



# basic education

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Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **MECHANICAL TECHNOLOGY (AUTOMOTIVE)**

### **GUIDELINES FOR PRACTICAL ASSESSMENT TASKS**

**GRADE 12**

**2021**

**These guidelines consist of 47 pages.**

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## 1. INTRODUCTION/BACKGROUND

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, Technical Sciences, Technical Mathematics
- **SERVICES:** Consumer Studies, Hospitality Studies, Tourism
- **TECHNOLOGY:** Mechanical Technology, Civil Technology, Electrical Technology, and Engineering Graphics and Design

A practical assessment task (PAT) mark 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-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.

The PAT is implemented across the first three terms of the school year.

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

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

- An attitude where the learner can selectively use ideas, gather evidence and facts, to drawing 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 learner 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 learner physically and mentally. The learner must show his/her 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 learners 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, learners can easily assess their progress. Instances where formal assessments take place, it is the responsibility of the teacher to administer assessment.

The PAT should be completed within the first three terms. The PAT should be completed under controlled conditions. (Refer to Mechanical Technology SPECIALISATION: CAPS Grades 10–12.)

### **2.2 Assessment of the PAT**

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

Both formal and informal assessment should be conducted to ensure that the embedded skills are developed. Informal assessment can be conducted only to monitor progress of the learner. Formal assessment should always be conducted and recorded by the teacher.

### **2.3 Moderation of the PAT**

The tasks, projects, assessment criteria as well as the mark sheets must be presented to the moderator during moderation of the PAT.

The moderator should be able to call on a learner to explain and demonstrate the functions, principles and skills during the moderation purposes.

On completion the moderator will, if necessary, adjust the marks of the group up or downwards depending on the decision reached as a result of moderation.

### **2.4 Consequences of absence/non-submission of tasks**

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

A learner's results are regarded as incomplete if he/she does not offer any component of the PAT task. He/She will be given another opportunity based on the decision of the head of the assessment body. Should the learner 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.

**2.5 Declaration of Authenticity**

NAME OF SCHOOL:

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NAME OF LEARNER:

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(FULL NAME(S) AND SURNAME)

NAME OF TEACHER:

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I hereby declare that the project 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/her own.

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SIGNATURE OF TEACHER

---

DATE

SCHOOL STAMP

### 3. LEARNER GUIDELINES

#### Instructions to the learner

- The PAT consists of a specialisation task in **Automotive**. The practical work is spread over three terms, as set out in this document. (See CAPS document.)
- All tasks must be completed according to the time frames set out in each of the tasks.
- Learners are requested to actively engage in all practical assessment tasks.
- Learners who are uncooperative will receive demerits or a zero mark for that particular section of the work.
- Learners who act unsafely in the workshop and place other learners in danger, will be given additional corrective tasks to improve their safety awareness.

#### 4. SPECIALISATION

##### AUTOMOTIVE

**Term: 1 to 3**

**Starting date: January 2021**

**Completion date: August 2021**

##### INTRODUCTION:

- This section comprises EIGHT practical tasks (choose any FOUR of the EIGHT given tasks, namely):
  - TASK 1: Compression test
  - TASK 2: Cylinder leakage test
  - TASK 3: Gas analysing test
  - TASK 4: Wheel balancing
  - TASK 5: Charging system
  - TASK 6: Cooling system test
  - TASK 7: Fuel system test
  - TASK 8: Measuring engine components
- It also comprises ONE compulsory task, namely:
  - TASK 9: Engines – Setting of valves

**NOTE: CONDUCT ANY FOUR OF THE EIGHT TASKS.  
TASK 9 IS COMPULSORY.**

**NOTE: Number of tasks = 5 (4 + 1)**

The teacher must explain to the learners which knowledge and skills will be assessed during these tasks, as well as the time to complete each task.

##### Activity outcome:

- Learners apply theoretical knowledge in practice with regard to:
  - Safety, tools, maintenance and systems and control
  - Correct use of tools and equipment
  - Use of equipment to diagnose low compression or other faults in the engine cylinder
- These tasks must be completed under the supervision of the teacher and the learners should be assessed while performing these tasks.
- The learners should answer questions, record findings and give reasons for certain actions on the worksheet given while they are performing these tasks.

**TASK 1: Compression test – Questions**

- Answer the questions on WORKSHEET 1.1.

**TASK 1: Compression test – Procedure**

- Perform the tasks as on WORKSHEET 1.2.
- Use the specification manual to obtain readings for the engine that you are using to conduct the compression test.
- Perform a dry and wet compression test on a four-cylinder, four-stroke petrol engine and record the findings.

**TASK 1: Compression test – Conclusion**

- Use the findings on WORKSHEET 1.2 to record the conclusions on WORKSHEET 1.3.

