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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MECHANICAL TECHNOLOGY: AUTOMOTIVE

NOVEMBER 2025

MARKING GUIDELINES

MARKS: 200

These marking guidelines consist of 23 pages.



Instructions to marker: Mechanical Technology – Automotive**1. General marking instructions:**

- 1.1 During marking of multiple-choice questions, only ONE possible answer can be accepted. If the candidate indicated two or more responses, ONLY the first response will be recognised /acknowledged and marked according to marking guideline.
- 1.2 Where the number of responses of the candidate exceeds the required number stated in the question, only the first required number of responses will be accepted. E.g. if the question states, 'Name THREE ...' and the candidate stated four different responses, ONLY the first three will be accepted. The remaining responses must be ignored with a line drawn through it.
- 1.3 When the question clearly indicates what is expected of the candidate:
- (a) If the candidate is required to describe a process step by step (e.g., a process in four steps), only the first four responses should be considered.
 - (b) However, if the candidate is required to explain a process, it should be noted that the response may be lengthy and not necessarily well organized. In such cases, the marker must evaluate the entire response to determine whether the candidate has explained the required outcome satisfactorily and allocate marks on merit.
- 1.4 If question numbering of sub-questions is not correct according to question paper sequence, the responses can be accepted if a sequence pattern can be identified or followed.
- 1.5 Attention must be given to mark allocation in questions where two (2) marks were allocated to one response, e.g. (**Any 1 x 2**).
- 1.6 ONE tick must be allocated for each mark awarded and no global marking is allowed.
- 1.7 Unanswered and incorrect responses of questions must be indicated with a cross (X).
- 1.8 All blank pages in an ANSWER BOOK must be crossed out to indicate that the pages have been seen by the marker.
- 1.9 Attention must be given to questions where the candidate did not complete the answer and continued answer(s) on subsequent pages in the answer book. Continue marking such answers and award marks, if applicable. If a question is answered twice, mark the first response.



- 1.10 During calculation marking, pay attention to the position of the tick mark(s) in the marking guideline.
- 1.11 If a candidate skipped a step where a tick mark is allocated in the marking guideline and the final answer is correct, the total amount of tick marks must be indicated by the marker to indicate full marks awarded for the question correctly answered so that the examination assistants can verify marks awarded.
- 1.12 If the unit required for calculations is specified in the question, the final answer can be considered correct without explicitly stating the unit, provided that the numerical value matches the unit specified or used in the question.
- 1.13 If an incorrect unit is stated in the candidate's answer during calculations, the answer will be marked incorrect even if the value itself is correct.
- 1.14 Attention must be given to calculation type questions when different methods are used by candidates to obtain the correct answer. Consider answers where candidates have rounded off in sub-questions and it affects the final answer.
- 1.15 Attention must be given to special marking instructions to the marker which are stated for specific questions in the marking guideline.
- 1.16 A red line must be drawn by the marker to indicate the end of each question.
- 1.17 Marks of sub-questions must be indicated in the outside margins of the ANSWER BOOK pages and NOT in the inside margins.
- 1.18 When sub-question marks are allocated in the outside margins they must be in line with the sub-question and NOT be circled.
- 1.19 The total marks awarded for the question must be written on the red line drawn by the marker and circled to clearly indicate the marks awarded for that particular question.
- 1.20 Marker must transfer marks to cover page and ensure correctness of transfer.
- 1.21 Markers should familiarise themselves with the question and answer before evaluating the responses of candidates.
- 1.22 Always interpret the responses of the candidates within the context of the question.



