

MOTOR MECHANICS

6189
Paper 1

General Comments

Compared to 2020, more candidates entered this examination. Despite all the difficulties we experienced in 2021, centres still managed to provide the candidates with knowledge and skills. Congratulations for that effort you have put in. Performance in this paper was not good at all, especially in the structured questions.

Teachers are encouraged to study their syllabuses carefully and try to complete it on time. They must also try to combine the practical part with the theoretical part, in this way the candidates will understand the syllabus better.

Comments on individual questions

Section A

- 1 (a) Candidates were supposed to state three measures to be taken to make sure that work surfaces are safe. Most candidates answered it correctly, although some were confused with safety in a workshop.

The correct answer should be:

- Install non-slip surfaces, especially around machinery and equipment.
- Clearly mark steps, ramps, and other elevation changes.
- Protect/fix sharp edges and corners.
- If protruding parts cannot be removed, post clear warning signs.
- Keep surfaces of wooden benches smooth, sand them regularly.
- Fit mounted tools/machinery securely to the workbench.
- Install work surfaces at the correct height.
- Level and stabilize work benches and work stations.
- Enforce good housekeeping

(any 3) [3]

- (b) Candidates must identify safety hazards in figure 1. Most candidates scored marks here.

The correct answer should be:

- Man is not wearing welding goggles.
- Hand tools scattered on the floor.
- Man welding close to flammable substances.
- Coat hanging directly above an electric heater.
- Man standing on his toes trying to reach high load.
- Electric power tools lying on the floor.
- Fluid spills on the floor.
- Loose shoelaces.
- Heavy load carried alone.
- Man working with untied hair and loose hanging jewellery.
- Load on shelf above the door.
- Tyres stacked incorrectly.
- High mounted shelf overloaded.
- Electrical wall plug overloaded.

(any 2) [2]

- 2 Candidates were supposed to identify the component in figure 2. Most candidates could not identify it with answers like exhaust manifold and exhaust.

The correct answer should have been:

Catalytic converter / Muffler

[1]

- 3 (a) Candidates must state the functions of:

Lighting system - Makes the vehicle visible to other road users.
- Provide visibility for driving in darkness and bad weather conditions.
- Provides light in darkness.

[1]

Steering system - Main function is to steer the vehicle by turning the front wheels.
- Reduce driver effort by making act of steering easier.

[1]

(b) Candidates must write down to defects caused by the loose holding clamp.

The correct answer should be:

- Cracked casing/
- Frayed or broken cables
- Cracked cell wall
- Low electrolyte

(any 2) [2]

4 Candidates must write down the function of the component. Most candidates could not do it.

The correct answer must refer to:

- Allows the wheels to rotate at different speeds when the car moves around corners and over uneven road surfaces.
- Even torque is transmitted to the side-shaft and drive wheels, irrespective of the difference in rotational speed between the wheels.
- The final drive gear ratio can also be selected to provide the best traction on a given vehicle's drive train. [3]

5 Candidates must state one use of the following tools:

(a) **bench vice:** Used to grip material firmly so that it can be filed, sawed, hammered drilled, etc. [1]

(b) **Bearing clamp:** Used to remove the many types of bearings in motor vehicles. [1]

(c) **Verneer Calliper:** To measure the inside and outside diameters of pipes and rods.
To measure the depth of a hole. (any 1) [1]

Most candidates could not identify the function of the earing clamp.

6 Candidates must list one function of:

Cylinder head – Serves as a lid for the cylinders so that the fuel-air mixture can be compressed without a loss of pressure

In most cases, it contains a section of the combustion chamber.

It house the valve mechanism in an overhead valve engine.

It houses the spark plugs. (any 1)

Piston – It serves as a pump – causing vacuum during the intake stroke, compresses the fuel mixture during compression stroke and forces out the burnt gases during the exhaust stroke.

It transfers the force of the expanding gases to the crankshaft through the connecting rod to rotate the crankshaft (any1)

Camshaft – It converts the rotary movement of the crankshaft into the reciprocating movement of the valves.

It opens the valves at predetermined times.

In some engines, it drives the distributor, oil pump and mechanical fuel pump. (any1) [3]

7 (a) Candidates must identify the oil pumps. Most candidate could only identify the gear pump.

The correct answer is:

A: Rotor type oil pump.

