



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

MECHANICAL TECHNOLOGY (AUTOMOTIVE)

GUIDELINES FOR PRACTICAL ASSESSMENT TASKS

GRADE 12

2026

These guidelines consist of 40 pages.

TABLE OF CONTENTS

	Page
1. INTRODUCTION	3
2. TEACHER GUIDELINES	4
2.1 Administration of the PAT	4
2.2 Assessment of the PAT	4
2.3 Moderation of the PAT	4
2.4 Consequences of absence/non-submission of tasks	5
2.5 Declaration of Authenticity	6
3. CANDIDATE GUIDELINES	7
Instructions to the candidate	7
4. SPECIALISATION: AUTOMOTIVE (SPECIFIC)	8
INTRODUCTION	8
TASK 1: Cooling system test	10
TASK 2: Cylinder leakage test	13
TASK 3: Exhaust gas analysis	16
TASK 4: Wheel balancing	20
TASK 5: Charging system	24
TASK 6: Computerised diagnostic scanner	27
TASK 7: Engine components measurement and calculations (COMPULSORY)	31
5. COMPOSITE MARK SHEET – TOTALS	37
6. ANNEXURE A – SPECIFICATIONS SHEET	38
7. CONCLUSION	40

1. INTRODUCTION

The 18 Curriculum and Assessment Policy Statements subjects which contain a practical component all include a practical assessment task (PAT). These subjects are:

- **AGRICULTURE:** Agricultural Management Practices, Agricultural Technology
- **ARTS:** Dance Studies, Design, Dramatic Arts, Music, Visual Arts
- **SCIENCES:** Computer Applications Technology, Information Technology
- **SERVICES:** Consumer Studies, Hospitality Studies, Tourism
- **TECHNOLOGY:** Civil Technology, Electrical Technology, Mechanical Technology and Engineering Graphics and Design
- **TECHNICAL:** Technical Mathematics, Technical Sciences

A practical assessment task (PAT) is a compulsory component of the final promotion mark for all candidates offering subjects that have a practical component and counts 25% (100 marks) of the end-of-the-year examination mark. The PAT is implemented across the first three terms of the school year. This is broken down into different phases or a series of smaller activities that make up the PAT. The PAT allows for learners to be assessed on a regular basis during the school year and it also allows for the assessment of skills that cannot be assessed in a written format, e.g. test or examination. It is therefore important that schools ensure that all learners complete the practical assessment tasks within the stipulated period to ensure that learners are resulted at the end of the school year. The planning and execution of the PAT differs from subject to subject.

The PAT allows the teacher to directly and systematically observe applied competence. The PAT comprises the application/performance of the knowledge, skills and values particular to that subject and counts 25% of the total promotion/certification mark out of 400 for the subject.

Any profession requires of its members a thorough grounding in both theory and practice, and MECHANICAL TECHNOLOGY is no exception. It is emphasised that the goal of the practical assessment task is to produce a skilled candidate in each specialisation field. A nation's true wealth is in its manpower and education that should aim to develop the talents of a candidate so that he/she can contribute to the well-being of the society by using and developing scientific and technological resources.

To prepare a candidate in the MECHANICAL TECHNOLOGY'S specialisation fields, one must focus on the following:

- An attitude where the candidate can selectively use ideas, gather evidence and facts and draw logical conclusions to put them to good use creatively and with imagination;
- A capability to express ideas and information clearly by speech, writing, drawing and manufacturing; and
- A willingness and capability to accept and exercise responsibility, to make decisions, and to learn by experience.

Attributes such as these cannot all be achieved in a classroom. A sound knowledge of engineering sciences is essential to equip the MECHANICAL TECHNOLOGY candidate with the necessary practical capabilities for the required processes. Practical training is the application of acquiring essential skills to bridge between trade theory and practice.

Practical application in the workshop must therefore be made an interesting and challenging experience to develop the candidates physically and mentally. The candidates must show their initiative, curiosity and persistence in learning. In order to stimulate and develop self-confidence, the granting of some degree of responsibility during the practical application is very important.

2. TEACHER GUIDELINES

2.1 Administration of the PAT

Teachers are requested to make copies of the different specialisation PAT documents. These documents need to be handed out to the candidates at the beginning of the year. The practical assessment task for Grade 12 is externally set, internally assessed and externally moderated.

Teachers must attach due dates for the different facets of the PAT (*refer to the CAPS document*). In this manner, candidates can easily assess their progress. It is the responsibility of the teacher to administer formal assessment.

The PAT should be completed within the first three terms. The PAT should be completed under controlled conditions. (*Refer to CAPS document*).

Teachers MUST compile the manufacturer's specifications of the engines and vehicles available in their workshops before the tasks can commence. See ANNEXURE A as an example of a specification sheet. Candidates must have access to these specification sheets during the tasks. Teachers must perform all the tasks prior to assessing candidates so that the teacher can identify possible challenges and the final results. It provides the teacher with insight into possible challenges regarding equipment or tools and what possible procedures he/she needs to follow in the workshop in order to complete the PAT.

NOTE: The candidate must complete the **procedures** practically. The teacher must record reasons, readings, specifications, etc. provided by the candidate onto the worksheet.

TASK 7: The candidate must be provided with WORKSHEET 7 during the assessment task because the candidate must record his/her own measurements and perform the necessary calculations.

The teacher **MUST** draft his/her own guidelines on the compulsory task where the teacher must use the exact measurements of the actual components to assess the candidate.

2.2 Assessment of the PAT

Frequent and developmental feedback is needed to ensure the necessary guidance and support to the candidates.

Both formal and informal assessment should be conducted to ensure that the embedded skills are developed. Informal assessments must be conducted to monitor the progress of the candidates.

