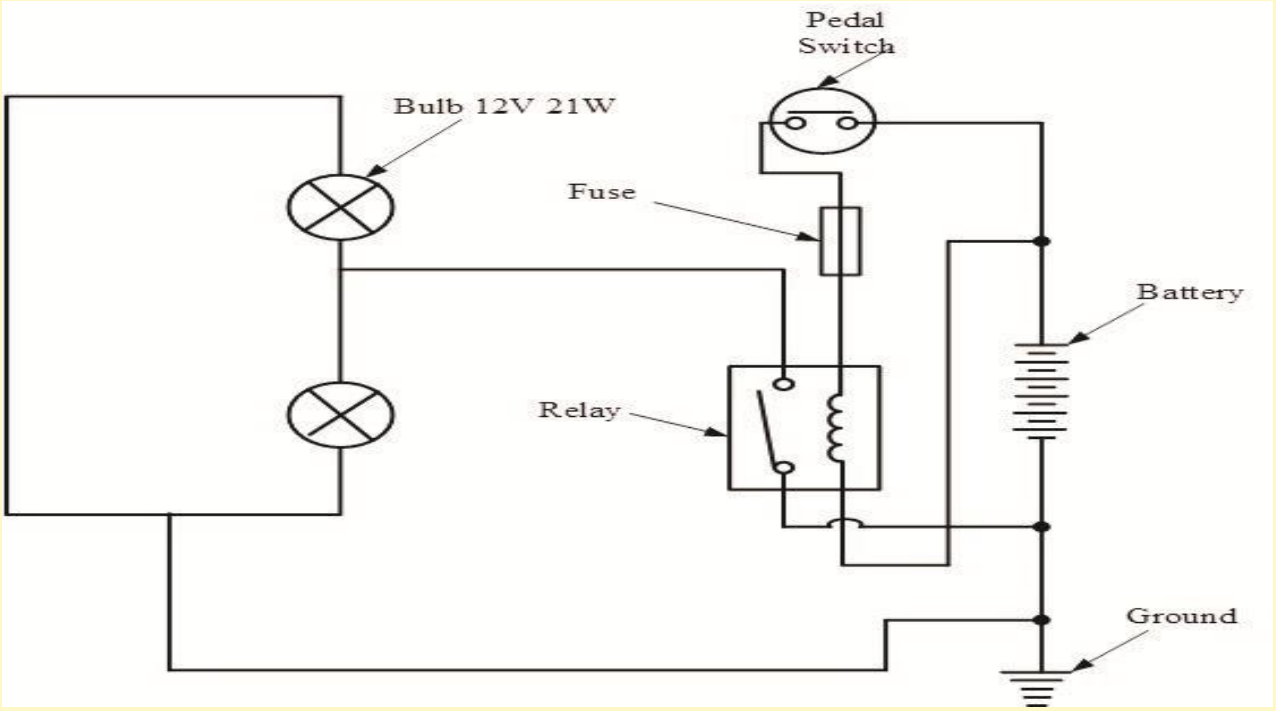
THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

STUDENTS' ITEM RESPONSE ANALYSIS REPORT ON THE FORM TWO NATIONAL ASSESSMENT (FTNA) 2025

MECHANICAL ENGINEERING SUBJECTS



THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

STUDENTS' ITEM RESPONSE ANALYSIS REPORT ON THE FORM TWO NATIONAL ASSESSMENT (FTNA) 2025

MECHANICAL ENGINEERING SUBJECTS (VOCATIONAL STREAM)

Published by:
The National Examinations Council of Tanzania,
P.O. Box 2624,
Dar es Salaam, Tanzania.

TABLE OF CONTENTS

FOREWORD

The National Examinations Council of Tanzania has prepared a general report analyzing students' responses in Mechanical Engineering subjects in the Form Two National Assessment (FTNA) 2025, Vocational Stream. This report shows the overall performance of students and performance in the competences assessed in Mechanical Engineering subjects which are Motor Vehicle Mechanics, Auto Electrics, Welding and Metal Fabrication and Refrigeration and Air Conditioning. It also identifies questions that were well and weakly answered in the assessment papers. In addition, the report explains the reasons why students were able or unable to answer some of the questions correctly. The report aims to provide feedback to education stakeholders and the general public on the factors that contributed to the students' performance in the Mechanical Engineering subjects.