- 1.23 Mark what the candidate wrote and do not make assumptions about or predict intended responses.
- 1.24 Accept incorrect spelling in answers unless the spelling changes the meaning of the answer.
- 1.25 Pencil work is normally acknowledged as rough work and should not be considered/marked.
- 1.26 As a rule, marks are not awarded for formulas that are found in the attached formula sheet. If a formula was correctly manipulated, then only can a mark be awarded. Marks will also be awarded for correct formulas given by candidates if the particular formula is not found in formula sheet. Marks are awarded for correct substitution.
- 1.27 Incorrect values from previous calculations substituted at the right place in the formula will be awarded marks.
- 1.28 Markers must pay attention to calculations where an incorrect answer from a previous step was correctly substituted in the next calculation. In such cases, they must write “*sub*” next to the tick mark on the script to indicate that the mark was awarded for correct substitution only.
- 1.29 If during the calculations of a candidate, the formula that appear on the formula page was not indicated correctly but calculations and steps were done correctly, full marks may be awarded.
- 1.30 If, during a candidate’s calculations, the formula from the formula sheet was transferred incorrectly, no marks should be awarded for the values substituted in that calculation, as it renders the solution mathematically incorrect.

2. Specific marking instructions:

- 2.1 In Question 7.2.1, markers must pay attention to the units that can be utilised in the substitution as it may be in millimetres, centimetres or meters. The units for both substitutions must however be the same as to award marks.



QUESTION 1: MULTIPLE-CHOICE (GENERIC)

- | | | |
|-----|-----|------------|
| 1.1 | D ✓ | (1) |
| 1.2 | D ✓ | (1) |
| 1.3 | A ✓ | (1) |
| 1.4 | C ✓ | (1) |
| 1.5 | A ✓ | (1) |
| 1.6 | B ✓ | (1) |
| | | [6] |



QUESTION 2: SAFETY (GENERIC)**2.1 Examination procedures:**

- Breathing irregularities. ✓
- Abnormal position of limbs that indicate breakages. ✓
- Any visible signs of bleeding. ✓
- Level of consciousness. ✓

(Any 2 x 1) (2)**2.2 Arc welding safety:**

- An operator must be adequately trained. ✓
- A workplace must be effectively partitioned off. ✓
- An operator uses protective equipment. ✓
- Ensure that all equipment is in safe working conditions. ✓
- Keep proper housekeeping to avoid fire hazards and electric shocks. ✓

(Any 2 x 1) (2)**2.3 Portable angle grinder (PPE excluded):**

- Safety guard must be in place. ✓
- Protective shields must be placed around the area where grinding is taking place. ✓
- Use the correct disc. ✓
- Ensure the grinder is in good and safe working order.
- Make sure there are no cracks on the disc. ✓
- Ensure the lockable switch is in the off position. ✓
- Check electrical cables for any defects. ✓
- Ensure that the surrounding area is dry. ✓
- Ensure the grinder is in good and safe working order. ✓
- Ensure the disc is securely fastened. ✓
- Clamp work piece firmly. ✓

(Any 2 x 1) (2)**2.4 Handling gas cylinders:**

- Never stack cylinders on top of one another. ✓
- Cylinders must not be stored in direct sunlight. ✓
- Chain/handle cylinders in upright position. ✓
- Valve guards must be on cylinders. ✓
- Don't work or bang on cylinders. ✓
- Never allow cylinders to fall. ✓
- Do not allow oil or grease to come into contact with oxygen fittings. ✓
- Do not interfere with the structure (no modification) of the gas cylinders. ✓
- Store full and empty cylinders separately. ✓
- Store acetylene and oxygen cylinders separately. ✓
- Keep cylinders away from flammable substances. ✓
- Do not drag/roll cylinders. ✓
- Cylinders' valves should be closed properly. ✓

(Any 2 x 1) (2)

2.5 **Disadvantage of product layout:**

- Lack of flexibility. ✓
- Optimum use of equipment is not possible. ✓

(Any 1 x 1) (1)

2.6 **Employee responsibilities:**

- Take reasonable care of the health and safety of himself and others. ✓
- To cooperate with employer to comply with any duty or responsibility. ✓
- Carry out any lawful order to him/her as to obey the health and safety rules. ✓
- Report any unsafe conditions. ✓
- Report any unhealthy conditions. ✓
- Report any incident immediately. ✓
- Report any injury immediately if possible. ✓

