

Reference Materials: Note: This exam may contain some "accepted practice" type questions not found in the reference material listed below.

NFPA 1917, *Standard for Automotive Ambulances*, including annexes

NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus*

National Fire Protection Association, Quincy, MA. To order call (800) 344-3555 or www.nfpa.org

Ford Ambulance QVM Guide, https://fordbbas.com/topics/qvm_ambu.html

General shop manuals, such as: Ford 1-ton chassis, Freightliner Medium Duty, International/Navistar Medium Duty, Allison Transmission E books

Any service manual for OBD-2, Class 1 Diagnostic Service Codes

LEARNING OBJECTIVES FOR THE E-4 EXAM

1. **Physical Characteristics of an ambulance** - Identify the design requirements as stated in NFPA 1917:
 - a. Height, width, wheel base & length
 - b. Ambulance types
 - c. Ambulance class & configurations
 - d. Weight distribution
 - e. Rearview mirrors

2. **Cab and Body** - Identify components and location. Describe maintenance and repair of the following:
 - a. Doors, latches & hardware
 - b. Oxygen Systems
 - (1) Maximum leakage
 - (2) Hose requirements
 - c. Dissimilar metals
 - d. Handrails
 - e. Warning light system
 - (1) Do not move light
 - (2) Low voltage
 - f. Patient compartment
 - (1) seat belts warning signal
 - g. Back up alarm
 - (1) Control
 - (2) Decibels

3. **Chassis** - Describe principles of operation, maintenance, and repair of the following:
 - a. Brakes
 - (1) Hydraulic brake systems & fluid types
 - (a) Fluid level
 - (2) Parking brakes and cables
 - (3) Anti-lock systems
 - (a) Wiring
 - (b) Bleeding
 - (c) Driveline retarder
 - (4) Brake assemblies
 - (a) Rotors
 - (b) Rotor measurements
 - (c) Rotor run out
 - (5) Brake retarder installation
 - b. Suspension
 - (1) Tires & wheels
 - (a) Tire balance
 - (b) Tire size
 - (c) Tire air pressure/monitoring system
 - (2) Wheel nuts/torque
 - (3) Air ride height adjustment
 - c. Frame
 - (1) Body & cab mounts
 - d. Steering
 - (i) Symptoms
 - (2) Alignment

4. **Powertrain** - describe principles of operation, maintenance and repair of the following
 - a. Power train control module
 - b. Engine
 - (1) Breakout box use
 - (2) Effects of water in fuel
 - (3) Coolant additives
 - (4) Common rail diesel fuel systems
 - (5) Diesel exhaust service
 - (a) After treatment
 - c. Automatic transmissions
 - (1) Torque convertor
 - (a) Components
 - (b) Function
 - (c) Installation
 - (2) Towing vehicle with automatic transmission
 - (3) Manual downshifting
 - (4) Rocking vehicle with automatic transmission
 - (5) Inspection
 - (a) Gauges and indicators
 - (b) Exterior
 - (c) Diagnostic codes
 - (6) Maintenance
 - (a) Service intervals
 - (b) Required procedures after overhaul or replacement
 - (c) Fluid change
 - (7) Fluid
 - (a) Purpose
 - (b) Level
 - (c) Types
 - (d) Change intervals
 - (e) Effects of coolant contamination
 - (8) Electronic controls
 - (a) Shift point after calibration
 - (b) Main ECU power and ground wiring
 - (c) Cleaning connectors
 - (d) Effects of electromagnetic interference (EMI)
 - (e) Effects of radio transmitter interference
 - d. Drive line
 - (1) Inspection
 - (2) Driveline angle
 - (3) Driveline phasing
 - (4) Slip joints & U-joints
 - (5) Vibration causes
 - (6) RPM test
 - e. Differentials
 - (1) Vibration
 - f. Road speed test

5. Troubleshooting & Diagnostics -Understand accepted practices of the following:

- a. Retrieving and interpreting diagnostic codes
 - (1) Breakout box
- b. Interpret diagnostic charts and service manuals
 - (1) Idle Validation Switch wiring
- c. Understanding schematic drawings
- d. Using diagnostic equipment
 - (1) Multi-meter uses
- e. Road testing for driveability problems
- f. Transmission
 - (1) Fluid
 - (a) Levels
 - (b) Contamination
 - (c) Effects of coolant contamination
 - (d) Fluid level too high
 - (e) Metal contaminated fluid
 - (2) Effects of a clogged breather
 - (3) Adjustments
 - (a) Linkage
 - (b) Shift points
 - (4)
 - (5) Electronic controls
 - (a) Multiple fault code
 - (b) Troubleshooting steps
 - (c) Cause of not shifting into gear
 - (d) Effect of poor battery connections
 - (e) Effects of water in connectors
 - (f) Historical code use
 - (6) Output shaft seal and yoke
 - (7) Stall test
 - (8) Troubleshooting procedure
 - (a) basic
 - (b) no code troubleshooting
 - (9) Leak diagnoses
 - (10) causes of overheating
- g. Welding precautions
- h. Driveline
 - (1) Vibration
 - (2) Driveline test
- i. Engine
 - (1) Leaks diagnoses
 - (2) Slow cranking
 - (3) Glow plug diagnostics
 - (4) Effects of clogged air filter
 - (5) Cause of pressure buildup in radiator
 - (6) Effect of incorrect muffler installation
- j. Differential
 - (1) Chattering noise
- k. Troubleshooting steps
- l. Brakes
 - (1) ABS braking systems
 - (2) Brake testing
 - (3) Boosters

6. Safety - Identify and describe the following:

- a. Safety procedures
 - (1) Use of wheel chocks
 - (2) Proper lifting & support equipment
 - (3) Right to know law
- b. Out of Service criteria
 - (1) Hydraulic brakes
 - (2) Engine oil leaks
 - (3) Automatic transmission
 - (4) Identifying out of service vehicle or component
 - (5) body mounts
 - (6) windshield wipers
- c. Equipment Storage and Mounting