All mark sheets in the candidate's portfolio of evidence must be signed by the teacher, departmental head and moderator (if the candidate was moderated). The formal assessment mark must be recorded on the composite mark sheet. The composite mark sheets **MUST** be signed by the teacher, departmental head and the principal before external moderation commences.

On completion of each phase in each term, the marks for the completed phase need to be recorded onto the South African School Administration and Management System (SA-SAMS). Candidates must sign and date the mark sheet on completion of every phase.

2.3 Moderation of the PAT

Internal moderation by the departmental head of the school **MUST** be conducted for each completed phase. Evidence of moderation reports must be available in the teacher file and be available as proof for provincial and external moderation. The internal moderator must use the same mark sheets as are available in the candidate's portfolio of evidence whereby the candidate has conducted self-assessment, with formal assessment by the teacher.

Marks must be recorded in the space provided for internal moderation. The marks on the school administration system, captured by the school, must be verified by the moderator against the composite mark sheet. The tasks/phase, assessment criteria and the mark sheets must be presented to the moderator during moderation of the PAT.

Any moderator may require from a candidate to explain and demonstrate the functions, principles and skills during the moderation process.

On completion, the moderator will, if necessary, adjust the marks of the group upwards or downwards should he/she deem it necessary.

All tasks/phases must be clearly marked with the correct date, initials, surname and signature of the candidate.

All phases must be completed as per program of assessment in this guideline by end of **August 2026**. Provincial moderation must be conducted in the month of September by the PED as to be ready for national external moderation in October.

2.4 Consequences of absence/non-submission of tasks

If a candidate's practical assessment task is incomplete or unavailable with a valid reason, the candidate may be given three weeks before the commencement of the final end-of-year examination to submit the outstanding task. Should the candidate fail to fulfil the outstanding PAT requirement, such a candidate will be awarded a zero mark for that PAT component.

A candidate's results are regarded as incomplete if he/she does not present any component of the PAT task. Should the candidate fail to fulfil the outstanding PAT requirement, the marks for these components will be omitted and the final mark for Mechanical Technology will be adjusted for promotion purposes in terms of the completed tasks. If any tasks are still outstanding, the candidate runs the risk of not being resulted at the end of the year. He/She will be given another opportunity **based on the decision of the head of the assessment body**.

2.5 Declaration of Authenticity

NAME OF SCHOOL:

NAME OF CANDIDATE:

(FULL NAMES AND SURNAME)

NAME OF TEACHER:

I hereby declare that the Practical Assessment Task submitted for assessment is my own, original work and has not been previously submitted for moderation.

SIGNATURE OF CANDIDATE

DATE

As far as I know, the above declaration by the candidate is true and I accept that the work offered is his or her own.

SIGNATURE OF TEACHER

DATE

SCHOOL STAMP

3. CANDIDATE GUIDELINES

Instructions to the candidate

- The PAT consists of a compulsory task in **Automotive**. The compulsory task could be completed during any of the three terms, as set out in this document. (*Also see CAPS document.*)
- All tasks must be completed according to the timeframes as set out in this document.
- You are requested to actively engage in all practical assessment tasks.
- Candidates who are uncooperative will receive demerits or a zero mark for that particular section of the work.
- Candidates who act unsafely in the workshop and place other candidates in danger will be given additional corrective measures to improve their safety awareness.
- Your tasks must be completed fully by the end of **August 2026** in order to be ready for provincial and/or national moderation.
- Your worksheets need to be **clearly marked** with your name, surname, signature and date of assessment.
- At least one task must be completed each term. The additional compulsory task must be completed during term 1, term 2 or term 3.
- The candidate must be present and available to explain and demonstrate the functions, principles and skills during the moderation.
- Candidates **MUST** complete the **Declaration of Authenticity** to declare that the tasks they presented for formal assessment is their own work.
- Each term must have a completed task/phase in order to enter the mark on the working mark sheet and the South African School Administration and Management System (SA-SAMS).

4. SPECIALISATION: AUTOMOTIVE (SPECIFIC)**Term: 1 to 3****Starting date: January 2026****Completion date: August 2026****INTRODUCTION**

This section comprises SEVEN practical tasks.

Choose any THREE tasks from the SIX tasks given (TASKS 1–6), namely:

TASK 1: Cooling system test

TASK 2: Cylinder leakage tests

TASK 3: Exhaust gas analysis

TASK 4: Wheel balancing

TASK 5: Charging system

TASK 6: Computerised diagnostic scanner

The following task is a **COMPULSORY TASK**:

TASK 7: Engine components measurement and calculations

NOTE: TASK 7 IS COMPULSORY.**CONDUCT ANY THREE OF THE SIX TASKS GIVEN (TASKS 1–6).****NOTE: The total number of tasks to be completed = 4 (3 choices + 1 compulsory).**

The teacher must explain and demonstrate the knowledge and skills that will be assessed during these tasks. Due dates for the completion of the tasks should also be communicated to the candidates.

Activity outcome:

- Candidates apply theoretical knowledge in practice with regard to:
 - Safety, tools, maintenance and systems and control
 - Correct use of tools and equipment
 - Use equipment to diagnose faults in the engine
- These tasks must be done under the supervision of the teacher, and the candidates should be assessed while performing these tasks.
- The candidates should answer questions, inform the teacher of the findings and give reasons for certain actions while they are performing these tasks.
- The teacher must record the findings on the worksheet provided.

TASK 1: COOLING SYSTEM TEST

- WORKSHEET 1 – Cooling System Test – Procedure
 - Perform the tasks as on WORKSHEET 1.
 - Record the cooling system readings and reasons on WORKSHEET 1.
 - Use the specification manual or ANNEXURE A to obtain specifications for the engine that you are using to conduct the cooling system test.
 - Perform a cooling system pressure test, check anti-freeze concentration, radiator cap test and thermostat test.