B: Gear type oil pump. [2]

(b) **Candidates must list engine oil filtration systems: Candidates could not do it.**

The correct answer is:

Full-flow oil filtration system.

Bypass oil filtration system. [2]

8 Candidates must name three examples of electronic communication. Almost all candidate scored here.

The correct answer is:

- Data can be stored in a limited space.
- Data can be shared almost immediately.
- You do not have to travel to meet clients in person.
- It is an inexpensive way to communicate.
- Quick and easy exchange of information.
- Wide coverage of communication. (any 2) [2]

- 9 Candidates must differentiate between technical service bulletin and a recall. Most candidates could not do it.
The correct answer is:
Technical service bulletin: These are special notices issued by the original vehicle manufacturer to their service dealers. [1]
A recall: Is issued because of safety concerns. [1]
- 10 Candidates must explain what the possible cause could be of a leakage.
 Almost all the candidates scored only one mark.
The correct answer should refer to:
 The leakage can occur as a result of: (a) bearing failure or
 (b) The inner shaft seal that is leaking. [2]

SECTION B

- 11 (a) Candidates should name the functions of the oil filter.
The correct answer should refer to:
 • The oil filter traps impurities in circulation with the lubrication oil.
 • Cleans the oil coming from the oil pan / sump. (any 1) 1]
- (b) Candidates must state the importance of changing of engine oil.
 They scored only one mark at the most.
The correct answer should refer to:
 Foreign matter, metal particles and the by-products of combustion all gather in the sump of an engine over a period of time.
 An oil change cleans the sump and prevents possible internal damage. [2]
- (c) Candidates must explain what will happen if the filter becomes clogged.
 Almost all the candidates could not answer this question.
The correct answer is:
 In the event of an oil filter becoming clogged, the pressure in the filter rises.
 A bypass valve that is fitted inside the filter, is lifted from its seat by the rising pressure, and allows oil to continue to flow through the filter to avoid serious engine damage. Although the oil is unfiltered, it is better than no oil. (any 4) [4]
- (d) Candidates must name one disadvantage of a gear-type oil filter.
 Some candidates manage to score here.
The correct answer is:
 • The wear between the gears and the housing reduces the pump pressure.
 • When the gears wear, the pump becomes noisy.
 • It is very expensive to manufacture. (any1)] [1]
- (e) Candidates must mention two reasons for crankcase ventilation.
 Almost all the candidates failed here.
The correct answer should refer to:
 Rising temperature expands the air trapped inside the crankcase, putting excessive pressure on the seals and gaskets, which can blow out causing oil leaks.
 Crankcase ventilation prevents the build-up of contaminants that can cause the rapid deterioration of the oil. [2]
- 12 (a) Candidates must state the functions of:
steering column: Connects the steering wheel to the steering mechanism to transfer the driver's input torque from the steering wheel to the steering box.
tie-rod: Transmits force from the steering centre link or rack gear to the steering knuckle, causing the wheel to turn.
steering rack: Converts the rotary motion of the steering wheel into a reciprocating motion to steer the wheels. [3]
 Candidates could not managed to score full marks here.

(b) Candidates must describe how to rectify excessive steering play. They could not score marks here.

The correct answer should refer to:

- Check the steering system joints for excessive play or damaged dust covers. Replace if necessary.
- Check suspension arm ball joints for excessive play and replace if necessary.
- Check sliding yoke on steering intermediate shaft for excessive play and replace if necessary.
- Check front wheel bearings for excessive play or damage and adjust or replace if necessary.
- Check steering gear for excessive play and adjust if necessary.
- Check the security of the steering box or steering rack mounting points and secure if necessary.
- Check the steering box or rack and pinion rubber boots for signs of oil leakage or damage, and replace if necessary. [7]

13 (a) Candidates must write down the measurements: All the candidates scored a zero here.

The correct answer is:

(i) 9.02 mm [1]

(ii) 21.32 mm [1]

(b) Candidates must describe how to read a micrometre.

Almost all of them could not describe it.

The correct answer is:

- Read the numbers above the datum line first, and write it down – they represent the millimetres.
- Now read the numbers below the datum line, and write it down – these are the half millimetres.
- Then read the numbers on the thimble scale and write it down as well – they are measurements in hundredths of a millimetre.
- Now you add all the numbers written down, in decimal order.
- Some metric outside micrometers have horizontal lines above the datum line – they indicate thousandths of a millimetre. If these lines are present, that value must also be added to the rest of the numbers. [5]

(c) Candidates must list three uses of a soldering iron. Candidates could not describe it.

