

AREA FFA TRACTOR TECHNICIAN CDE

2024 Written Exam

For correct statements, bubble **True (A) Bubble**. For incorrect statements, bubble **False (B)**.

PLEASE DO NOT WRITE ON THIS EXAM

True / False

1. A gear driving a smaller gear in a gear train delivers lower torque but greater speed of the driven shaft. (FOS Power Trains)
2. A small gear driving a larger gear in a gear train delivers lower rpm but greater torque from the driven shaft. (FOS Power Trains)
3. The purpose of the top ring of a piston (with the piston crown pointed up) is to spread the lubricating oil on the cylinder wall and scrape off excess oil on the down stroke. (Harrell)
4. On exhaust valves with positive rotators, the greatest wear occurs at the valve spring retainer (keeper) groove due to spinning effect of the valve. (Harrell)
5. When testing circuits containing solid-state electronic components, use only volt-ohm meters that have impedance ratings of below 5,000 ohms per volt. (IMS 8799-A)
6. When using an ohmmeter to test resistance, attach the leads 'across' or in-parallel with the component or section of conductor being tested. (IMS 8799-A)
7. For DC circuits of 50 V or less, wires with black insulation are normally used as system ground wires; in AC circuits of 120 V or more, wires with black insulation are 'hot' wires. (IMS 8803-A)
8. Fully charged electrolyte (from a battery) has a specific gravity of 1.250 at 80° F and is roughly 64% sulfuric acid and 36% water. (FOS Electronic and Electrical Systems)
9. Adding water with a high mineral content, such as calcium or iron, has no effect on the life or performance of a wet-cell storage battery. (FOS Electronic and Electrical Systems)
10. Attaching a test lamp or other low-resistance test meter in-parallel to a live circuit can cause a sudden and significant change in current flow through the circuit resulting in improper test results, improper operation of the electronic system, and/or damage to sensitive semiconductor components in the circuit. (IMS 8803-B)
11. In an electrical circuit, pulse is a sudden on-off of direct current within a circuit. (FOS Electronic and Electrical Systems)
12. Micron is a measurement used to determine the degree of filtration of a filter. One micron is 0.001 millimeters; 100,000 microns equals one centimeter. (FOS Hydraulics)
13. Two basic types of seals are used in hydraulic systems; dynamic seals are used to seal fixed parts that do not move; static seals are used to seal moving parts. (FOS Hydraulics)

14. Fluid escaping under high pressure can penetrate the skin, causing serious injury. Diesel or hydraulic oil injected into the skin must be surgically removed within hours or gangrene is likely to result. (FOS Hydraulics)
15. 'Plastigage' is a precision measuring instrument and can be used to check the running clearance between crankshaft main bearing inserts and journals.
16. An SAE grade 8 bolt has a higher tensile strength than an SAE grade 5 bolt. (IMS 8792-C)
17. End play is the clearance or play between gears in mesh. (Harrell)
18. In an engine, a small amount of back-lash is necessary for the crankshaft to turn freely after the engine reaches operating temperature. (Harrell)
19. 'Permanent (ethylene-glycol based) antifreeze' means it will not boil away at normal operating temperatures and can be left in an engine indefinitely. (IMS 8206-A)
20. Use a dial indicator or flat thickness gauge to check the crankshaft end play. (Harrell)
21. Air velocity passing through a carburetor increases as it passes through the venturi. (IMS 8793-A)
22. A dragging armature in starter could be caused by either a bent armature or by worn bushings. (Harrell)
23. When disassembling equipment that contains coil springs, a technician should exercise caution because the springs may contain stored energy due to compression or tension. (IMS 8790)
24. The signal word 'WARNING' is used on safety decals on agricultural equipment to indicate the most potentially hazardous conditions. (IMS 8790)
25. A faulty injector could cause excessive black or gray smoke by a diesel engine. (Harrell)
26. A 12 V starting motor produces very high horsepower (for its size) but is designed to be operated only for short intervals (20-30 seconds) before allowing it to cool. (FOS Electronic and Electrical Systems)
27. In a diesel engine, the cetane rating of diesel fuel is not important; a diesel engine is designed to use any grade diesel fuel in any weather condition. (FMO Preventative Maintenance)
28. Tire traction or wheel slippage can be estimated by looking at the tire tread pattern on the soil when pulling under load. (FMO Preventative Maintenance)
29. The standard dimensions and pin sizes for Category I, II, III, and IV three-point hitches have been established by the SAE (Society of Automotive Engineers). (FMO Tractors)
30. Twisted wires with lead seals are often used on injector pumps and other precision devices to prevent unauthorized tampering or adjustment. (IMS 8792-C)
31. A potentiometer is actually a variable capacitance resistor. (IMS 8211-A)