(Any 1 x 1) (1)
[10]



QUESTION 3: MATERIALS (GENERIC)**3.1 Bend test:**

3.1.1 Bends easily ✓ (1)

- 3.1.2
- Hard to bend ✓
 - It will snap/break easily ✓
 - Tends to crack/fracture easily ✓
- (Any 1 x 1) (1)**

3.2 Heat treatment:

To change the properties ✓ of metals. (1)

3.3 Quenching media:

- Water ✓
 - Brine (salt and water) ✓
 - Oil ✓
 - Molten metal salts ✓
 - Nitrogen ✓
 - Air ✓
 - Sand ✓
 - Molten lead ✓
 - Ash ✓
- (Any 3 x 1) (3)**

3.4 Sound test:

- Tap with a hammer ✓
 - Drop on the floor ✓
- (2)

3.5 Purpose of case hardening:

It is to produce a hard case ✓ over a tough core. ✓ (2)

3.6 Case hardening methods:

- Carburising ✓
 - Nitriding ✓
 - Cyaniding ✓
- (Any 2 x 1) (2)**

3.7 Normalising:

It is to relieve the internal stresses ✓ caused by machining/forging/welding. ✓ (2)

[14]

QUESTION 4: MULTIPLE-CHOICE (SPECIFIC)

- | | | |
|------|-----|-------------|
| 4.1 | B ✓ | (1) |
| 4.2 | B ✓ | (1) |
| 4.3 | C ✓ | (1) |
| 4.4 | B ✓ | (1) |
| 4.5 | A ✓ | (1) |
| 4.6 | D ✓ | (1) |
| 4.7 | D ✓ | (1) |
| 4.8 | C ✓ | (1) |
| 4.9 | B ✓ | (1) |
| 4.10 | D ✓ | (1) |
| 4.11 | C ✓ | (1) |
| 4.12 | B ✓ | (1) |
| 4.13 | A ✓ | (1) |
| 4.14 | B ✓ | (1) |
| | | [14] |



QUESTION 5: TOOLS AND EQUIPMENT (SPECIFIC)**5.1 Compression tester:**

- A. Flexible hose/pipe ✓
- B. Gauge/Meter ✓
- C. Release/Reset button/knob ✓
- D. Adapter ✓

(4)

5.2 Precautions compression test:**5.2.1 Operating temperature:**

- So that the piston and compression rings will expand ✓ and ensure an accurate reading. ✓
- So that the rings could create a good seal ✓ and ensure an accurate reading. ✓

(Any 1 x 2) (2)

5.2.2 Clean around the spark plugs:

Avoid dirt falling into the cylinder ✓ through the spark plug hole. ✓

(2)

5.3 Function of cylinder leakage test:

- To check the location of gas leaks ✓ at end of compression stroke/at start of power stroke/at TDC with both valves closed. ✓
- To determine the percentage pressure loss ✓ from the combustion chamber. ✓

(Any 1 x 2) (2)

5.4 Exhaust gas analyser:

- Switch on the gas analyser/connect analyser to the battery. ✓
- Zero the gauge on the gas analyser. ✓
- Insert the probe into the exhaust pipe. ✓
- Connect the hose to the probe and gas analyser. ✓

(4)

5.5 On-board diagnostics (OBD) scanner:

- Retrieve trouble codes ✓
- Scan system for faults ✓
- Clear the trouble codes ✓
- Programme/adjust the ECU ✓
- Retrieve vehicle information/Live data ✓

(Any 3 x 1) (3)



5.6 Pre-check on tyre:

- Check the tyre for uneven wear. ✓
- Check the tyre for damage. ✓
- Check tyre tread wear level at the tyre wear indicators (TWI). ✓
- Remove foreign matter from the tyre. ✓
- Check tyre pressure. ✓
- Date of manufacture/expiration date of tyre. ✓

