



0171-523 JUNE 2018

Level 2 Technical Certificate in Land-Based Engineering

Level 2 Land-Based Engineering – Theory Exam

Friday 22 June 2018
09:30 – 11:30

You should have the following for this examination

- a multiple-choice answer sheet
- a pen with black or blue ink

This question paper is the property of the City and Guilds of London Institute and is to be returned after the examination.

Read the following notes before you answer any questions

- You **must** use a pen with black or blue ink to complete **all** parts of the answer sheet.
- Check that you have the correct answer sheet for the examination.
- Check that your name and candidate details are printed correctly at the top of your answer sheet.
- Inform the invigilator if your name or examination details are not correct.
- Each question shows **four** possible answers (lettered 'a', 'b', 'c' and 'd'); only **one** is correct.
- Decide which **one** is correct and mark your answer on the **answer sheet** with your pen.

For example if you decide 'a' is correct, mark your answer like this

101	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Cancel	Cancel	Cancel	Cancel

If you want to change your answer, cancel your first choice by filling in the 'cancel' box below the circle like this

101	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Cancel	Cancel	Cancel	

Then mark the answer which you have now decided is correct. For example if you now decide 'c' is correct, mark your answer like this

101	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
	Cancel	Cancel	Cancel	

Any other marks on the form may invalidate some of your answers.

- Any calculations or rough working can be done on the question paper.
- Attempt all questions. If you find a question difficult, leave it and return to it later.

This paper contains 50 questions. Answer them using the 'boxes' numbered 1 to 50 on the answer sheet.

- 1 Which one of the following is an advantage of a four wheel drive system?
 - a Larger turning circle.
 - b Smaller turning circle.
 - c Continuous drive to all wheels.
 - d Continuous drive to front wheels.

- 2 Which one of the following is a **main** type of tyre that is used in the land based industry?
 - a Turf.
 - b Radial.
 - c Winter.
 - d Regrooved.

- 3 Which one of the following should be used to degrease bearings from land based transmissions?
 - a Grease proof paper.
 - b A power washer.
 - c Lint free cloths.
 - d A parts washer.



Figure 1

- 4 Which one of the following items is shown in Figure 1?
 - a Wishbone.
 - b PTO shaft.
 - c Top link.
 - d Drag link.

- 5 A tractor with a mechanical transmission keeps jumping out of gear. Which one of the following is **most** likely to be a possible fault?
 - a The selector lever is broken.
 - b Worn interlock on selector rail.
 - c The output shaft has snapped.
 - d Worn detent on selector rail.

- 6 What is the correct procedure for checking the rolling torque on an axle swivel housing?
 - a Fit the swivel pins and check with a spring balance.
 - b Fit the swivel pins then tighten the wheel nuts.
 - c Remove the wheel and then check the swivel pins.
 - d Remove the swivel pins and check with a spring balance.

- 7 If a single plate clutch is experiencing slipping when driving, what is the **most** likely cause?
 - a Worn friction disc.
 - b Worn release bearing.
 - c Worn damping springs.
 - d Worn mechanical linkage.

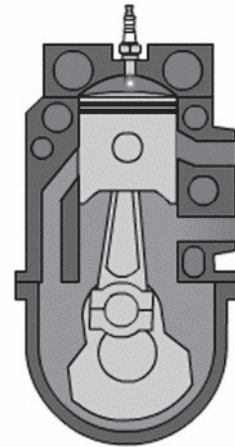


Figure 2

- 8 What type of engine is shown in Figure 2?
 - a A four stroke diesel engine.
 - b A two stroke diesel engine.
 - c A four stroke petrol engine.
 - d A two stroke petrol engine.