**NOTE:** The learner must record and give reasons for certain actions when he/she completes this task.

**TASK 2: Cylinder leakage test – Questions and Procedure**

- Answer the questions on WORKSHEETS 2.1 and 2.2.

**TASK 2: Cylinder leakage test – Procedure**

- Do a cylinder leakage test on a four-cylinder, four-stroke petrol engine and record the findings on WORKSHEET 2.3.

**NOTE:** The learner must record and give reasons for certain actions when he/she completes this task.

**TASK 3: Gas analysing test – Questions**

- Answer the questions on WORKSHEET 3.1.

**TASK 3: Gas analysing test – Procedure**

- Perform the tasks as on WORKSHEETS 3.2.
- Use the specification manual to obtain readings for the engine that you are using to conduct the gas analysing test.

**TASK 3: Gas analysing test – Conclusion**

- Record the findings on WORKSHEET 3.3.

**NOTE:** The learner must record and give reasons for certain actions when he/she completes this task.

**TASK 4: Wheel balancing – Questions**

- Answer the questions on WORKSHEET 4.1.

**TASK 4: Wheel balancing – Procedure**

- Perform the tasks as on WORKSHEET 4.2.
- Use the wheel balancer to conduct the test.

**TASK 4: Wheel balancing – Conclusion**

- Draw conclusions and record the findings on WORKSHEET 4.3.

**NOTE:** The learner must record and give reasons for certain actions when he/she completes this task.



**TASK 5: Charging system – Questions**

- Answer the questions on WORKSHEET 5.1.

**TASK 5: Charging system – Procedure**

- Perform the charging system procedures on an alternator, parts, stripping, testing and assembling and thereafter, record the findings on WORKSHEET 5.2.

**NOTE:** The learner must record and give reasons for certain actions when he/she completes this task.

**TASK 6: Cooling system test – Questions**

- Answer the questions on WORKSHEET 6.1.

**TASK 6: Cooling system test – Procedure**

- Perform the radiator test procedures on a radiator cap and radiator, and record the findings on WORKSHEET 6.2.

**TASK 7: Fuel system test – Questions**

- Answer the questions on WORKSHEET 7.1.

**TASK 7: Fuel system test – Procedure**

- Perform the fuel system test procedures on a fuel system and record the findings on WORKSHEET 7.2.

**TASK 8: Measuring engine components and engine calculations – Questions**

- Answer the questions on WORKSHEET 8.1.

**TASK 8: Measuring engine components and engine calculations – Procedure**

- Perform tasks on WORKSHEET 8.2.

**TASK 9 (COMPULSORY)****TASK 9: Engines – Valves – Questions**

- Answer the questions on WORKSHEET 9.1.

**TASK 9: Engines – Valves – Procedure**

- Complete WORKSHEET 9.2.

**SUGGESTION:** Do TWO tasks in Term 1, TWO tasks in Term 2 and the Compulsory Task in Term 3.

**TASK 1: COMPRESSION TEST – QUESTIONS**

**WORKSHEET 1.1**

**NAME:** \_\_\_\_\_

QUESTION	ANSWER	MARK	TOTAL
1. Explain the term <i>engine compression</i> .		2	
2. State THREE causes for low compression in an engine.		3	
3. State THREE effects of low compression in an engine.		3	
4. Name TWO compression tests that can be done on an internal combustion engine.		2	
5. After which compression test could the reading be higher, and why?		3	
6. State TWO safety precautions that must be considered when conducting a compression test.		2	
<b>TOTAL – Compression test – questions</b>		<b>15</b>	

**TASK 1: COMPRESSION TEST – PROCEDURE****WORKSHEET 1.2****NAME:** \_\_\_\_\_

PROCEDURE	REASON		MARK	TOTAL
Run the engine to reach operating temperature.			2	
Clean around the spark plugs before removing them.			2	
Remove the spark plugs.			4	
Remove the air filter.			2	
Disable the ignition system; if not, remove the HT lead from the coil.			2	
Fully open the throttle valve.			2	
Perform the compression test on each cylinder to obtain readings.			4	
Record the readings.	1.	2.	4	
	3.	4.		
Conduct a wet compression test on the cylinder with the lowest reading.			3	
<b>TOTAL – Compression test – procedure</b>			<b>25</b>	

**TASK 1: COMPRESSION TEST – CONCLUSION****WORKSHEET 1.3**

NAME: \_\_\_\_\_

<b>Results of the cylinder compression test executed:</b>			
<b>PROCEDURE</b>	<b>CONCLUSION</b>	<b>MARK</b>	<b>TOTAL</b>
Adherence to safety procedures while conducting the compression test		2	
Possible causes of pressure differences between cylinders after the dry compression test		4	
Conclusions after the wet compression test		2	
Replace spark plugs, electrical connections, and HT leads.		2	
<b>TOTAL – Compression test – conclusion</b>		<b>10</b>	