(Any 3 x 1) (3)**5.7 Optical alignment gauge:****5.7.1 Read the toe angle:**

Toe gauge ✓

(1)**5.7.2 Placement of contact bars:**

- Place it on the inner bead of the wheel rim ✓
- Place it across the centre of the wheel ✓

(2)**[23]**

QUESTION 6: ENGINES (SPECIFIC)**6.1 Crankshaft:****6.1.1 Labels:**

- A. Crankshaft nose ✓
 - B. Big end journal/Crank pin ✓
 - C. Crank web/counterweight ✓
- (3)

6.1.2 Main function:

It converts the linear/reciprocating movement ✓ of the piston to rotating motion. ✓

(2)

6.2 Vibration damper:**6.2.1 Labels:**

- A. Crankshaft ✓
 - B. Flange ✓
 - C. Secondary flywheel ✓
 - D. Friction spring ✓
- (4)

6.2.2 Friction face vibration damper ✓

(1)

6.3 Crankshaft vibration:

- The varying quantity of torque produced on power strokes. ✓
- The crankshaft alternately winding up and releasing as it rotates. ✓
- The crankshaft also has its own natural frequency of vibration. ✓
- The coinciding of different dynamic imbalances could produce excessive vibration called resonance. ✓
- Torsional or twisting effect of the power strokes upon the crankshaft. ✓
- The crankshaft is not statically balanced. ✓
- The flywheel is not statically balanced. ✓
- The crankshaft is not dynamically balanced. ✓
- The flywheel is not dynamically balanced. ✓
- The reciprocating mass is not balanced. ✓
- Faulty vibration damper. ✓
- Engine misfire/Incorrect air/fuel ratio/Incorrect valve timing/Faulty ignition system. ✓
- Incorrectly tightened components attached to the crankshaft. ✓
- Excessive wear on components attached to the crankshaft. ✓

(Any 2 x 1) (2)

6.4 Firing orders:

- 1; 3; 4; 2 ✓
 - 1; 2; 4; 3 ✓
- (2)



6.5 Cylinder layout:

6.5.1 Inline/straight ✓ (1)

- 6.5.2
- Boxer ✓
 - Horizontally opposed ✓
 - Flat engine ✓
 - V-engine ✓
 - W-engine ✓

(Any 1 x 1) (1)

6.6 Power strokes:

6.6.1 2 ✓ (1)

6.6.2 3 ✓ (1)

6.7 Turbocharger:**6.7.1 Labels:**

- A. Engine/cylinder ✓
- B. Intercooler ✓
- C. Compressed air flow ✓
- D. Exhaust gas flow ✓

(4)

6.7.2 Advantages of turbo-charged vs naturally aspirated engine:

- Improved fuel economy. ✓
- Increased torque output. ✓
- Increased power output. ✓
- Height above sea level deficit eliminated. ✓
- Increased volumetric efficiency. ✓

(Any 3 x 1) (3)

6.8 Label vane type supercharger:

- A. Rotor ✓
- B. Vane ✓
- C. Outlet ✓

(3)

[28]

QUESTION 7: FORCES (SPECIFIC)**7.1 Explanation of terms:****7.1.1 Indicated power:**

- Calculated using the volume ✓ and the indicated mean effective pressure. ✓
- Indicated power is the theoretical power ✓ produced in the cylinder. ✓
- Indicated power is calculated without considering any mechanical ✓ or other losses of the engine. ✓

(Any 1 x 2) (2)**7.1.2 Compression ratio:**

It is the relationship between the total volume ✓ and the clearance volume. ✓

(2)

7.2 Calculations:**7.2.1 Swept volume:**

$$\begin{aligned} \text{Swept volume} &= \frac{\pi \times D^2}{4} \times L \\ &= \frac{\pi \times 7,0^2 \checkmark}{4} \times 8,0 \checkmark \\ &= 307,88 \text{ cm}^3 \checkmark \end{aligned}$$

(3)

7.2.2 Original clearance volume:

$$\begin{aligned} CV &= \frac{SV}{CR - 1} \\ &= \frac{307,88 \checkmark}{9 - 1 \checkmark} \\ &= 38,49 \text{ cm}^3 \checkmark \end{aligned}$$