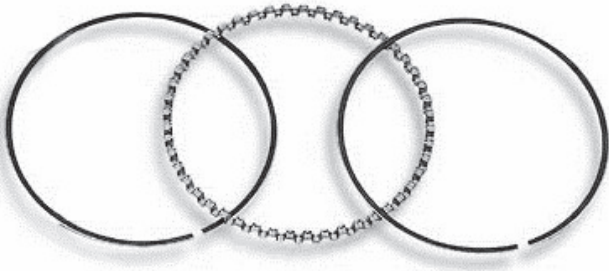


Figure 3

- 9 What is the purpose of the items in Figure 3?
- a To seal the combustion chamber.
 - b To seal the exhaust port.
 - c To seal the valve stems.
 - d To seal the inlet port.

- 10 One of the purposes of an engine oil pump is to
- a measure the amount of oil in an engine
 - b ensure the engine oil is the correct grade
 - c ensure that the engine oil remains in the sump
 - d create a flow of oil to all internal engine parts.

- 11 A four cylinder, four stroke in-line engine has a firing order of 1, 3, 4, 2.

Statement 1

If cylinder number 3 is on the power stroke then cylinder number 2 will be on the exhaust stroke.

Statement 2

If cylinder number 3 is on the power stroke then cylinder number 2 will be on the induction stroke.

Which one of the following is correct for the statements above?

	Statement 1	Statement 2
a	True	True
b	True	False
c	False	True
d	False	False

- 12 Maximum compression in the combustion chamber occurs when the piston is
- a at bottom dead centre
 - b on the exhaust stroke
 - c at top dead centre
 - d on the inlet stroke.

- 13 How does an external Exhaust Gas Recirculation system, fitted to an engine, operate?

- a By a lever on the crankshaft.
- b By a lobe fitted to the air intake.
- c By allowing air into the exhaust outlet.
- d By allowing exhaust gasses into the air inlet.

- 14 A lambda sensor helps to control emission by monitoring the

- a CO in the exhaust gasses
- b CO₂ in the exhaust gasses
- c NO_x in the exhaust gasses
- d O₂ levels in the exhaust gas.

- 15 Which one of the following is the **most** likely fault if an engine cooling system is **not** reaching normal working temperature?

- a The thermostat is stuck closed.
- b The thermostat is stuck open.
- c The coolant level is too high.
- d The water pump has failed.

- 16 The purpose of the oil filter bypass is to allow

- a unfiltered oil to bypass the filter
- b filtered oil to bypass the filter
- c the engine to run without oil
- d the oil to be changed easily.

- 17 Which one of the following precautions should be taken prior to working with vehicle electrics?

- a Disconnect the battery.
- b Remove all the fuses.
- c Remove all the relays.
- d Check all connectors.

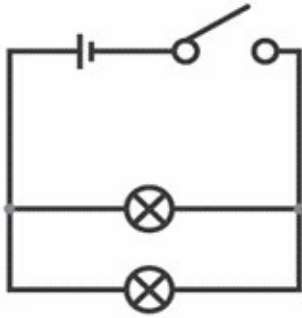


Figure 4

- 18 What type of circuit is shown in Figure 4?
- Series.
 - Parallel.
 - Open.
 - Closed.
- 19 Which unit of measure is used for electrical resistance?
- Volts.
 - Amps.
 - Watts.
 - Ohms.

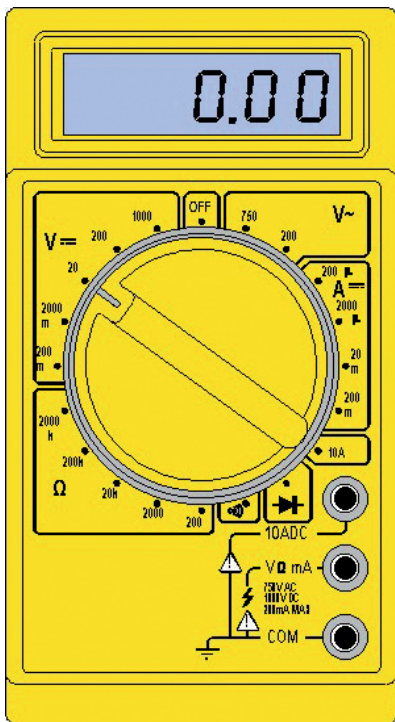


Figure 5

- 20 In Figure 5, what is the meter set to read?
- Volts AC.
 - Volts DC.
 - Amps.
 - Ohms.