<b>TOTAL – Compression test – questions</b>	<b>Worksheet 1.1</b>	<b>15</b>	
<b>TOTAL – Compression test – procedure</b>	<b>Worksheet 1.2</b>	<b>25</b>	
<b>TOTAL – Compression test – conclusion</b>	<b>Worksheet 1.3</b>	<b>10</b>	
<b>GRAND TOTAL</b>		<b>50</b>	

**TASK 2: CYLINDER LEAKAGE TEST – QUESTIONS**

**WORKSHEET 2.1**

**NAME:** \_\_\_\_\_

QUESTION	ANSWER	MARK	TOTAL
1. What is the difference between the <i>cylinder compression test</i> and the <i>cylinder leakage test</i> ?		2	
2. Give a reason why a <i>cylinder leakage test</i> is conducted on an internal combustion engine.		2	
3. State THREE causes of cylinder leakages on an internal combustion engine.		3	
4. How would you determine the causes of leakages on an internal combustion engine? Name THREE procedures.		3	
<b>TOTAL – Leakage test – questions</b>		<b>10</b>	



**TASK 2: CYLINDER LEAKAGE TEST – PROCEDURE****WORKSHEET 2.3**

NAME: \_\_\_\_\_

<b>Results of the cylinder leakage test executed:</b>			
<b>PROCEDURE</b>	<b>RESULT</b>	<b>MARK</b>	<b>TOTAL</b>
Obtain the cylinder compression pressure.		2	
Remove all the spark plugs.		2	
Piston at TDC on compression stroke		2	
Lock the crankshaft.		2	
Screw the spark plug hose adapter into the spark plug hole.		2	
Connect the leakage tester to the compressor.		2	
Set the compressor regulator.		2	
Calibrate the leakage tester.		2	
Connect the leakage tester to the spark plug hole adapter.		2	
Read the percentage leakage.		2	
Determine the cause of the leakage.		2	
<b>TOTAL – Leakage test – procedure (Results)</b>		<b>20</b>	

<b>TOTAL – Leakage test – questions</b>	<b>Worksheet 2.1</b>	<b>10</b>	
<b>TOTAL – Leakage test – procedure</b>	<b>Worksheet 2.2</b>	<b>20</b>	
<b>TOTAL – Leakage test – procedure (Results)</b>	<b>Worksheet 2.3</b>	<b>20</b>	
<b>GRAND TOTAL</b>		<b>50</b>	

**TASK 3: GAS ANALYSING – QUESTIONS**

**WORKSHEET 3.1**

**NAME:** \_\_\_\_\_

QUESTION	ANSWER	MARK	TOTAL
1. What is the purpose of using a gas analyser on an internal combustion engine?		3	
2. What would prompt you to analyse the exhaust gases of an internal combustion engine?		2	
3. What influences proper and complete combustion under different operating conditions? State FIVE such influences.		5	
4. State THREE possible causes of high CO readings.		6	
5. State FOUR possible causes of high NO <sub>x</sub> readings.		4	



6. Give FOUR reasons for high CO <sub>2</sub> readings.		2	
7. Give TWO reasons for low O <sub>2</sub> readings.		2	
8. State FOUR precautions to be taken when using the gas analyser.		4	
<b>TOTAL – Gas analysing – questions</b>		<b>28</b>	



**TASK 3: GAS ANALYSING – RESULTS****WORKSHEET 3.3**

NAME: \_\_\_\_\_


<b>Results of the gas analysing procedure on an internal combustion engine:</b>			
<b>PROCEDURE</b>	<b>RESULT</b>	<b>MARK</b>	<b>TOTAL</b>
CO – reading		2	
Conclusion		2	
HC – reading		2	
Conclusion		2	
CO <sub>2</sub> – reading		2	
Conclusion		2	
<b>TOTAL – Gas analysing – results</b>		<b>12</b>	

<b>TOTAL – Gas analysing – questions</b>	<b>Worksheet 3.1</b>	<b>28</b>	
<b>TOTAL – Gas analysing – procedure</b>	<b>Worksheet 3.2</b>	<b>10</b>	
<b>TOTAL – Gas analysing – results</b>	<b>Worksheet 3.3</b>	<b>12</b>	
<b>GRAND TOTAL</b>		<b>50</b>	