32. Convert inch-pounds of torque to foot-pounds of torque by multiplying by 12 since there are 12 inches in a foot. (IMS 8792-A)
33. If a tractor engine is properly tuned, and its transmission and clutch are in proper repair, then its advertised PTO horsepower should equal its drawbar horsepower. (IMS 8203-A)
34. Although SAE (Society of Automotive Engineers) number for gear oils are larger than numbers for engine crankcase oils, gear oils are not necessarily higher in viscosity. (FMO Tractors)
35. Excess valve clearance can cause valve cracking or breaking or scuffing of cam followers; too little valve clearance can cause burned valves. (FMO Preventative Maintenance)
36. Discolored paint on an engine valve spring indicates the spring has overheated. (Harrell)
37. The firing order for a 6-cylinder diesel engine is: 1-5-3-6-2-4. (FMO Preventative Maintenance)
38. Most operator manuals recommend that dry element paper-type air filters be removed and cleaned daily. (FMO Preventative Maintenance)
39. A radial bearing load is parallel to the axis of rotation. (FOS Power Trains)
40. Relays use a small amount of current in one circuit to control a circuit carrying a large amount of current. (FOS Electronic and Electrical Systems)
41. A short circuit occurs when one part of a circuit contacts another part of a circuit, diverting the flow of current from its intended path. (FMO Preventative Maintenance)
42. Always install chain idlers on the tension side of chain drive. (FMO Preventative Maintenance)
43. Differential locks are designed to lock the two rear drive wheels of a tractor together so that they turn at the same speed, allowing the operator to drive in a straight line across the field. (FMO Tractors)
44. Comparing the same diameter hoses, a piece of SAE 100R1 hydraulic hose has a higher working pressure rating than a piece of SAE 100R10. (Harrell)
45. When under pressure in a hydraulic system, hydraulic fluid acts like a 'flexible solid.' (Harrell)
46. The formula used to calculate force exerted by a hydraulic cylinder is Force = diameter of the piston X pressure. (Harrell)
47. Reserve capacity tells how long a battery will operate at 80 degrees F while maintaining a 25-amp delivery rate at 1.75 volts per cell. (FOS Electronic and Electrical Systems)
48. Use a hydrometer to check the specific gravity of electrolyte in a storage battery. (IMS 8792-A)

49. One advantage of an electronic ignition system over a traditional point/condenser system is spark plugs should last twice as long. (FOS Electronic and Electrical Systems)
50. The purpose of an intercooler on a diesel engine is to cool engine oil before it is re-circulated. (FMO Tractors)

Multiple Choice

Note! Check each answer against the statement; one or more answers may be correct. Mark each statement TRUE or FALSE.

- A. Batteries connected in parallel will produce _____. (FOS Electronic and Electrical Systems)
51. twice the voltage, but amperage remains the same
52. twice the amperage, but voltage remains the same.
- B. The purpose(s) of a flywheel on an engine is (are) to _____. (FOS Power Trains)
53. act as a balancer for the engine to level out power impulses.
54. provide a surface from which the clutch can pick up torque from the crankshaft and transfer it to the drive train.
55. provide a ring gear for the engine starting motor to contact.
- C. The basic type(s) of PTO(s) used on agricultural tractors is (are) _____. (FOS Power Trains)
56. a transmission driven PTO that operates only when the engine clutch is engaged.
57. an independent driven PTO that has its own separate clutch and power train,
58. a direct-drive PTO driven directly from the engine crankshaft.
- D. Straight cut spur gears _____. (FOS Power Trains)
59. are quieter operating than helical cut spur gears.
60. have more teeth area in contact than the same comparable size helical cut spur gears, thus are stronger and can transmit more power.
61. have teeth cut to the axis of rotation.
62. permit the power flow to 'turn the corner.'
- E. When reading an electrical/electronic schematic, ORG/G could indicate _____. (IMS 8803-A)
63. an orange wire with green strips known as a tracer.
64. an orange-colored wire with green hash marks or dots known as tracers.
65. a gray wire with an orange tracer.
- F. DOT regulations specify that tractors and other self-propelled agricultural equipment operated on public roads shall be equipped with _____. (TxDOT handbook)
66. slow-moving vehicle (SMV) emblem mounted on rear of machine
67. at least two amber flashing warning lights visible from front and rear of machine
68. two red taillights mounted to the rear of the machine
- G. The effects of centrifugal force during the operation of agricultural equipment increases _____. (IMS 8201-A)
69. as the center of gravity of the equipment lowers.
70. as travel speed increases.
71. as the wheelbase of the equipment is shortened and or narrowed.

