soot) and chemical contaminants (CO, VOCs), providing comprehensive air quality monitoring for driver health.

28. D — Identify component degradation before complete failure. Predictive maintenance capability identifies component degradation (gradual performance decline, fault precursors) before complete failure, supporting preventive maintenance scheduling. This is a sophisticated diagnostic feature beyond reactive maintenance.

29. A — Use OEM-specified scan tool and follow manufacturer update procedures. HVAC system software updates require OEM-specified scan tools and manufacturer update procedures to ensure proper software installation and configuration. Improper update procedures can damage modules or cause operational issues.

30. C — Both Tech A and Tech B. Heavy-duty truck HVAC systems may include integration with telematics for remote monitoring of HVAC operation. HVAC telematics data can support preventive maintenance scheduling by identifying developing issues and performance trends across the fleet.

31. C — Adjust automatic operation based on driver preferences and patterns. Adaptive learning HVAC systems adjust automatic operation based on driver preferences and patterns, providing personalized comfort over time. This is a sophisticated feature beyond fixed automatic operation.

32. A — Use OEM-specified scan tool and follow manufacturer diagnostic procedures. Adaptive HVAC system diagnosis requires OEM-specified scan tools and manufacturer procedures because the adaptive learning function is proprietary and complex. Standard diagnostic methods are inadequate for these systems.

33. D — Both Tech A and Tech B. Heavy-duty truck cabin air filters may include HEPA filtration for improved air quality, providing higher particulate removal than standard filters. HEPA filters require more frequent replacement than standard filters in heavy-duty applications because they capture more contamination and reach restriction limits faster.

34. B — Operate from auxiliary batteries with charging during engine operation. Battery-electric sleeper auxiliary HVAC systems operate from auxiliary batteries during engine-off periods, with charging occurring during engine operation. This eliminates engine idling for cab climate control, providing significant fuel savings.

35. A — Verify auxiliary power supply, control circuit, and HVAC system operation. Sleeper HVAC system fault diagnosis requires verification of auxiliary power supply, control circuit, and HVAC

system operation to isolate the specific fault. Component replacement without verification is inefficient.

36. D — Both Tech A and Tech B. Modern heavy-duty truck HVAC systems may include electronic compressor displacement control for precise capacity matching. Variable displacement provides better fuel economy and refrigerant cycle efficiency than fixed displacement by matching capacity to actual cooling demand.

37. B — Use of dedicated R-1234yf recovery equipment per EPA regulations. R-1234yf recovery requires dedicated equipment per EPA regulations because the refrigerant has different chemistry and handling requirements than other refrigerants. Cross-equipment use is prohibited and creates contamination and safety risks.

38. A — Both Tech A and Tech B. R-1234yf flammability classification (A2L) requires specific service procedures and adequate ventilation to prevent ignition risks. Proper service training is required for technicians handling R-1234yf because the safety procedures differ from non-flammable R-134a service.

39. C — DOT-approved cylinders specifically labeled for R-1234yf. R-1234yf storage requires DOT-approved cylinders specifically labeled for R-1234yf, since cylinder design and labeling must match the specific refrigerant. Mixing or improper labeling violates regulations and creates safety risks.

40. D — Meet SAE J2843 standards for R-1234yf recovery efficiency. EPA regulations require R-1234yf recovery equipment to meet SAE J2843 standards for recovery efficiency, ensuring adequate refrigerant capture during service. The standard specifies minimum efficiency requirements for R-1234yf recovery.