**TASK 4: WHEEL BALANCING – QUESTIONS****WORKSHEET 4.1**

NAME: \_\_\_\_\_

QUESTION	ANSWER	MARK	TOTAL
1. What is the purpose of wheel balancing?		3	
2. State THREE consequences of unbalanced wheels on a motor vehicle.		3	
3. Why is it necessary for the wheel balancing machine to be in a good working condition?		1	
4. What are the functions of the wheel-weight hammer?		3	
5. State FOUR pre-checks that must be carried out before wheel balancing.		4	
6. Define <i>static balance</i> of a wheel and tyre assembly.		2	
7. Define <i>dynamic balance</i> of a wheel and tyre assembly.		2	

<p>8. FIGURE 4.1.8 indicates different tyre wear conditions. State the cause of EACH condition.</p>	<b>A</b>	<b>B</b>	<b>C</b>	3	
					
	<b>FIGURE 4.1.8</b>				
	A –				
	B –				
C –					
<p>9. State FOUR safety measures to be carried out when performing wheel balancing.</p>				4	
<b>TOTAL – Wheel balancing – questions</b>				<b>25</b>	



**TASK 4: WHEEL BALANCING – RESULTS**

**WORKSHEET 4.3**

**NAME:** \_\_\_\_\_

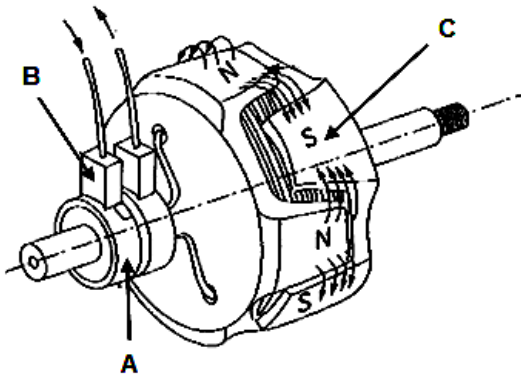
<b>Balancing of a wheel and tyre assembly:</b>			
<b>PROCEDURE</b>	<b>RESULT</b>	<b>MARK</b>	<b>TOTAL</b>
Condition of wheel and tyre assembly		2	
Give the imbalance readings on the wheel balancer		3	
Procedure to follow		3	
Final result		2	
<b>TOTAL – Wheel balancing – results</b>		<b>10</b>	

<b>TOTAL – Wheel balancing – questions</b>	<b>Worksheet 4.1</b>	<b>25</b>	
<b>TOTAL – Wheel balancing – procedure</b>	<b>Worksheet 4.2</b>	<b>15</b>	
<b>TOTAL – Wheel balancing – results</b>	<b>Worksheet 4.3</b>	<b>10</b>	
<b>GRAND TOTAL</b>		<b>50</b>	

**TASK 5: CHARGING SYSTEM – QUESTIONS**

**WORKSHEET 5.1**

NAME: \_\_\_\_\_

QUESTION	ANSWER	MARK	TOTAL
1. State the function of the alternator.		2	
2. Discuss the basic working principle of the alternator.		3	
3. State THREE methods to increase the output frequency of the alternator.		3	
4. State the functions of the stator.		3	
5. Label parts A–C of the rotor in FIGURE 5.1.5.	 <p style="text-align: center;"><b>FIGURE 5.1.5</b></p>	3	
	A –		
	B –		
	C –		