(3)



7.2.3 **New swept volume:**

$$CV = \frac{SV}{CR - 1}$$

$$\begin{aligned} SV &= CV(CR - 1) \checkmark \\ &= 38,49(10 - 1) \checkmark \\ &= 346,41 \text{ cm}^3 \checkmark \end{aligned}$$

(3)

7.2.4 **New diameter:**

$$\text{Swept volume (SV)} = \frac{\pi \times D^2}{4} \times L$$

$$D^2 = \frac{4 \times SV}{\pi \times L} \checkmark$$

$$D^2 = \frac{4 \times 346,41}{\pi \times 8} \checkmark$$

$$D = \sqrt{55,13} \checkmark$$

$$= 7,425 \text{ cm}$$

$$= 74,25 \text{ mm} \checkmark$$

(4)

7.3 **Calculations:**7.3.1 **Torque:**

$$\text{Torque} = \text{Force} \times \text{radius}$$

$$= (75 \times 10) \checkmark \times \frac{840}{1000} \checkmark$$

$$= 630 \text{ Nm} \checkmark$$

OR

$$\text{Torque} = \text{Force} \times \text{radius}$$

$$= (75 \times 9,81) \checkmark \times \frac{840}{1000} \checkmark$$

$$= 618,03 \text{ Nm} \checkmark$$

(3)



7.3.2 Indicated power:

$$P = 1800 \times 10^3 \text{ Pa}$$

$$L = \frac{150}{1000}$$

$$= 0,15 \text{ m} \checkmark$$

$$\text{Area} = \frac{\pi \times D^2}{4}$$

$$= \frac{\pi \times 0,11^2}{4} \checkmark$$

$$= 0,00950 \text{ m}^2 \checkmark$$

$$\text{OR} = 9,50 \times 10^{-3} \text{ m}^2 \checkmark$$

$$N = \frac{1200}{60 \times 2} \checkmark$$

$$= 10 \text{ power strokes per second} \checkmark$$

$$IP = PLANn$$

$$= (1800 \times 10^3) \times 0,15 \times 0,00950 \times 10 \times 4 \checkmark$$

$$= 102600 \text{ W}$$

$$= 102,60 \text{ kW} \checkmark$$

(7)

7.3.3 Brake power:

$$BP = 2\pi NT$$

$$= 2 \times \pi \times \frac{1200}{60} \checkmark \times 630 \checkmark$$

$$= 79,17 \text{ kW} \checkmark$$

OR

$$BP = 2\pi NT$$

$$= 2 \times \pi \times \frac{1200}{60} \checkmark \times 618,03 \checkmark$$

$$= 77,66 \text{ kW} \checkmark$$

(3)



7.3.4 **Mechanical efficiency:**

$$\begin{aligned} \text{ME} &= \frac{\text{BP}}{\text{IP}} \times 100 \\ &= \frac{79,17}{102,60} \checkmark \times 100 \\ &= 77,16 \% \checkmark \end{aligned}$$

OR

$$\begin{aligned} \text{ME} &= \frac{\text{BP}}{\text{IP}} \times 100 \\ &= \frac{77,66}{102,60} \checkmark \times 100 \\ &= 75,69 \% \checkmark \end{aligned}$$

(2)
[32]

QUESTION 8: MAINTENANCE (SPECIFIC)**8.1 Exhaust gases:**

- Carbon monoxide (CO) ✓
- Carbon dioxide (CO₂) ✓
- Oxygen (O₂) ✓
- Nitrogen oxides (NO_x) ✓
- Sulphur dioxide (SO₂) ✓

(Any 3 x 1) (3)**8.2 Cylinder leakage test:**

8.2.1 Leaking inlet valve. ✓

(1)

- 8.2.2
- Replace inlet valve. ✓
 - Reseat/lap inlet valve and seat. ✓
 - Replace the valve seat. ✓