This report shows that, the overall performance of the students was good, as a total of 308 (99.04%) students passed, while 3 (0.96%) students failed. This performance was attributed to several factors including adequate understanding of the students on the assessed competences and question requirements, appropriate use of language, presentation of relevant points and logical organisation of ideas. However, the analysis indicates that some students' scores were average due to averagely mastery of the assessed competences.

The National Examinations Council of Tanzania (NECTA) believes that, this report will enable education stakeholders to design effective teaching and learning strategies to ensure that every student acquires the intended knowledge and competencies at the Form Two level. The Council appreciates the efforts made by all who contributed to the preparation of this report.

Prof. Said Ally Mohamed
EXECUTIVE SECRETARY

1.0 INTRODUCTION

This report presents an analysis of students' performance in Mechanical Engineering subjects. The subjects are Motor Vehicle Mechanics, Auto Electrics, Welding and Metal Fabrication and Refrigeration and Air Conditioning. The assessment was administered in November 2025 and aimed at evaluating the competencies attained by Form Two students as prescribed in the Ordinary Secondary Education Syllabus issued in 2025.

Each of the Mechanical Engineering subjects had two assessment papers; Theory paper (Paper 1) and Actual Practical paper (Paper 2). The report provides details on the number of students and their attendance in the assessment. The report also shows the overall students' performance, performance by grades and performance in each subject assessed in 2025. In addition, the report presents an analysis of students' performance in competences and questions.

An analysis of students' performance by competencies was carried out in order to identify factors that contributed to observed performance in the respective subjects. The feedback from this analysis intends to assist stakeholders to have a clear understanding on areas in teaching and learning that require improvement, enhancement of instructional practices and eventually improvement of students' overall performance.

2.0 STUDENTS' REGISTRATION AND ATTENDANCE

2.1 Students' Registration

A total of 324 students were registered to sit for FTNA 2025 Vocational Stream in Mechanical Engineering subjects. Among them, 29 (8.95%) were female students while 295 (91.05%) were male. Among the 324 registered students, 158 were registered to sit for Motor Vehicle Mechanics, 65 for Auto Electrics, 84 for Welding and Metal Fabrication and 17 students registered for Refrigeration and Air Conditioning.

Table 1: Student Registration for FTNA Mechanical Engineering Subjects, 2025

S/N	Subject Name	Registered for Assessment		
		Males	**Females**	**Total**
1.	861 Motor Vehicle Mechanics	140	18	158
2.	862 Auto Electrics	65	0	65
3.	881 Welding and Metal fabrication	73	11	84
4.	882 Refrigeration and Air Conditioning	17	0	17
Total		**295**	**29**	**324**

2.2 Students' Attendance

The total number of students who sat for the assessment was 311, representing 95.99% of the registered students. Among them, 29 were female, accounting for 100% of the registered female students and 282 were male, representing 95.59% of the registered male students.

Table 2: Student Attendance for FTNA Mechanical Engineering Subjects, 2025

S/N	Subject Name	Registered for Assessment		
		Males	**Females**	**Total**
1.	861 Motor Vehicle Mechanics	138	18	156
2.	862 Auto Electrics	61	0	61
3.	881 Welding and Metal Fabrication	69	11	80
4.	882 Refrigeration and Air Conditioning	14	0	14
Total		**282**	**29**	**311**

3.0 THE ANALYSIS OF STUDENTS' PERFORMANCE IN THE ASSESSMENT

The analysis of the overall assessment results and subject-wise statistics was conducted to determine the level of students' performance.

3.1 The Overall Results

Performance statistics of the students who sat for the assessment indicates that, a total of 308 students (99.04%) passed the assessment. Among them, 29 were female students, representing 100% of all female students who sat for the assessment while 279 were male students, representing 98.94% of the male students who sat for the assessment. The pass mark for students in the FTNA 2025 assessment was 30 per cent.

3.2 Subject-wise Performance Analysis

The FTNA 2025 results show that, student performance was good in all analysed subjects. Every subject had a performance of over 95.00 per cent. The analysis is summarised in Table 3.