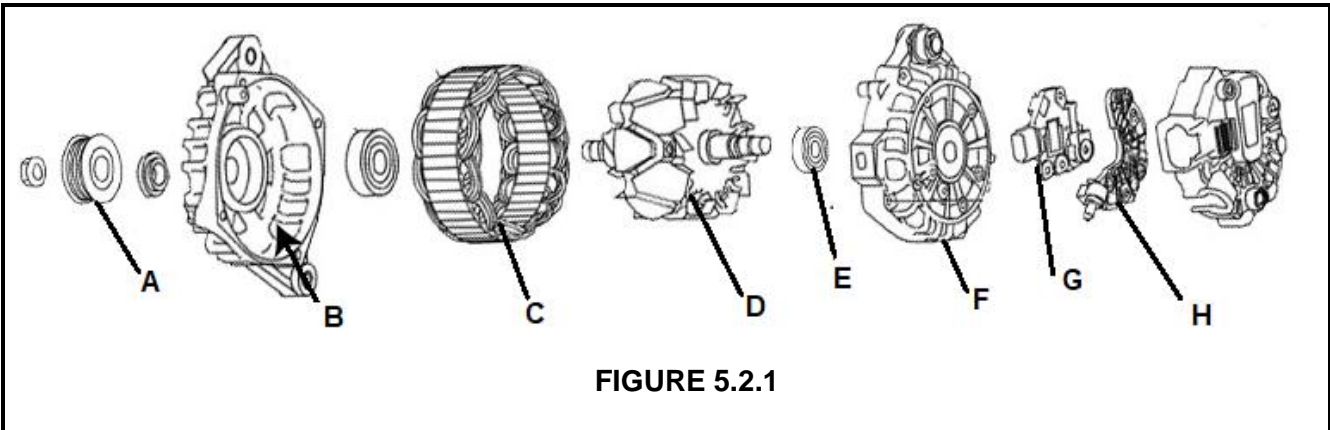


QUESTION	ANSWER	MARK	TOTAL
6. What are the functions of the rotor assembly?		3	
7. What are the functions of the slip ring and brush assembly?		2	
8. What is the function of the diode?		2	
9. What is the function of the rectifier?		2	
10. What is the function of the heat sink?		2	
11. What is the purpose of the voltage regulator?		3	
12. What is the function of the capacitor?		2	
<b>TOTAL – Charging system – questions</b>		<b>30</b>	

**TASK 5: CHARGING SYSTEM – PROCEDURE**

**WORKSHEET 5.2**

NAME: \_\_\_\_\_



**FIGURE 5.2.1**

QUESTION	ANSWER	MARK	TOTAL
1. Label any FIVE parts (A–H) of the alternator in FIGURE 5.2.1.	A.	5	
	B.		
	C.		
	D.		
	E.		
	F.		
	G.		
	H.		
2. State FOUR precautions that should be adhered to with regard to the charging system.		4	

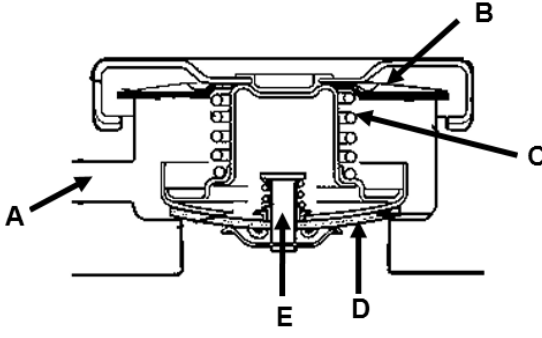


**TASK 6: COOLING SYSTEM TEST- QUESTIONS**

**WORKSHEET 6.1**

**NAME:** \_\_\_\_\_

QUESTION	ANSWER	MARK	TOTAL
1. What is the function of the cooling system?		2	
2. Name the type of metal used to manufacture the radiator core and tanks.		2	
3. State FOUR safety requirements to consider when setting up the cooling system test.		4	
4. State THREE manufacturer's specifications required to carry out a cooling system test.		3	

<p>5. State the function of the thermostat.</p>		2	
<p>6. What is the function of the radiator cap?</p>		2	
<p>7. Identify parts A–E of the radiator cap and radiator neck in FIGURE 7.1.6.</p>	<div style="text-align: center;">  <p><b>FIGURE 7.1.6</b></p> </div> <p>A –</p> <p>B –</p> <p>C –</p> <p>D –</p> <p>E –</p>	5	
	<p><b>TOTAL – Cooling system test – questions</b></p>	<p><b>20</b></p>	

**TASK 6: COOLING SYSTEM TEST – PROCEDURE**

**WORKSHEET 6.2**

NAME: \_\_\_\_\_

QUESTION	ANSWER	MARK	TOTAL
1. Conduct a radiator pressure test in the correct sequence.		12	
2. Conduct a radiator cap test.		6	

3. FAULT	POSSIBLE CAUSES	CORRECTIVE MEASURES	MARK	TOTAL
The heat gauge indicates that the engine is overheating. Identify SIX possible faults/causes and corrective measures.			12	
	<b>TOTAL – Cooling system – procedure</b>			
<b>TOTAL – Cooling system – questions</b>			<b>20</b>	
<b>TOTAL – Cooling system – procedure</b>			<b>30</b>	
<b>GRAND TOTAL</b>			<b>50</b>	

**TASK 7: FUEL SYSTEM TEST – QUESTIONS**

**WORKSHEET 7.1**

**NAME:** \_\_\_\_\_

QUESTION	ANSWER	MARK	TOTAL
1. State the function of the fuel pressure tester.		2	
2. Name TWO types of fuel pumps.		2	
3. State SIX precautions that must be adhered to while setting up the fuel pressure tester.		6	
4. State FOUR manufacturer's specifications required to carry out a fuel test.		4	
5. State the function of a fuel filter.		2	



	FAULT	CORRECTIVE MEASURE		
6. State THREE possible faults and their corrective measures for low fuel pressure.			6	
	<b>TOTAL – Fuel system test – questions</b>		<b>22</b>	