Figure 6

- 21 What is the symbol shown in Figure 6?
- A battery.
 - A light bulb.
 - A connector.
 - A capacitor.
- 22 What is meant by 'short circuit' in relation to vehicle electrics?
- When there is a break in the circuit.
 - When there is a high voltage drop in the circuit.
 - When current takes the intended path of high resistance.
 - When current takes an unintended path of least resistance.
- 23 Which one of the following components transfers current to the starter motor windings?
- Relay.
 - Solenoid.
 - Ignition barrel.
 - Contact breaker.
- 24 Which one of the following is the **most** likely cause of a vehicle fuse blowing frequently?
- An open circuit.
 - A short circuit.
 - A faulty regulator.
 - A high resistance.
- 25 If an ammeter is connected across the terminals of a battery, what will happen?
- The fuse inside the ammeter will blow.
 - It will read 12 V if the battery is fully charged.
 - It will read 25 A if the battery is fully charged.
 - The ammeter will read overload.

- 26 How is pressure in a hydraulic circuit generated?
- a By increasing the oil level.
 - b By opening a restriction.
 - c By increasing the flow.
 - d By restricting the flow.

- 27 What is the purpose of a hydraulic pump?
- a To create flow.
 - b To increase heat.
 - c To decrease heat.
 - d To create pressure.

- 28 After removing a hydraulic pipe from a hydraulic system, **always** ensure that the
- a machine and pipe are both capped
 - b machine and pipe are put in a safe place
 - c pipe removed remains with the machine
 - d original pipe is fitted back on the machine.



<https://www.e4training.com>

Figure 7

- 29 What is the hydraulic symbol shown in Figure 7?
- a Open centre pressure relief valve.
 - b Closed centre pressure relief valve.
 - c Open centre directional control valve.
 - d Closed centre directional control valve.
- 30 What is the **main** danger of hydraulic oil injection into the bloodstream?
- a It may cause breathing problems.
 - b It may cause dermatitis.
 - c It can cause an infection.
 - d It can cause death.

- 31 A customer reports a hydraulic leak on their machine.

Statement 1

The technician operates the machine carefully and safely because it is important to verify the fault.

Statement 2

The technician operates the machine in order to find the hydraulic leak.

Which one of the following is correct for the statements above?

	Statement 1	Statement 2
a	True	True
b	True	False
c	False	True
d	False	False

- 32 After conducting a pressure test of the spool valves on a tractor, the pressure is found to be below manufacturer's specification. What is the **most** likely cause?

- a Correctly adjusted pressure relief valve.
- b Incorrectly adjusted pressure relief valve.
- c Incorrect hydraulic oil type.
- d Low hydraulic oil level.

- 33 On a tractor with a worn hydraulic pump, which one of the following symptoms would the tractor display?

- a Three point linkage slow to raise.
- b Three point linkage fast when raising.
- c High hydraulic oil temperature when raising.
- d Low hydraulic oil temperature when raising.

- 34 Which one of the following safety checks **must** be carried out **before** taking a machine onto the highway?

- a Check that all oil, fuel and filter levels are correct.
- b Check the power take off is switched on.
- c Check the hydraulic spool valves for correct operation.
- d Check all the lights are functioning correctly.

- 35 Which of the following maintenance checks should be conducted prior to starting a machine?
- a Check engine oil, coolant, hydraulic oil and fuel level.
 - b Check engine oil, battery level, alternator belt tension.
 - c Check coolant, alternator belt tension and battery level.
 - d Check hydraulic oil, fuel level and alternator belt tension.



Figure 8

- 36 What does the warning symbol in Figure 8 represent?
- a Battery warning.
 - b Engine oil level.
 - c Brake warning.
 - d Tyre pressures.