- H. On agricultural tractors and equipment, hazardous conditions that would result in the **highest probability** of serious injury or death if proper safety precautions are not followed are marked with _____. (IMS 8201-A)
72. black and yellow colored safety decals with the word "Caution" on them.
 73. black and yellow colored safety decals with the word "Warning" on them.
 74. red and white colored safety decals with the word "Danger" on them
- I. Common problem(s) which result(s) in leakage or failure of hydraulic connections is (are) _____. (Harrell)
75. over-tightening causing distortion of seats and flares or cracks in castings.
 76. under-tightening allowing the fitting to loosen due to vibration.
 77. mismatched fittings such as a 37° JIC flare joined to a 45° SAE swivel.
 78. dirt or foreign materials between the mating surfaces.
- J. A two-gear set in a power train with a 15-tooth driving gear and a 30-tooth driven gear with the driving shaft turning at 1000 rpm has _____. (Harrell)
79. a 1:2 gear ratio.
 80. a 2:1 gear ratio.
 81. a 2:1 speed ratio.
 82. the impact of increased output torque.
- K. Use a telescoping gauge and/or small hole gauge and a proper sized micrometer, to check the following parts/conditions in an engine to determine if they are within specifications _____. (Harrell)
83. crankshaft to bearing journal running clearance
 84. valve guide wear
 85. camshaft gear backlash
 86. valve timing
- L. Cetane number is an indication of the ignition quality of diesel fuel or the ease with which the fuel will ignite and burn: _____. (Harrell)
87. diesel fuel with a high cetane rating causes difficult engine starting in winter months.
 88. diesel fuel with a lower cetane rating will reduce carbon and varnish deposits.
 89. diesel fuel with a high cetane rating will help eliminate engine knock.
- M. It is preferable to re-fuel a tractor or other piece of agricultural equipment such as combine and cotton harvesting equipment _____. (FMO Preventive Maintenance)
90. in the middle of the workday.
 91. in the evening before storage.
 92. in the morning before going to the field.
 93. only when gauge shows less than 1/8 of a tank so fuel additives can be fully mixed.
- N. A digital electronic stepper motor used in the control devices of electro-hydraulic systems on modern agricultural equipment provides _____. (FMO Tractors)
94. a rotor that can positively stop at any precise location with no freewheeling.
 95. a rotor that can turn in a precise angular step or can turn continuously.
 96. that the direction of travel of the rotor can precisely controlled.

- O. The basic purpose(s) of a bearing is to ____.
- 97. support a moving part.
 - 98. reduce friction
 - 99. reduce wear
 - 100. provide a replaceable wear surface.

(IMS 8202-A)

Resources for this CDE

CDE Rules and Guidelines, some study materials	https://www.texasffa.org/cde-tractor-tech
John Deere FOS / FMO training manuals	https://techpubs.deere.com/content/educationalflyer.pdf
Online Trac Tech exams - QBank	https://quiz.judgingcard.com/
Written exams from previous years	kc.edney@outlook.com , 979/219-3782 (AEPD)
AIMS materials	https://agrilifelearn.tamu.edu/s/
Digital Multimeter Principles and student workbook (ATP)	https://www.atplearning.com/product/670/digital-multimeter-principles
Ag Teachers Association of Texas website	https://www.texasagteachers.org/

Key to 2024 Area FFA Tractor Technician CDE Written Exam

1	T	26	T	51	F	76	T
2	T	27	F	52	T	77	T
3	F	28	T	53	T	78	T
4	F	29	F	54	T	79	T
5	F	30	T	55	T	80	F
6	T	31	F	56	T	81	T
7	T	32	F	57	T	82	T
8	F	33	F	58	F	83	T
9	F	34	T	59	F	84	T
10	T	35	F	60	F	85	F
11	T	36	T	61	T	86	F
12	T	37	T	62	F	87	F
13	F	38	F	63	T	88	F
14	T	39	F	64	T	89	T
15	T	40	T	65	F	90	F
16	T	41	T	66	T	91	T
17	F	42	F	67	T	92	F
18	F	43	F	68	T	93	F
19	F	44	F	69	F	94	T
20	T	45	T	70	T	95	T
21	T	46	F	71	T	96	T
22	T	47	T	72	F	97	T
23	T	48	T	73	F	98	T
24	F	49	T	74	T	99	T
25	T	50	F	75	T	100	T