**TASK 7: FUEL SYSTEM TEST– PROCEDURE****WORKSHEET 7.2**

NAME: \_\_\_\_\_

<b>Conduct the fuel system test in the correct sequence.</b>			
<b>PROCEDURE</b>	<b>CONCLUSION</b>	<b>MARK</b>	<b>TOTAL</b>
Obtain the fuel pressure specifications.		1	
Obtain the correct adaptor in accordance with the hose size.		1	
Fit the fuel pressure tester securely to fuel tank side, block off the tester at the engine's side.		2	
Switch the ignition on and off after the full pressure is reached.		2	
Check the fuel pressure on the gauge.		3	
Release the pressure and connect to the fuel hose on the engine side as well.		2	
Switch the ignition on and off after the full pressure is reached.		2	
Check the fuel pressure on the gauge.		2	
Check the regulator vacuum hose for wetness.		2	
Check for leaking injectors.		4	

<b>Check the fuel delivery rate.</b>			
Release the fuel pressure from the fuel system.		2	
Disconnect the fuel hose.		1	
Insert the fuel hose into the measuring beaker.		1	
Switch the ignition on.		1	
Measure the fuel delivery volume after ONE minute.		2	
<b>TOTAL – Fuel system test – procedure</b>		<b>28</b>	

<b>TOTAL – Fuel system test – questions</b>	<b>Worksheet 7.1</b>	<b>22</b>	
<b>TOTAL – Fuel system test – procedure</b>	<b>Worksheet 7.2</b>	<b>28</b>	
<b>GRAND TOTAL</b>		<b>50</b>	

**TASK 8: MEASURING ENGINE COMPONENTS AND ENGINE CALCULATIONS – QUESTIONS**

**WORKSHEET 8.1**

**NAME:** \_\_\_\_\_

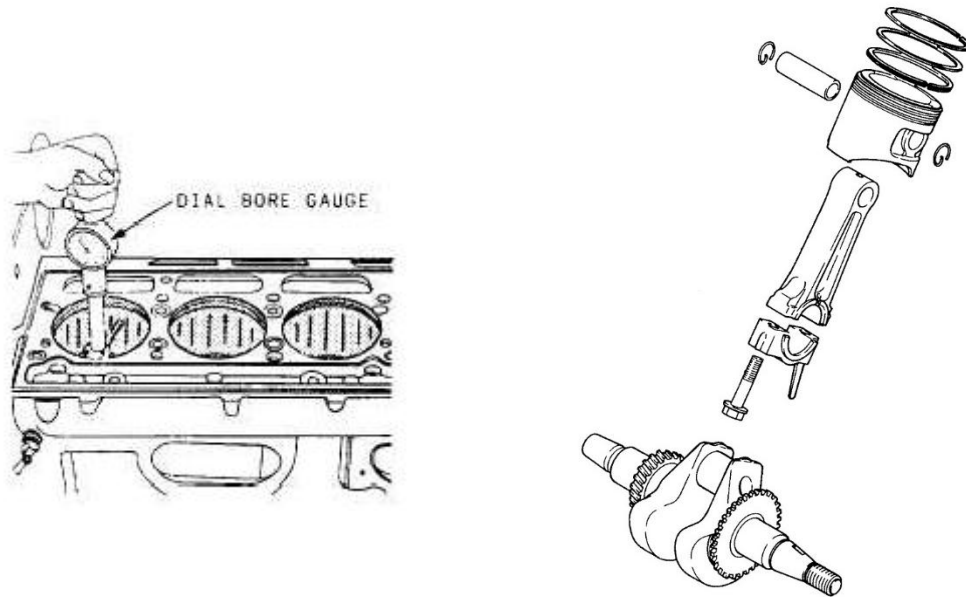
QUESTION	ANSWER	MARK	TOTAL
1. Explain what is meant by <i>swept volume</i> .		2	
2. Define <i>clearance volume</i> .		2	
3. What do you understand by the term <i>compression ratio</i> ?		2	
4. Describe THREE methods of <i>raising</i> the compression ratio in an engine.		3	
5. Describe THREE methods of <i>lowering</i> the compression ratio in an engine.		3	
<b>TOTAL – Measuring engine components – questions</b>		<b>12</b>	

**TASK 8: MEASURING ENGINE COMPONENTS AND ENGINE CALCULATIONS – PROCEDURE**

**WORKSHEET 8.2**

**NAME:** \_\_\_\_\_

Measure the cylinder bore and crankshaft journal of an internal combustion engine. Answer the questions that follow.