Figure 9

- 37 What does the warning symbol in Figure 9 represent?
- a Coolant temperature.
 - b Engine oil pressure.
 - c Engine oil level.
 - d Fuel level.



Figure 10

- 38 What is the piece of equipment shown in Figure 10?
- a A plough.
 - b A seed drill.
 - c A power harrow.
 - d A fertiliser spreader.

- 39 **Statement 1**
Prior to the start of the season the operator should check the fertiliser spreader for damage and wear.

Statement 2
At the end of the season the operator should ensure the fertiliser spreader is calibrated.

Which one of the following is correct for the statements above?

	Statement 1	Statement 2
a	True	True
b	True	False
c	False	True
d	False	False

- 40 The correct sequence for attaching the three point linkage when looking from the rear of the tractor is
- a top link, PTO, right link
 - b left link, right link, top link
 - c PTO, left link, right link
 - d left link, top link, right link.

To answer questions 41-44 you must refer to Scenario 1.

Scenario 1:

A customer has noticed that their tractor is down on power and has asked that the technician can investigate the fault at the same time of completing an annual service.

- 41 Before completing the tasks as requested by the customer, the technician should
- a check that they have all of the equipment required to complete the task
 - b check that the correct sensors are in stock
 - c check if the tractor can be kept in the workshop overnight
 - d check that they have the correct specification of tyres in stock.
- 42 Which **two** of the following components on the tractor will need to be replaced?
- 1 Fuel filter.
 - 2 Oil filter.
 - 3 Camshaft sensor.
 - 4 Fuel pressure sensor.
- a 1 and 2
 - b 2 and 3
 - c 3 and 1
 - d 4 and 3
- 43 Which one of the following is the **first** test that should be carried out in order to confirm the fault on the tractor?
- a A cylinder leak test.
 - b A compression test.
 - c A dynamometer test.
 - d An injector test.
- 44 Which one of the following is likely to cause the fault reported?
- a Low fuel level.
 - b Low engine oil level.
 - c Low battery voltage.
 - d Low cylinder compression.

To answer questions 45-50 you must refer to Scenario 2.

Scenario 2:

A customer has reported to the technician that their tractor will not start due to an electrical issue. They also suspect that a wheel bearing is out of adjustment as it judders when it drives.

- 45 What is the correct order of tasks to complete the adjustment in the scenario?
- 1 Remove wheels
 - 2 Remove hub cap
 - 3 Refit new split pin
 - 4 Place on axle stands
 - 5 Pre load the bearing
 - 6 Rebuild in reverse
 - 7 Remove split pin
- a 2, 3, 6, 1, 4, 5, 7
 - b 4, 1, 2, 7, 5, 3, 6
 - c 3, 7, 1, 2, 5, 6, 4
 - d 5, 6, 2, 4, 3, 7, 1
- 46 What tool should be used to ensure the correct size bearing is fitted?
- a Feeler gauge.
 - b Micrometer.
 - c Vernier caliper.
 - d Dial test indicator.
- 47 On completion of the repair, what should be used in order to lubricate the component?
- a Oil.
 - b Grease.
 - c Diesel fuel.
 - d Copper slip.
- 48 When investigating the electrical issue, the technician will check for
- a 12 v at the battery
 - b 12 A at the battery
 - c 24 v at the battery
 - d 24 A at the battery.

49 **Statement 1**
As the battery voltage is correct, the technician should check the voltage at the starter motor exciter terminal.

Statement 2
The technician should check the voltage at the motor earth return.

Which one of the following is correct for the statements above?

	Statement 1	Statement 2
a	True	True
b	True	False
c	False	True
d	False	False

50 Upon completion of all the tasks, what should the technician do?

- a Allow the customer to remove the tractor.
- b Complete a work log for the workshop manager.
- c Complete a full function test of the tractor.
- d Wait until allocated time has been used.

NOW GO BACK AND CHECK YOUR WORK

- **IMPORTANT -**
Are the details at the top of the answer sheet correct?
Have you filled in your answers in INK in the appropriate boxes on the answer sheet?