The correct answer is:

- Sealing the seams on cans for the canning industry.
- The installation and repairs of electronic assemblies.
- Soldering joints of sheet metal objects.
- Soldering joints in copper pipes.
- Joining gutters.
- Joining roof flashing. (any 3) [3]

14 (a) Candidates were supposed to use the identification number.

All candidates lost marks here.

The correct answer is:

- (i) first digit – Indicates where the vehicle was built.
- (ii) second and third digits – The manufacturer.
- (iii) fourth to eighth digits – Portrait of the vehicle – brand, engine size and type.
- (iv) tenth digit – Model year of the car.
- (v) last six digits – Serial number of the vehicle. [5]

(b) Candidates must list causes of overheating. Most of them scored here.

The correct answer could be:

- Rust and lime deposits in the radiator tubes or water jackets / blocked radiator tubes.
- A thermostat stuck in the closed position.
- A leaky radiator cap / damaged radiator cap.
- Pieces of rubber from the radiator hoses or foreign matter causing restriction to coolant flow.
- Water leakages in the cooling system.
- Insects or foreign matter blown onto the radiator, blocking the air passages.
- A perished radiator hose on the inlet side of the pump collapsed.
- A leaky waterpump can cause inadequate water circulation.
- Pressure of radiator cap too low.

- Absence of antifreeze coolant can cause water to freeze inside the radiator.
- Excessive clearance between the impeller and water pump housing.
- Insufficient tension of fan belt.
- Blown cylinder head gasket. (any 5) [5]

15 (a) Candidates must mention three visual inspections. Although it is actually grade 8 work, some candidates could not answer it.

The correct answer could be:

- Tyres
- Lights
- Windows and windscreens
- Windscreen wipers
- Exhaust system
- Body including doors, bonnet, boot, handles and catches
- Oil, water and fuel leaks
- Registration number plates (any 3) [3]

(b) Candidates must describe the procedure to follow when checking oil levels of an automatic transmission. Candidates failed here.

The correct answer should be:

- Ensure that vehicle is parked on level ground.
- Start vehicle and leave the engine to idle.
- Shift gear selector through all the gears and then back to Neutral or Park.
- Locate transmission fluid dipstick, pull it out and wipe clean, then insert it again. With engine still running, pull out dipstick again and check oil level.
- If too little oil, fill up to level, if too much oil, carefully drain to level and check oil level again. [5]

(c) Candidates must state one possible sign for replacing of brake fluid. Candidates failed to do it.

The correct answer should be:

Discoloration of brake fluid, it becomes dark. [1]

(d) Candidates must differentiate between two types of brake fluid.

The correct answer is:

- Silicon-based brake fluid: does not absorb water.
- Glycol-based brake fluid: can absorb water. [1]

16 Candidates must describe the operation of the brake master cylinder when brakes are applied. Candidates failed to score marks here.

The correct answer should refer to:

- When we press the brake pedal(1), it pushes on the primary piston(1) through a linkage.
- Pressure is built up in the cylinder(1) and the brake lines as the pedal is pressed down further(1).
- The pressure between the primary and secondary pistons(1) forces the secondary piston to compress the brake fluid in its circuit(1).
- If the brakes are operating properly(1), the pressure will be the same in both circuits(1).
- If there is a leak in one of the circuits(1), that circuit will not be able to maintain the pressure(1). [10]

17 Candidates were ask to describe and suggest a suitable test to determine the cause of the problem. All the candidates failed in this question.

The correct answer should refer to:

- Perform a stall-speed test.
- Check with the car or transmission manufacturer that it is safe to run the test.
- Make sure all fluids are in good condition, chock the wheels and apply the parking brake.
- Install a tachometer if the car does not have one.
- Press the brake pedal all the way to the floor and start the engine.
- Shift the transmission into drive, and don't let go of the brakes.
- While pressing on the brake pedal with one foot, use the other foot to press the accelerator pedal to the floor for 2 – 3 seconds, never more than 5 seconds, or you risk damaging the transmission.
- The rpm reading where the engine stalls, is the stall speed.
- A lower rpm reading than the manufacturer's recommendation, means the torque converter is failing, and needs replacement.
- A higher rpm reading indicates that the transmission is slipping, and needs further investigation. [10]