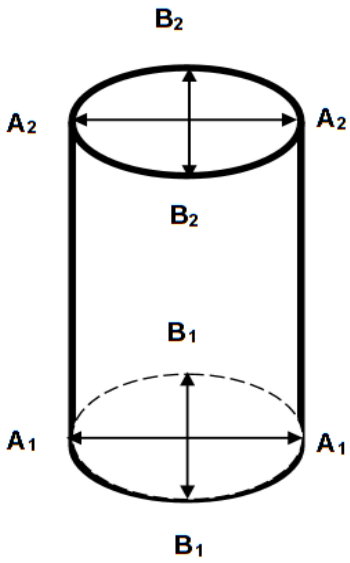


**FIGURE 8.2.1: ENGINE BLOCK, CRANKSHAFT AND CONROD ASSEMBLY**

1.	<b>Obtain specifications for the following:</b>			
	<b>COMPONENT</b>	<b>SPECIFICATION</b>	<b>MARK</b>	<b>TOTAL</b>
1.1	Big-end journal		1	
1.2	Main journal		1	
1.3	Cylinder bore diameter		1	
1.4	Strokes		1	
1.5	Bearing clearance		1	

2.	Measure main journal No. _____ Specification:
<b>FIGURE 8.2.2: MAIN JOURNAL</b>	

DIMENSION	MEASUREMENT	MARK	TOTAL
A <sub>1</sub>		2	
A <sub>2</sub>		2	
B <sub>1</sub>		2	
B <sub>2</sub>		2	
2.1	Ovality:		
	A <sub>1</sub> – B <sub>1</sub> =	1	
	A <sub>2</sub> – B <sub>2</sub> =	1	
2.2	Taper:		
	A <sub>1</sub> – A <sub>2</sub> =	1	
	B <sub>1</sub> – B <sub>2</sub> =	1	

3.	Measure cylinder bore No. _____ Specification:
	
<b>FIGURE 8.2.3: CYLINDER BORE</b>	

DIMENSION	MEASUREMENT	MARK	TOTAL
A <sub>1</sub>		2	
A <sub>2</sub>		2	
B <sub>1</sub>		2	
B <sub>2</sub>		2	
3.1	Ovality:		
	A <sub>1</sub> – B <sub>1</sub> =	1	
	A <sub>2</sub> – B <sub>2</sub> =	1	
3.2	Taper:		
	A <sub>1</sub> – A <sub>2</sub> =	1	
	B <sub>1</sub> – B <sub>2</sub> =	1	

4.	<b>Calculate the compression ratio.</b>		
4.1	Measure the following dimensions as listed below:		
	<b>DIMENSION</b>	<b>MEASUREMENT</b>	<b>MARK</b>
	Stroke length		2
	Bore diameter		2
4.2	Use the following data to calculate the compression ratio: Stroke length = 80 mm Bore diameter = 70 mm Clearance volume = 35 cm <sup>3</sup>		
			2
			3
	<b>TOTAL – Measuring engine components – procedure</b>		<b>38</b>
<b>TOTAL – Measuring engine components – procedure</b>			<b>12</b>
<b>TOTAL – Measuring engine components – questions</b>			<b>38</b>
<b>GRAND TOTAL</b>			<b>50</b>



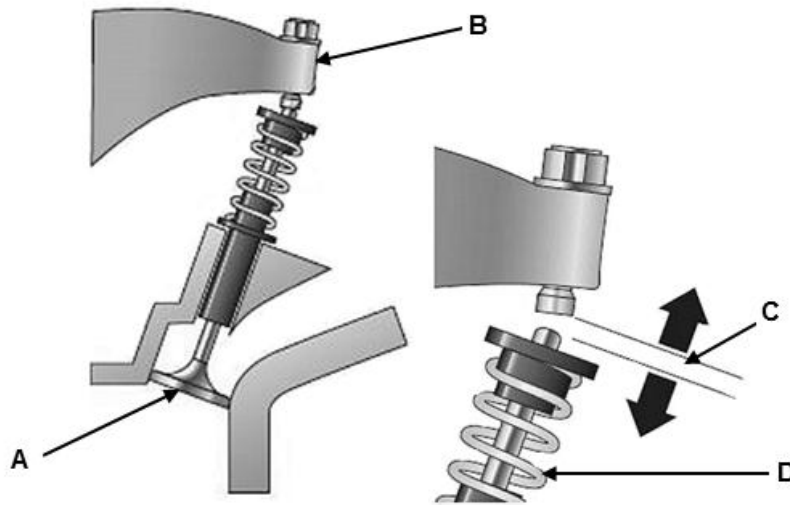
**THE FOLLOWING TASK IS COMPULSORY.**

**TASK 9: ENGINES – SETTING OF VALVES – QUESTIONS**  
**(Four-cylinder SI engine)**

**WORKSHEET 9.1**

**NAME:** \_\_\_\_\_

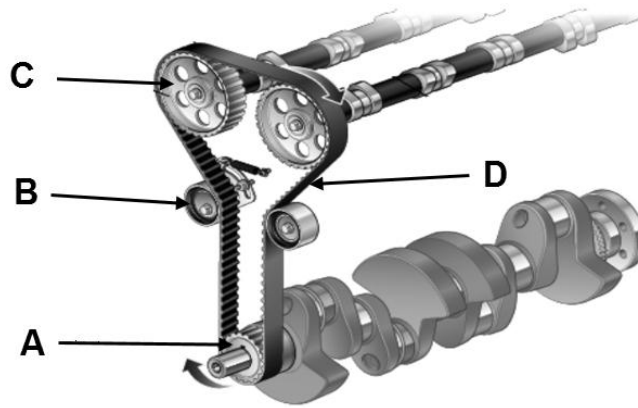
1. FIGURE 9.1 shows the valve assembly of an internal combustion engine. Answer the questions that follow.