TASK 2: CYLINDER LEAKAGE TEST

- WORKSHEET 2 – Cylinder Leakage Test – Procedure
 - Perform a cylinder leakage test on a four-cylinder, four-stroke petrol engine.
 - Record the causes and reasons on WORKSHEET 2.

TASK 3: EXHAUST GAS ANALYSIS

- WORKSHEET 3 – Exhaust Gas Analysis – Procedure
 - Use the specification manual or ANNEXURE A to obtain readings for the engine that you are using to conduct the exhaust gas analysis task.
 - Perform the tasks as on WORKSHEET 3.

TASK 4: WHEEL BALANCING

- WORKSHEET 4.1 – Wheel Balancing – Questions
 - Answer the questions on WORKSHEET 4.1 under examination-controlled conditions.
- WORKSHEET 4.2 – Wheel Balancing – Procedure
 - Perform the tasks as on WORKSHEET 4.2.
 - Use a wheel-balancing machine to balance a wheel.

TASK 5: CHARGING SYSTEM

- WORKSHEET 5 – Charging System – Procedure
 - Perform the charging system test procedures on a vehicle engine.
 - Identify components of the alternator.
 - Test alternator components as on WORKSHEET 5.

TASK 6: COMPUTERISED DIAGNOSTIC SCANNER

- WORKSHEET 6.1 – Computerised Diagnostic Scanner – Questions
 - Answer the questions on WORKSHEET 6.1 under examination-controlled conditions.
- WORKSHEET 6.2 – Computerised Diagnostic Scanner – Procedure
 - Perform the computerised diagnostic scanning procedures on a vehicle and record the findings on WORKSHEET 6.2.

COMPULSORY TASK**TASK 7: ENGINE COMPONENTS MEASUREMENT**

- WORKSHEET 7 – Engine Components Measurement – Procedure
 - Perform the engine components measurement and calculations procedures on an engine.
 - Record the findings on WORKSHEET 7.

TASK 1: COOLING SYSTEM TEST**WORKSHEET 1 – PROCEDURE****CANDIDATE'S NAME AND SURNAME:** _____

COOLING SYSTEM TEST		
1. Perform a cooling system pressure test.		
PROCEDURE	MARK	TOTAL
PERFORM A COOLING SYSTEM PRESSURE TEST:		
1.1 Obtain cooling system working pressure from specifications or from the radiator cap.	1	
1.2 Check if engine is hot.	1	
1.3 Safely (even if not hot) remove radiator cap.	2	
1.4 Ensure that the coolant level is correct.	1	
1.5 Fit adapter of the pressure pump to radiator or expansion bottle.	2	
1.6 Couple the pressure pump to the adapter.	1	
1.7 Pressurise the cooling system by pumping the pressure pump to the prescribed pressure.	2	
1.8 Wait and check for pressure drop on the pump gauge.	2	
1.9 Visually check for leaks and report on leaks.	2	
1.10 Release pressure safely.	1	
1.11 Remove pressure pump and adapter correctly.	1	
TOTAL – Cooling system pressure test – Procedure	16	

CHECK THE ANTI-FREEZE STRENGTH:		
1.12 Obtain coolant antifreeze ratio from specifications.	1	
1.13 Insert nozzle into coolant.	1	
1.14 Hold the hydrometer vertically.	1	
1.15 Squeeze the rubber bulb.	1	
1.16 Release the bulb gently to draw up coolant.	1	
1.17 Draw enough coolant level to enable the float to lift freely.	1	
1.18 Read the scale on the float for the anti-freeze %.	1	
1.19 Squirt coolant back into cooling system.	1	
1.20 Choose correct antifreeze.	1	
1.21 Correct antifreeze level. • Pour antifreeze into cooling system. • Circulate coolant. • Recheck antifreeze concentration.	3	
TOTAL – Anti-freeze strength check – Procedure	12	

PERFORM A RADIATOR CAP TEST:		
1.22	Check opening pressure on the radiator cap.	1
1.23	Fit radiator cap adapter to the pressure pump.	2
1.24	Pump the tester.	1
1.25	Check the release pressure of the cap.	1
1.26	Report if release pressure is correct or incorrect.	1
1.27	Report on condition of the radiator cap.	1
1.28	Release pressure safely.	1
1.29	Remove adapter from pressure pump.	1
1.30	Fit radiator cap.	1
TOTAL – Radiator cap test – Procedure		10

TEST THERMOSTAT:		
1.31	Obtain temperature at which thermostat opens.	1
1.32	Insert thermometer into a container.	1
1.33	Secure thermometer from falling into container.	1
1.34	Fill container with water.	1
1.35	Heat water in the container.	1
1.36	Gently ease open the thermostat valve.	1
1.37	Place 0,05 mm feeler gauge blade or thin wire between the thermostat valve and seat.	1
1.38	Suspend the thermostat.	2
1.39	Record the temperature at which the feeler/gauge is released from the thermostat.	2
1.40	Report on condition of the thermostat.	1
TOTAL – Test thermostat – Procedure		12

TOTAL – Cooling system pressure test– Procedure	16	
TOTAL – Anti-freeze strength check – Procedure	12	
TOTAL – Radiator cap test – Procedure	10	
TOTAL – Test thermostat –Procedure	12	
TOTAL – Cooling System Test	50	

SIGNATURES			
Candidate	Date	Teacher	Date
Internal moderator	Date	External moderator	Date

Declaration by the teacher:

I, _____, declare that the marks for the Cooling System Test are
Initial & Surname (Teacher)
captured on the school database.