Table 3: Students' Performance in Mechanical Engineering Subjects in 2025

S/N	Subject	Number of Students		
		Sat	Passed	
			Number	Percentage
1	Motor Vehicle Mechanics	156	156	100
2	Auto Electrics	61	58	95.08
3	Welding and Metal Fabrication	80	80	100
4	Refrigeration and Air Conditioning	14	14	100

4.0 ANALYSIS OF STUDENTS' PERFORMANCE BY COMPETENCES AND QUESTIONS IN EACH SUBJECT

The analysis of assessment results and students' responses was conducted to determine the level of competence attained. The level of performance in each competence was determined based on the average percentage scores for questions derived from the respective competence. A summary of the performance of the assessed competences and the corresponding percentage levels of students' performance in each subject is presented in the Appendices.

The analysis also aimed at identifying challenges encountered by students when answering the questions and proposing possible solutions.

4.1 Analysis of Students' Performance based on Competences

The students in Mechanical Engineering were assessed in the following subjects, which are Motor Vehicle Mechanics, Welding and Metal Fabrication, Auto Electrics and Refrigeration and Air conditioning. The assessment of these subjects was done using two papers, namely the Theory assessment paper and Actual Practical assessment paper. Theory assessment (Paper 1) consisted of 10 questions while Actual practical (Paper 2) consisted of one question. Performance by competence was determined based on the percentage of students who scored 30 per cent or above of the marks allocated to a question drawn from the respective competence. The distribution of pass percentages was categorized into three groups: 65–100 (Good Performance), 30–64 (Average Performance) and 0–29 (Weak Performance). In addition, analysis was conducted by identifying questions that were well answered and those that were weakly answered.

Questions that were correctly and incorrectly answered were identified and the reasons for good and weak performance in those questions were explained. Furthermore, to clarify these reasons, samples of students' responses were presented. Recommendations to improve performance in the respective subjects were also provided. A summary of competence performance for each subject is presented in the Appendices of this report.

4.1.1 Analysis of Students' Performance in Auto Electrics

The FTNA Auto Electrics assessment consisted of two papers. Theory Paper (Paper 1) and Actual Practical Paper (Paper 2) which covered 10 competences. These competences are: *Performing Bench Works, Carrying out General Maintenance on Electrical and Electronic Systems, Building Simple Electronic Circuits, Repairing Hydraulic Brake System, Maintaining Wheels and Tyres, Maintaining the Lighting System, Maintaining Safety of the Workshop and Surroundings, Carrying out General Vehicle Services and Building Simple Electric Circuit.*

The analysis of students' performance indicates that, they performed well in most competences assessed in Auto Electrics 1. The best performance was observed in Question 5, which tested the competence of *Maintaining the Lighting System* (93.44%), where most students attained average to good scores. Question 1 also recorded high performance (91.80%) in the assessed competences, namely: *Performing Bench Work, Carrying out General Maintenance on Electrical and Electronic Systems and Building Simple Electric and Electronic Circuits*.

The other competences with good performance include *Building Simple Electric Circuits* (85.25%), *Maintaining Safety of the Workshop and Surroundings* (73.77%), *Carrying out General Maintenance on Electrical and Electronic Systems* (77.05%) and *Carrying out General Vehicle Services* (72.13%). The students who performed well had adequate knowledge and skills in the assessed competences. They were able to correctly interpret the questions, provide precise explanations and identify various auto electrical components and systems.

On the other hand, the analysis of Auto Electrics 2 (Actual Practical Paper) reveals that, the competence of *Maintaining Lighting Systems* had a good performance of 88.52 per cent. Students who attained high marks were able to correctly follow procedures and apply practical skills to achieve the desired outcomes.

Even though students generally performed well in most competences, the performance in the competence of *Repairing Hydraulic Brake Systems* was moderate, with an average performance of 44.26 per cent. This average

performance was primarily attributed to inappropriate explanations and insufficient knowledge and skills related to the specified question, particularly in identifying and explaining materials used in manufacturing brake pads.

On the other hand, the analysis of Auto Electrics 2 (Actual Practical Paper) reveals that, the competence of *Maintaining Lighting Systems* had a good performance of 88.52 per cent. Good performance implies that the students possessed adequate knowledge and skills in identifying components, diagnosing faults and observing safety procedures. This performance reflects sufficient practical sessions and proper use of relevant tools and equipment. However, 11.48 per cent of the students had average performance, indicating that they had inadequate hands on practice, limited understanding of system principles and insufficient adherence to safety practices. Overall, students performed better in the Auto Electrics 2 (Actual Practical paper) than in the paper 1(Theory paper).
A summary of the students' performance in each competence in Auto Electrics is presented in Appendix II.