(Any 1 x 1) (1)

8.2.3 Hissing noise at exhaust pipe. ✓

(1)

- 8.2.4
- Replace exhaust valve. ✓
 - Reseat/lap exhaust valve and seat. ✓
 - Replace the valve seat. ✓

(Any 1 x 1) (1)

- 8.2.5
- Bubbles in the radiator. ✓
 - Hissing sound from adjacent cylinder/spark plug hole. ✓

(Any 1 x 1) (1)**8.3 Compression test:****8.3.1 Low compression reading:**

- Worn rings ✓
- Worn/broken piston ✓
- Worn bore ✓
- Leaking inlet valve ✓
- Leaking exhaust valve ✓
- Blown head gasket ✓
- Cracked cylinder head ✓
- Cracked/damaged engine cylinder ✓

(Any 3 x 1) (3)**8.3.2 Wet compression test:**

- Squirt oil onto the piston. ✓
- Redo compression test. ✓
- Compare readings. ✓

(3)



8.4 Oil pressure specifications:

Oil pressure when engine is ...

- idling. ✓
- cold. ✓
- hot. ✓
- at high revolutions. ✓

(Any 3 x 1) (3)**8.5 Fuel pressure test:****8.5.1 Low pressure from pump:**

- Replace faulty fuel pump. ✓
- Replace cracked fuel line. ✓
- Clean clogged pump strainer. ✓
- Correct low voltage supplied to the fuel pump. ✓
- Fill empty fuel tank. ✓
- Replace faulty fuel pump relay. ✓
- Unblock fuel line. ✓

(Any 1 x 1) (1)**8.5.2 High pressure in common rail:**

- Repair/replace faulty fuel pressure regulator. ✓
- Unblock fuel return line. ✓

(Any 1 x 1) (1)**8.6 Locations of coolant leaks:**

- Water pipes/hoses ✓
- Water pump ✓
- Welch/Core plugs ✓
- Interior heater radiator ✓
- Heater tap ✓
- Cylinder head gasket ✓
- Cracked engine cylinder ✓
- Cracked cylinder head ✓
- Cracked expansion tank ✓
- Temperature sensor unit ✓
- Engine radiator ✓
- Radiator cap ✓

**(Any 4 x 1) (4)
[23]**

QUESTION 9: SYSTEMS AND CONTROL (AUTOMATIC GEARBOX) (SPECIFIC)**9.1 Torque converter:****9.1.1 Labels:**

- A. Lockup clutch ✓
- B. Turbine ✓
- C. Stator ✓
- D. Housing/casing/impeller/pump ✓ (4)

9.1.2 Functions of the torque converter:

- Multiplies engine torque automatically according to road and engine speeds. ✓
- Transfers drive from the engine to the transmission. ✓
- Acts as a flywheel to keep the engine turning during the idle strokes. ✓
- Slips during initial acceleration to prevent stalling. ✓
- Slips while stopping to prevent stalling. ✓
- Dampens torsional vibrations of the engine. ✓
- Wheel spin is greatly reduced. ✓
- Drive the transmission oil pump. ✓
- Contributes toward smoother gear changing. ✓

(Any 3 x 1) (3)**9.2 Single epicyclic gear system:****9.2.1 Labels:**

- A. Planetary carrier ✓
- B. Ring gear/Annulus ✓
- C. Sun gear ✓
- D. Planetary gear ✓ (4)

9.2.2 Obtained reverse gear:

- Sun gear is the driver. ✓
- Planetary carrier is locked. ✓
- The annulus rotates in reverse direction/driven. ✓

OR

- Annulus is the driver. ✓
- Planetary carrier is locked. ✓
- The sun gear rotates in reverse direction/driven. ✓ (3)

9.3 Methods of cooling the automatic transmission fluid:

- The automatic transmission fluid is circulated through an oil cooler at the radiator. ✓
- The airflow over the transmission sump allow for cooling of the oil. ✓ (2)

9.4 Gearshift lever positions:

- P ✓
- N ✓ (2)