**FIGURE 9.1: VALVE ASSEMBLY**

1.1	Label parts A–D indicated in FIGURE 9.1.		
	A –		
	B –		
	C –		
	D –		
		(4)	
1.2	Name TWO types of valves found inside the combustion chamber of an SI engine and state the function of EACH.		
		(4)	

2. FIGURE 9.1.2 indicates the cam/crankshaft layout of an internal combustion engine. Answer the questions that follow.



**FIGURE 9.1.2**

2.1 Identify the type of drive shown in FIGURE 9.1.2.

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	(2)	
--	-----	--

2.2 Label parts A–D indicated in FIGURE 9.1.2.

A –	
B –	
C –	
D –	

	(4)	
--	-----	--

2.3 State the function of part B in the system indicated in FIGURE 9.1.2.

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	(2)	
--	-----	--

2.4 State TWO advantages of the type of drive in FIGURE 9.1.2.

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	(2)	
--	-----	--

3.	Answer the following questions regarding the setting of the valve clearance.	
3.1	Give the reason for the engine being at normal operating temperature.	
		(2)
3.2	Give TWO reasons why the clearance for each type of valve differs.	
		(2)
3.3	Give TWO reasons why the surface area for each type of valve differs.	
		(2)
3.4	State TWO harmful effects of excessive valve clearance.	
		(2)

3.5	State TWO effects on the performance of an SI engine if the valve clearance is too small.		
	<b>(2)</b>		

**TASK 9: ENGINES – SETTING OF VALVES – PROCEDURE (COMPULSORY)****WORKSHEET 9.2**

NAME: \_\_\_\_\_

<b>SETTING VALVES</b>			
Set the valves clearances on an internal combustion engine while following the correct sequence of events.			
<b>PROCEDURE</b>	<b>RESULTS</b>	<b>MARK</b>	<b>TOTAL</b>
Obtain specifications of inlet valve clearance and exhaust valve clearance.		3	
The engine must be at normal operating temperature if at HOT setting.		1	
Choose the correct feeler gauge blades accordingly.		1	
Number 1 piston at TDC on the compression stroke.		2	
Set cylinder 1 valves.		2	
Number 3 piston at TDC on the compression stroke.		2	
Set cylinder 3 valves.		2	
Number 4 piston at TDC on the compression stroke.		2	
Set cylinder 4 valves.		2	
Number 2 piston at TDC on the compression stroke.		2	
Set cylinder 2 valves.		2	
Type of crank/cam drive		1	
<b>TOTAL – Engines – Valves – procedure</b>		<b>22</b>	

<b>TOTAL – Engines – Valves – questions</b>	<b>Worksheet 9.1</b>	<b>28</b>	
<b>TOTAL – Engines – Valves – procedure</b>	<b>Worksheet 9.2</b>	<b>22</b>	
<b>GRAND TOTAL</b>		<b>50</b>	

<b>MECHANICAL TECHNOLOGY</b>															
<b>AUTOMOTIVE</b>															
<b>MARK SHEET</b>															
<b>GRADE</b>		<b>12</b>			<b>DATE</b>										
		<b>LEARNERS</b>													
<b>TASKS</b>	<b>MARKS</b>														
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>
COMPRESSION TEST TASK 1	50														
CYLINDER LEAKAGE TEST TASK 2	50														
GAS ANALYSING TEST TASK 3	50														
WHEEL BALANCING TASK 4	50														
CHARGING SYSTEM TASK 5	50														
COOLING SYSTEM TEST TASK 6	50														
FUEL SYSTEM TEST TASK 7	50														
ENGINE MEASUREMENT TASK 8	50														
ENGINES – VALVES TASK 9	50														
<b>GRAND TOTAL</b>	<b>250</b>														
<b>FINAL PAT MARK</b>	<b>100</b>														
<b>SIGNATURE OF TEACHER</b>															
<b>SIGNATURE OF SUBJECT HEAD</b>															
<b>SIGNATURE OF MODERATOR</b>															

## 5. CONCLUSION

On completion of the practical assessment task learners 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 learners' life skills and provides opportunities for learners to engage in their own learning.