To overcome average performance specifically in *Repairing Hydraulic Brake System competence*, it is recommended that:

(a) Increase practical sessions focused on hydraulic brake system repair to strengthen students' hands-on skills and application of theoretical concepts.
(b) Provide targeted exercises and guided practice on key areas such as brake fluid inspection, bleeding procedures, fault diagnosis and component replacement to address learning gaps.
(c) Integrate theory with practice by directly linking classroom concepts such as hydraulic principles, brake force transmission to real workshop tasks.
(d) Reinforce safety procedures consistently, particularly those related to handling brake fluids, using tools correctly and maintaining a safe working environment during brake system repair.
(e) Use interactive teaching methods and continuous assessment strategies such as live demonstrations, supervised repair tasks,

group problem solving activities and practical projects to enhance understanding and monitor students' progress effectively.

4.1.2 Students' Performance in Refrigeration and Air Conditioning

The FTNA in Refrigeration and Air Conditioning subject comprised two assessment papers: Theory (Paper 1) and Actual Practical (Paper 2). The assessment covered the following competences: *Maintaining Workshop Tools, Equipment and Safety; Performing Preventive Maintenance of Tools, Equipment and Machines; Performing Bench Work; Building Simple Electric Circuits; Building Simple Electronic Circuits;* and *Maintaining Domestic Refrigeration Systems*.

The analysis of students' performance indicates that they performed well in most competences assessed in Refrigeration and Air Conditioning 1 (Theory Paper). The highest performance (92.86%) was recorded in Question 1 multiple choice question, which assessed competences in *Building Simple Electric Circuits, Maintaining Domestic Refrigeration Systems and Building Simple Electronic Circuits*.

The other competences with good performance were as follows; *Building Simple Electric Circuits* (71.43%), *Maintaining Domestic Refrigeration Systems* (69.05%) and *Performing Bench Work* (67.86%). The students who performed well had adequate knowledge and skills in the assessed competences. They were able to correctly interpret the questions, provide accurate explanations and apply practical knowledge, including producing relevant drawings where required.

On the other hand, the analysis reveals that the competence of *Building Simple Electronic Circuits* had a moderate average performance of 35.71 per cent. This average performance was primarily attributed to limited knowledge and partial competence in applying the required concepts and skills. Students' responses reflected gaps in understanding key aspects such as electrical calculations (e.g., resistance and voltage) and the application of concepts related to refrigeration system electrical components. Some students also did not fully interpret the requirements of the question.

A summary of students' performance in each competence for Refrigeration and Air Conditioning 1 is presented in Appendix I.

On the other hand, the analysis of Refrigeration and Air Conditioning 2 (Actual Practical Paper) reveals that the competence of *Maintaining Domestic Refrigeration Systems* had a good performance of 100 per cent. Students who attained high marks were able to correctly follow procedures, apply practical skills effectively and demonstrate understanding of system operations. This performance reflects sufficient practical sessions and proper use of relevant tools and equipment.

The following measures are recommended to improve the average performance:

(a) Strengthen the integration of theory and practice by directly linking theoretical concepts in refrigeration and electrical calculations with practical demonstrations and hands-on activities.
(b) Employ participatory teaching methods such as group discussions, demonstrations and collaborative learning to enhance student engagement and understanding.
(c) Provide targeted support for weak competences, particularly Building Simple Electronic Circuits, with emphasis on electrical calculations such as resistance and voltage.
(d) Increase guided problem-solving exercises to help students better interpret question requirements and accurately apply their knowledge in theory assessments.
(e) Maintain and further expand practical training sessions, as the good performance observed in the actual practical paper demonstrates their effectiveness in enhancing students' skills and understanding.
(f) Implement continuous formative assessment and timely feedback to identify learning gaps early and reinforce understanding before final assessments.

4.1.3 Students' Performance in Motor Vehicle Mechanics

The Motor Vehicle Mechanics subject had two assessment papers namely Theory paper (Paper 1) and Actual Practical paper (Paper 2). The Theory paper had nine assessed competences. These competences are *Maintaining Safety of Workshop and Surroundings, Performing Bench Works, Performing Welding and Fabrication, Repairing Wheels and Tires, Carrying out General Vehicle Service, Carrying out General Maintenance*

on Electrical and Electronic System, Maintaining Suspension System, Maintaining Brake System and Maintaining Steering System.