Signature

Date

TASK 2: CYLINDER LEAKAGE TEST**WORKSHEET 2 – PROCEDURE****CANDIDATE'S NAME AND SURNAME:** _____

CYLINDER LEAKAGE TEST				
2	Perform the cylinder leakage test on one cylinder.			
PROCEDURE			MARK	TOTAL
2.1	Give TWO reasons that would prompt you to perform a cylinder leakage test on an engine.	REASON:	2	
2.2	Start the engine.		1	
2.3	Check if the engine is at operating temperature.	REASON:	2	
2.4	Switch off the engine.		1	
2.5	Remove the air filter.	REASON:	2	
2.6	Number the spark plug (HT) leads according to the cylinders.	REASON:	2	
2.7	Remove the spark plug (HT) leads.		1	

2.8	Clean around the spark plugs before removing them.	REASON:	2	
2.9	Remove all the spark plugs.		4	
2.10	Turn the engine clockwise at front pulley.		1	
2.11	Turn engine till piston is on compression stroke.	REASON:	2	
2.12	Turn piston to TDC.		1	
2.13	Lock the crankshaft.		1	
2.14	Screw the spark plug hose adapter into the spark plug hole.		1	
2.15	Ensure compressor pressure is sufficient.		1	
2.16	Connect the leakage tester to the compressor.		1	
2.17	Calibrate the leakage tester.	REASON:	2	
2.18	Connect leakage tester to spark plug hole adapter.	REASON:	2	
2.19	Record the percentage leakage. 	DEDUCTION:	2	

2.20	Check for FIVE causes of leakage(s) (irrespective of the engine condition).	PROCEDURE AND CAUSE:	10	
2.21	Reset tester pressure to zero before unplugging hoses.		2	
2.22	Replace spark plugs (initially turn spark plugs in by hand)		4	
2.23	Reconnect HT leads.		1	
2.24	Refit air filter.		1	
2.25	Remove numbering on HT leads.		1	
TOTAL – Cylinder Leakage Test – Procedure			50	

SIGNATURES			
Candidate	Date	Teacher	Date
Internal moderator	Date	External moderator	Date

Declaration by the teacher:

I, _____, declare that the marks for the Cylinder Leakage Test marks
Initial & Surname (Teacher)
 are captured on the school database.

 Signature

 Date

TASK 3: EXHAUST GAS ANALYSIS**WORKSHEET 3 – PROCEDURE****CANDIDATE'S NAME AND SURNAME:** _____

EXHAUST GAS ANALYSIS				
3. Conduct an exhaust gas analysis on an internal combustion engine, following the correct sequence. Analyse any TWO of the following gases: oxygen (O ₂), carbon monoxide (CO) and carbon dioxide (CO ₂).				
PROCEDURE			MARK	TOTAL
3.1	Obtain the following manufacturers' exhaust gas specifications of the engine to be tested. - Oxygen (O₂) - Carbon monoxide (CO) - Carbon dioxide (CO₂)	3		
3.2	State whether the following air/fuel ratios are lean, ideal or rich. 14,7 : 1 16,7 : 1 12,7 : 1	3		
3.3	Place the gas analyser so that it will not fall.	1		
3.4	Ensure proper ventilation when conducting test.	REASON:	2	
3.5	Select Neutral or Park.	1		
3.6	Ensure that there are no people standing in front or behind the vehicle when the engine is started.	1		
3.7	Bring engine to operating temperature.	REASON:	2	
3.8	Ensure the filters on the gas analyser are clean.	2		
3.9	Check for any exhaust leaks.	EFFECTS OF EXHAUST LEAKS:	5	

3.10	Check for any vacuum leaks.	EFFECTS OF VACUUM LEAKS:	5	
3.11	Switch on the gas analyser.		1	
3.12	Calibrate the gas analyser. Ensure the probe is not in exhaust.		2	
3.13	Ensure that the inlet hose is not restricted.		1	
3.14	Ensure that the inlet hose connections are airtight.		1	
3.15	Check or remove condensate from inlet hose.		1	
3.16	Drain the condenser of any condensate.		1	
3.17	Insert probe into exhaust pipe.		1	
3.18	Secure probe correctly.		1	
3.19	Take the readings of the exhaust gases. (Choose any TWO of the following three gases: CO, O ₂ or CO ₂)			
3.19.1 OBTAIN CO% RESULTS:		CO% READING: 	1	
Compare the CO reading with specifications.	CONCLUSION:		3	
POSSIBLE CAUSE:		CORRECTIVE MEASURE:	2	

3.19.2 OBTAIN O₂% RESULTS:		O ₂ % READING:	1	
Compare O ₂ reading with specifications.	CONCLUSION:		3	
POSSIBLE CAUSE:	CORRECTIVE MEASURE:		2	
3.19.3 OBTAIN CO₂% RESULTS:		CO ₂ % READING:	1	
Compare the CO ₂ reading with specifications.	CONCLUSION:		3	
POSSIBLE CAUSE:	CORRECTIVE MEASURE:		2	
3.20 Switch off the gas analyser at switch.			1	
3.21 Disconnect inlet hose from gas analyser.			1	
3.22 Remove the probe from the exhaust pipe.			1	
3.23 Blow condensate from pipes.			1	
TOTAL – Exhaust Gas Analysis – Procedure			50	

SIGNATURES			
Candidate	Date	Teacher	Date
Internal moderator	Date	External moderator	Date

Declaration by the teacher:

I, _____, declare that the marks for the Exhaust Gas Analysis Test
Initial & Surname (Teacher)
are captured on the school database.