[18]

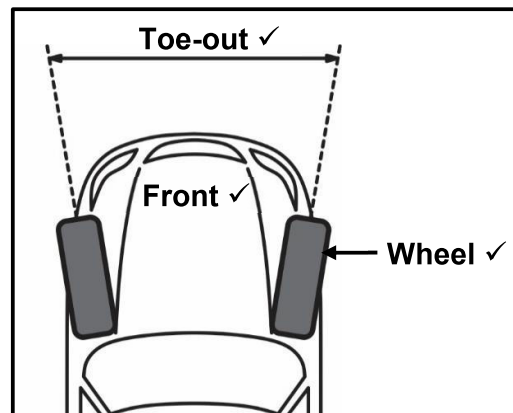
QUESTION 10: SYSTEMS AND CONTROL (AXLES, STEERING GEOMETRY AND ELECTRONIC) (SPECIFIC)

10.1 Pre-checks on suspension:

- Correct preload on the wheel (hub) bearings. ✓
- Wear on kingpins. ✓
- Suspension ball joints for wear, locking and lifting. ✓
- Suspension bushes for excessive free movement/damage. ✓
- Steering box/rack play and whether secure on chassis. ✓
- Tie-rod ends. ✓
- Sagged springs, which includes riding height. ✓
- Ineffective shock absorbers. ✓
- Spring U-bolts. ✓
- Chassis for possible cracks and loose cross-members. ✓
- Damaged struts/saddles. ✓
- Worn control arm. ✓
- Worn out track rod. ✓
- Kerb mass. ✓

(Any 3 x 1) (3)

10.2 Toe-out:



Sketch ✓

(4)

10.3 Purpose of alignment angles:

10.3.1 Negative camber:

- Improves road holding ✓ during cornering. ✓
- Improves vehicle stability ✓ during cornering. ✓
- Improves traction ✓ during cornering. ✓

(Any 1 x 2) (2)

10.3.2 Toe out on turns:

- Give the wheels a true rolling motion ✓ when cornering. ✓
- To prevent scuffing of the tyres ✓ when cornering. ✓

(Any 1 x 2) (2)

10.4 **Static balancing of a wheel:**

- Mount the wheel on a spindle. ✓
 - Turn the wheel. ✓
 - Mark the position where the wheel comes to rest. ✓
 - Turn the wheel again. ✓
 - If wheel stops at the same position, place weight opposite to mark/
If wheel does not stop at the same position, wheel is balanced. ✓
- (5)

10.5 **Systems controlled by the ECU:**10.5.1 **Air-induction:**

- The air induction system measures ✓ and controls the air ✓ required for combustion.
- Guides the clean ✓ air to the cylinders. ✓

(Any 1 x 2) (2)

10.5.2 **Ignition:**

The ignition system is to ignite the air/fuel mixture ✓ in the combustion chamber at the correct time. ✓

(2)

10.6 **Catalytic convertor:**

- Palladium ✓
- Platinum ✓
- Rhodium ✓

(Any 2 x 1) (2)

10.7 **CRDI:**10.7.1 **High pressure pump:**

Generates high fuel pressure ✓ in the common rail. ✓

(2)

10.7.2 **Electronic control unit (ECU):**

- Receives signals/information from sensors. ✓
- Evaluates/processes signals/information. ✓
- Controls the actuators. ✓

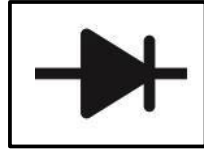
(Any 2 x 1) (2)

10.7.3 **Accelerator pedal sensor:**

Measures pedal position ✓ and relays signal to the ECU. ✓

(2)



10.8 Alternator:**10.8.1 Diodes:**

Two marks for correct complete symbol.

(2)

10.8.2 Functions of the diode:

- It allows current to flow ✓ in one direction only. ✓
- Prevents current from changing ✓ its direction of flow. ✓

(Any 1 x 2)

(2)

[32]

TOTAL: 200