The analysis of students' performance in Motor Vehicle Mechanics Theory Paper 1 shows that, they performed well in most competences. The highest performance was observed in the competence of *Maintaining Suspension System* (83.97%), assessed in Question 10. Similarly, Question 1, a multiple choice item, recorded strong performance (83.97%). The competences assessed in this question included *Repairing Wheels and Tires, Maintaining Health and Safety of Workshop and Surroundings, Performing Bench Work, Carrying out General Vehicle Service, Carrying out General Maintenance on Electrical and Electronic Systems, Maintaining Brake System, Performing Welding and Fabrication and Maintaining Suspension System*.

Good performance was also observed in the following competences; *Maintaining Brake System* (79.49%), *Performing Welding and Fabrication* (73.72*%), Carrying out General Vehicle Service* (70.52%), *Maintaining Steering System* (69.24%) and *Carrying out General Maintenance on Electrical and Electronic Systems* (69.23%). Students who performed well demonstrated a clear understanding of the assessment requirements and applied their knowledge and skills effectively to the competences tested.

In contrast, the competence of *Performing Bench Work* recorded an average performance of 55.77 per cent. Most students demonstrated only a partial understanding and limited skills in this area.

A summary of students' performance in each competence for Motor Vehicle Mechanics 1 and 2 is presented in Appendix III.

The following strategies are recommended to increase performance:

(a) Provide students with more hands on practice in the workshop so they can develop understanding through practical experience.
(b) Use student centered teaching methods such as group work, problem solving activities and demonstrations to encourage active participation in the learning process.

(c) Relate theoretical concepts to real life practice in motor vehicle mechanics to enhance students' understanding and sustain their interest.

4.1.4 Students' Performance in Welding and Metal Fabrication

In the Welding and Metal Fabrication subject, six competences were assessed. These competences are *Maintaining Safety of Workshop and Surroundings, Performing Bench Works, Performing Sheet Metal Work, Performing Shielded Metal Arc Welding and Arc Cutting, Performing Gas Welding and Brazing on Ferrous and Non-ferrous Metals and Performing Arc Welding of Alloy Steels and Ferrous Metals*.

The analysis of students' performance in Welding and Metal Fabrication 1 (Theory Paper) shows that students performed well in several competences. The best performance (93.75%) was observed in competences assessed through a multiple-choice question comprising ten items from various competences, including *Performing Bench Work, Performing Gas Welding and Brazing on Ferrous and Non-ferrous Metals, Maintaining Safety of Workshop and Surroundings, Performing Sheet Metal Work, Performing Shielded Metal Arc Welding and Arc Cutting* and *Performing Arc Welding of Alloy Steels and Ferrous Metals*. Students who performed well demonstrated a thorough understanding of the assessment requirements and effectively applied both their theoretical knowledge and practical skills to the competences tested.

The other competences with good performance were *Performing Gas Welding and Brazing on Ferrous and Non-ferrous Metals* (75.00%) and Maintaining Safety of Workshop and Surroundings (72.50%).

In contrast, some competences observed average performance. These include *Performing Shielded Metal Arc Welding and Arc Cutting* (63.75%), *Performing Gas Welding and Brazing on Ferrous and Non-ferrous Metals* (47.50%) and *Performing Arc Welding of Alloy Steels and Ferrous Metals* (38.75%). The analysis indicates that students demonstrated partial theoretical knowledge and limited ability to apply the required practical skills in these areas, highlighting the need for further targeted practice and

support.

Conversely, the analysis of Welding and Metal Fabrication 2 (Actual Practical Paper) observed a good performance of 100 per cent in the competence of *Performing Shielded Metal Arc Welding and Arc Cutting*. Students who performed well demonstrated a clear understanding of the task requirements and effectively applied both their knowledge and practical skills to achieve the expected outcomes.

A summary of students' performance in each competence for Welding and Metal Fabrication 1 and 2 is presented in Appendix IV.

To address weak performance, it is recommended to implement the following strategies to improve performance:

(a) Provide remedial support to slow learners to enhance their skills and build confidence;
(b) Conduct regular continuous assessments to monitor and evaluate students' progress and improvement; and
(c) Encourage teachers to adopt participatory teaching methods that stimulate students' interest in learning and build competence. These methods include demonstrations, group discussions and presentations, as well as question and answer sessions, which promote knowledge acquisition through idea sharing.