Signature

Date

TASK 4: WHEEL BALANCING**WORKSHEET 4.1 – QUESTIONS****CANDIDATE'S NAME AND SURNAME:** _____

QUESTIONS	MARK
4.1.1 State FOUR advantages of having the motor vehicle's wheels balanced.	4
4.1.2 Why is it necessary for the wheel balancing machine to be correctly calibrated?	1
4.1.3 State THREE functions of the wheel-weight hammer.	3
4.1.4 Define <i>static balance</i> of a wheel and tyre assembly.	2
4.1.5 Define <i>dynamic balance</i> of a wheel and tyre assembly.	2

4.1.6	FIGURE 4.1.6 shows different tyre conditions. State the cause of EACH condition (A–C).	A	B	C	3
					
		FIGURE 4.1.6			
		A –			
		B –			
		C –			
4.1.7	State FOUR safety measures that should be observed when performing wheel balancing.				4
TOTAL – Wheel Balancing – Questions					19

TASK 4: WHEEL BALANCING**WORKSHEET 4.2 – PROCEDURE****CANDIDATE'S NAME AND SURNAME:** _____

WHEEL BALANCING			
4.2 Balance a wheel and tyre assembly using the correct procedure.			
PROCEDURE		MARK	TOTAL
4.2.1	Choose the correct rim adapter (for the rim size) to mount the wheel.	1	
4.2.2	Fit the wheel to the wheel balancer correctly.	1	
4.2.3	Check the tyre for uneven wear.	1	
4.2.4	Check the tyre for bruises, cracks and damaged side walls.	1	
4.2.5	Check tyre tread wear level at the tyre wear indicators (TWI).	1	
4.2.6	Remove foreign matter from the rim and tyre.	1	
4.2.7	Check the wheel rim for damaged beads.	1	
4.2.8	Obtain the wheel rim diameter from the tyre.	1	
4.2.9	Enter the wheel rim diameter into the wheel balancer.	1	
4.2.10	Obtain tyre pressure specifications.	1	
4.2.11	Check tyre pressure.	1	
4.2.12	Use the calliper to determine the rim width.	1	
4.2.13	Enter wheel rim width into the wheel balancer.	1	
4.2.14	Use the off-set arm to measure the distance to the wheel.	1	
4.2.15	Enter the off-set measurement into the wheel balancer.	1	
4.2.16	Close the safety cover.	1	
4.2.17	Start the wheel balancer and allow the wheel to spin.	1	
4.2.18	Obtain the imbalance readings on the outer and inner part of the rim. Outer reading: Inner reading:	REASON:	3

4.2.19	Remove the wheel weights.	1	
4.2.20	Close the safety cover.	1	
4.2.21	Start the wheel balancer and allow wheel to spin.	1	
4.2.22	Obtain the imbalance readings and its locations on the rim. Outer reading:..... Inner reading:.....	2	
4.2.23	Choose the correct weights.	2	
4.2.24	Fit the weights correctly.	2	
4.2.25	Re-check the balancing.	1	
4.2.26	Remove the wheel if balanced.	1	
TOTAL – Wheel Balancing – Procedure		31	

TOTAL – Wheel Balancing – Questions		19	
TOTAL – Wheel Balancing –Procedure		31	
TOTAL – Wheel Balancing		50	

SIGNATURES			
Candidate	Date	Teacher	Date
Internal moderator	Date	External moderator	Date

Declaration by the teacher:

I, _____, declare that the marks for the Wheel Balancing Test are
 Initial & Surname (Teacher)
 captured on the school database.

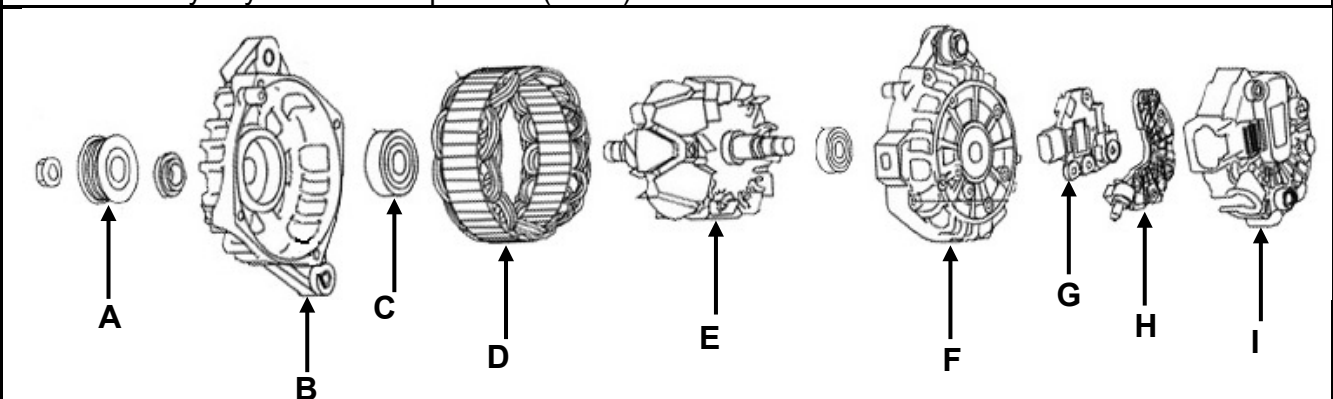
 Signature

 Date

TASK 5: CHARGING SYSTEM**WORKSHEET 5 – PROCEDURE****CANDIDATE'S NAME AND SURNAME:** _____

CHARGING SYSTEM (ALTERNATOR)			
5.1 Test the charging system on a vehicle.			
PROCEDURE			MARK
			TOTAL
5.1.1	Select DC voltage on the multimeter.		1
5.1.2	Obtain the manufacturer's specifications for the vehicle's charging system.		2
5.1.3	Check for loose electrical connections.		1
5.1.4	Check the fan belt.		2
5.1.5	Use the multimeter to measure the battery voltage at idling speed without load .		2
5.1.6	Use the multimeter to measure the battery voltage at idling speed with load .		2
5.1.7	Report on voltage drop between readings at idling speed, with and without load.		2
TOTAL – Charging System – Procedure			12

5.2 FIGURE 5.2 below shows an exploded view of an alternator. Identify any SEVEN components (A to I) of the alternator.

**FIGURE 5.2**

A -	F -
B -	G -
C -	H -
D -	I -
E -	
TOTAL – Alternator Component Identification	
7	

5.3 Test the following components of a dismantled alternator.		
ALTERNATOR TESTING –PROCEDURE		MARK
5.3.1 Select continuity (buzzer) on the multimeter.	1	TOTAL
Check the six diodes on the rectifier:		
5.3.2 Connect the multimeter to both sides of the diodes.	6	
5.3.3 Report on condition of diodes.	6	
Check stator for continuity:		
5.3.4 Connect the multimeter to a different pair of each of the three winding ends respectively.	3	
5.3.5 Report on continuity of stator windings.	3	
Check stator for earth leakage:		
5.3.6 Connect the multimeter to the stator framework and the other end to any of the three windings ends.	1	
5.3.7 Report on earth leakage of stator windings.	1	
Check rotor for continuity:		
5.3.8 Connect multimeter to both slip rings.	1	
5.3.9 Report on continuity of rotor windings.	1	
5.3.10 Check if slip rings are connected properly to rotor windings.	2	
5.3.11 Check slip rings for wear.	1	
Check rotor for earth leakage:		
5.3.12 Connect multimeter to rotor winding and rotor framework (poles).	1	
5.3.13 Report on earth leakage of rotor windings.	1	
5.3.14 End brackets/Cover for wear.	1	
5.3.15 Check front bearing and rear bearing.	2	
TOTAL – Alternator Testing – Procedure	31	
TOTAL – Charging System – Procedure	12	
TOTAL – Alternator Component Identification	7	
TOTAL – Alternator Testing – Procedure	31	
TOTAL – Charging system	50	

SIGNATURES			
Candidate	Date	Teacher	Date
Internal moderator	Date	External moderator	Date

Declaration by the teacher:

I, _____, declare that the marks for the Charging System (Alternator)
Initial & Surname (Teacher)
are captured on the school database.

Signature

Date

TASK 6: COMPUTERISED DIAGNOSTIC SCANNER**WORKSHEET 6.1 – QUESTIONS****CANDIDATE'S NAME AND SURNAME:** _____

QUESTIONS		MARK
6.1.1	What do the following abbreviations stand for?	
(a)	ISC	1
(b)	PCM	1
(c)	TCU	1
(d)	MAP	1
(e)	DIS	1
6.1.2	Interpret the following fault code: P0304	
(a)	P	1
(b)	0	1
(c)	3	1
(d)	04	1
6.1.3	State TWO manufacturer's specifications required to set up an OBD scanner.	2

6.1.4	State the FOUR basic functions of an OBD scanner.	4
6.1.5	Name FIVE systems that the OBD scanner can detect.	5
TOTAL – Computerised Diagnostic Scanner – Questions		20

TASK 6: COMPUTERISED DIAGNOSTIC SCANNER**WORKSHEET 6.2 – PROCEDURE****CANDIDATE'S NAME AND SURNAME:** _____

COMPUTERISED DIAGNOSTIC SCANNER			
6.2 Conduct a Computerised Diagnostic Test on a vehicle using the OBD-II scanner.			
PROCEDURE		MARK	TOTAL
6.2.1 Check for any of the SIX obvious problems listed:		6	
6.2.2 Obtain the VIN of the vehicle.		1	
6.2.3 Obtain the make and model of the vehicle.		1	
6.2.4 Locate the car's OBD-II port.		1	
6.2.5 Gain access to the car's OBD-II port.		1	
6.2.6 Plug the diagnostic tool into the OBD-II port.		2	
6.2.7 Access the diagnostic scanner.		2	
6.2.8 Enter/Confirm the vehicle's details on the scanner.		2	
6.2.9 Turn on the vehicle's ignition.		2	
6.2.10 Select the system to be scanned.		2	
6.2.11 Perform a diagnostic scan.		2	
6.2.12 Record any diagnostic trouble codes.		2	
6.2.13 Clear the trouble codes and restart the diagnostic scan.		2	
6.2.14 Read the trouble codes.		1	
6.2.15 Interpret the trouble codes.		1	
6.2.16 Make a diagnosis.		2	
TOTAL – Computerised Diagnostic Scanner –Procedure		30	
TOTAL – Computerised Diagnostic Scanner – Questions		20	
TOTAL – Computerised Diagnostic Scanner – Procedure		30	
TOTAL – Computerised Diagnostic Scanner		50	

SIGNATURES			
Candidate	Date	Teacher	Date
Internal moderator	Date	External moderator	Date

Declaration by the teacher:

I, _____, declare that the marks for the Computerised Diagnostic
Initial & Surname (Teacher)
Scanner are captured on the school database.

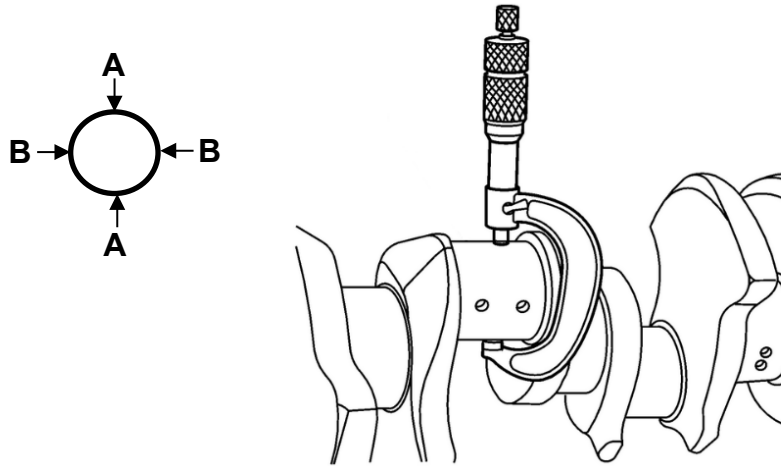
Signature

Date

TASK 7: ENGINE COMPONENT MEASUREMENTS (COMPULSORY)**WORKSHEET 7 – ENGINE COMPONENT MEASUREMENTS – PROCEDURE****CANDIDATE'S NAME AND SURNAME:** _____

ENGINE COMPONENTS MEASUREMENT			
7. Measure the crankshaft big-end journal, big-end bearing, cylinder bore, stroke length, piston diameter, ring gap and clearance volume of an internal combustion engine. Answer the questions that follow:			

7.1 Obtain specifications for the following.			
COMPONENT	SPECIFICATION	MARK	TOTAL
Main journal size		1	
Big-end journal size		1	
Mains bearing clearance		1	
Big-end journal clearance		1	
Cylinder bore diameter		1	
Stroke length		1	
Piston-to-bore clearance		1	
Ring gap		1	
TOTAL – Engine Specifications		8	

7.2 BIG-END MEASUREMENT**FIGURE 7.2: BIG-END JOURNAL****7.2.1 Measure the big-end journal.**

DIMENSION	MEASUREMENT	MARK	TOTAL
AA	±0,1 mm tolerance allowed, thereafter, -1 MARK for every 0,1 mm out	5	
BB	±0,1 mm tolerance allowed, thereafter, -1 MARK for every 0,1 mm out	5	

7.2.2 Calculate the ovality.

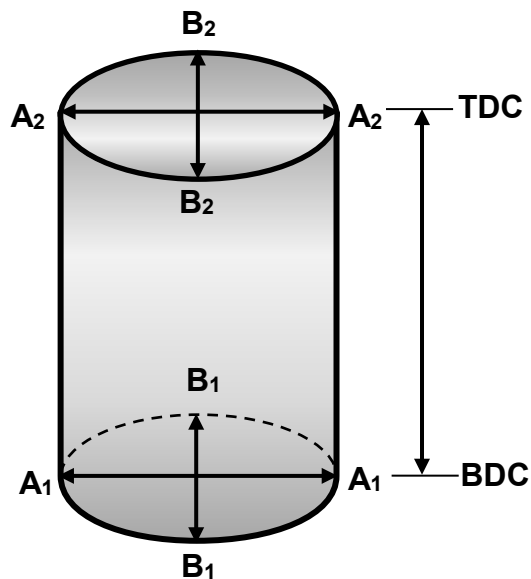
AA – BB =		2	
-----------	--	---	--

7.2.3 Measure the big-end bearing on the connecting rod.

DIMENSION	MEASUREMENT	MARK	TOTAL
Measure the big-end bearing inside diameter	±0,1 mm tolerance allowed, thereafter, -1 MARK for every 0,1 mm out	5	

7.2.4 Calculate the big-end bearing clearance.

	3	
TOTAL – Big-end Measurement and Calculation	20	

7.3 CYLINDER BORE:**7.3.1 Measure the cylinder bore.****FIGURE 7.3.1: CYLINDER BORE**

DIMENSION	MEASUREMENT	MARK	TOTAL
A ₁	±0,1 mm tolerance allowed, thereafter, -1 MARK for every 0,1 mm out	5	
A ₂	±0,1 mm tolerance allowed, thereafter, -1 MARK for every 0,1 mm out	5	
B ₁	±0,1 mm tolerance allowed, thereafter, -1 MARK for every 0,1 mm out	5	
B ₂	±0,1 mm tolerance allowed, thereafter, -1 MARK for every 0,1 mm out	5	

7.3.2 Measure the stroke length.

• Ensure that piston is at BDC.		1	
A ₂ to A ₁	±0,1 mm tolerance allowed, thereafter, -1 MARK for every 0,1mm out	5	

7.3.3 Calculate the ovality.

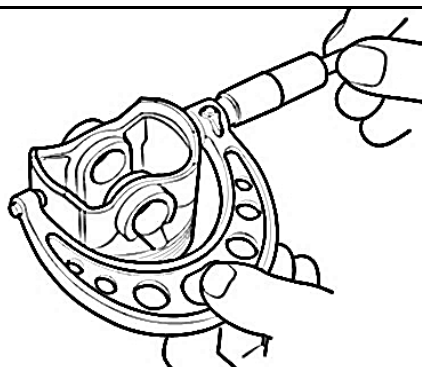
A ₁ – B ₁ =		2	
A ₂ – B ₂ =		2	

7.3.4 Calculate the taper.

A ₁ – A ₂ =		2	
B ₁ – B ₂ =		2	
TOTAL – Cylinder Bore Measurement		34	

7.4 PISTON MEASUREMENT:

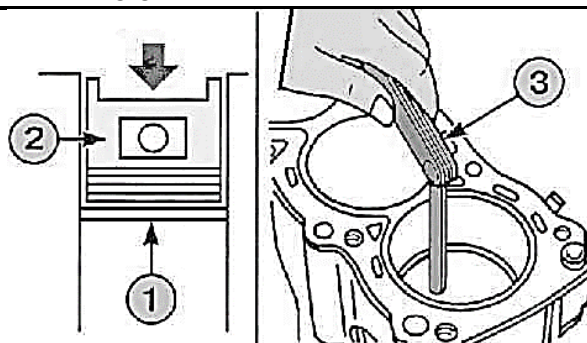
7.4.1 Measure the piston and bore diameters.

**FIGURE 7.4.1: MEASURING PISTON DIAMETER**

DIMENSION	MEASUREMENT	MARK	TOTAL
Piston diameter	$\pm 0,1$ mm tolerance allowed, thereafter, -1 MARK for every 0,1 mm out	5	
Piston-to-bore clearance calculation		3	
TOTAL – Piston Measurement		8	

7.5 COMPRESSION RING GAP

Measure the compression ring gap.

**FIGURE 7.5: MEASURING RING GAP**

MEASURING RING GAP			MARK	TOTAL
7.5.1	Insert ring into the bore by hand.		2	
7.5.2	Use piston to square the ring in the bore.		2	
7.5.3	Ensure ring is about 25 mm deep in the cylinder.		1	
7.5.4	Use feeler gauge to measure ring gap.		3	
7.5.5	Record ring gap measurement.		1	
7.5.6	Is the ring gap within specifications?	Yes No	1	
TOTAL – Ring Gap Measurement			10	

7.6 MEASUREMENT OF CLEARANCE VOLUME			MARK	TOTAL
7.6.1	Ensure all valves are closed.		1	
7.6.2	Check with tools if spark plug is correctly tightened.		2	
7.6.3	Level the cylinder head.		2	
7.6.4	Apply grease to cylinder head.		1	
7.6.5	Place transparent sheet onto cylinder head covering the combustion chamber.		2	
7.6.6	Pour sufficient viscous liquid into burette.	Burette Reading 1:	2	
7.6.7	Place burette above hole in transparent sheet.		1	
7.6.8	Slowly fill the combustion chamber with liquid from burette. • Filling • No spillage		2	
7.6.9	No air bubbles under transparent sheet.		2	
7.6.10	Check reading on burette.	Burette Reading 2:	2	
7.6.11	Calculate clearance volume in cm ³ .		3	
TOTAL – Clearance Volume Measurement			20	

TOTAL – Engine Specifications	8	
TOTAL – Big-end Measurement and Calculation	20	
TOTAL – Cylinder Bore Measurement	34	
TOTAL – Piston Measurement	8	
TOTAL – Ring Gap Measurement	10	
TOTAL – Clearance Volume Measurement	20	
TOTAL –Engine Component Measurements	100	

SIGNATURES			
Candidate	Date	Teacher	Date
Internal moderator	Date	External moderator	Date

Declaration by the teacher:

I, _____, declare that the marks for the Engine Component
Initial & Surname (Teacher)
Measurements and Calculations are captured on the school database.

Signature

Date

5. COMPOSITE MARK SHEET – TOTALS

MECHANICAL TECHNOLOGY											
AUTOMOTIVE											
COMPOSITE MARK SHEET– TOTALS											
GRADE		12	DATE								
		CANDIDATES									
PHASES	MARKS										
		1	2	3	4	5	6	7	8	9	10
PHASE 1/ TASK: _____	50										
PHASE 2/ TASK: _____	50										
PHASE 3/ TASK: _____	50										
PHASE 4/ TASK 7 COMPULSORY	100										
TOTAL:	250										
TOTAL PAT MARK:	100										
NAME AND SIGNATURE OF TEACHER											
NAME AND SIGNATURE OF TECHNICAL DEPARTMENTAL HEAD											
NAME AND SIGNATURE OF PRINCIPAL											
NAME AND SIGNATURE OF PROVINCIALMODERATOR											
NAME AND SIGNATURE OF EXTERNALMODERATOR											

SCHOOL STAMP

6. ANNEXURE A – SPECIFICATIONS SHEET

ENGINE:	
Type	
Bore	
Stroke	
Idling speed	
Power max.	
Torque max.	
Compression ratio	
Oil pressure	
Firing order	
Clearance volume	

TRANSMISSION:	
Clutch type and diameter	
Gearbox	
Rear axle type	
Final drive type and ratio	
Speed in top gear per 1 000 r/min	

CAPACITIES:	
Sump without oil filter	
Gearbox	
Final drive	
Cooling system	
Fuel tank	

FUEL:	
Fuel system	
Aspiration	
Consumption	
CO emissions	
CO ₂ emissions	
O ₂ emissions	
Fuel type	

PISTONS AND RINGS:	
Piston clearance in bore	
Over-sizes	
Number of rings	
Groove gap	
Ring gap in bore	

COOLING SYSTEM:	
Radiator cap pressure	
Thermostat opening temperature	
Anti-freeze ratio	

VALVES:	
Working clearance	
Inlet	
Exhaust	
Timing	
Inlet opens	
Inlet closes	
Timing	
Exhaust opens	
Exhaust closes	
Valve spring free length	
Valve spring rate	
Valve seat angle	
Valve lift	
Cam height	

CRANKSHAFT:	
Main bearings	
Under-sizes	
Clearance	
Big end	
Under-sizes	
Clearance	
Small end bushes	

TORQUE SETTINGS:	
Flywheel	
Cylinder head	
Big-end bearings	
Main bearings	
OHC bearing caps	

IGNITION AND ELECTRICAL:	
Distributor type	
Stroboscopic setting	
Position of timing marks	
Spark plugs	
Spark plug gaps	
Battery	
Alternator	
Charging rate	
Regulator type	

7. CONCLUSION

On completion of the practical assessment task candidates should be able to demonstrate their understanding of the industry, enhance their knowledge, skills, values and reasoning abilities as well as establish connections to life outside the classroom and address real-world challenges. The PAT furthermore develops the candidate's life skills and provides opportunities for candidates to engage in their own learning.