4.2 Analysis of Students' Responses by Question

The analysis of students' responses in the FTNA 2025 in the Mechanical Engineering subjects was undertaken to determine the factors contributing to variations in students' performance particularly, at both good and weak performance. The primary objective of this analysis was to identify strengths and weakness in students' responses so as to improve teaching and learning practices.

The analysis focused on the key factors that influenced students' responses which make them to attain high or low marks in the assessment of Mechanical Engineering subjects. Emphasis was placed on evaluating the extent to which students indicated understanding of the required

competencies, as well as identifying areas of weak performance that require specific instructional interventions.

Therefore, this section presents an analysis of students' performance based on the scores obtained in individual questions. It provides details on the type and nature of the questions, the competences from which they were derived, the competences assessed and the specific requirements of each question.

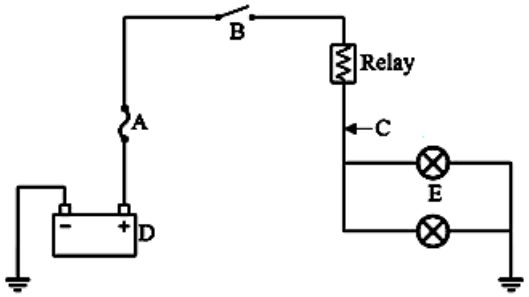
4.2.1 Analysis of Students' Responses in Auto Electrics

A total of 10 questions were assessed in Auto Electrics 1 (Theory paper) and one question was assessed in Auto Electrics 2 (Actual Practical paper). The students had good performance in nine questions of paper 1 and one question of paper 2. However, one question in the Theory paper had average performance.

4.2.1.1 Auto Electrics 1

The Auto Electrics 1 assessment consisted of 10 questions. Students performed well in nine questions; however, one question showed average performance. Question 5 recorded the best performance, whereby 49 (93.44%) students attained higher scores compared to all other questions. The question was drawn from competence of *Maintaining the lighting system.* The question was:

Study the schematic diagram in Figure below and answer the questions that follow:



(a) Identify the components A, B, C, D and E.

(b) Distinguish the following components based on their functions:

(i) Component D and E

(ii) Component A and B

(c) Parallel connection of component E is preferred compared to series connection in the headlight circuit. Justify the statement by providing three reasons.

The question aimed to assess students' understanding on electrical circuit diagrams, component identification and knowledge of electrical connection principles in automotive lighting systems.

Generally, the students' performance in this question was good, as most students scored high marks. In part (a), the majority correctly identified the components as follows: battery (D), switch (A), fuse or circuit breaker (B), relay (C) and headlights (E). Their responses showed good knowledge on automotive electrical symbols and components.

In part (b), the students clearly distinguished the functions of the components. They correctly explained that component D supplies electrical power while component E acts as a load (headlights). Similarly, they described component A as a switch used to control current flow and component B as a protective device, such as a fuse or circuit breaker.

In part (c), the students provided logical reasons for the preference of parallel connection of component E. These reasons included ensuring that each headlight receives the full voltage, maintaining brightness consistency and preventing total circuit failure if one headlight stops working. The responses reflected sound understanding of series and parallel circuit advantages.

Good performance in this question was attributed to students sufficient practical exposure on electrical systems, understanding the requirements of the questions and theoretical knowledge of electrical circuits. Extract 1.1 is a sample of responses from the script of a student who had good performance.

Study schematic diagram in Figure 2 and answer the questions that follow:

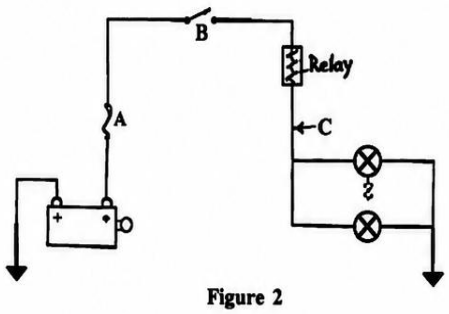


Figure 2

(a) Identify the components A, B, C, D and E.

A is the fuse.
B is the switch.
C is the wire or cenductor.
D is the Battery.
E is the bulb

(b) Distinguish the following components based on their functions.

(i) Component D and E

(D) Battery is a component that is used to store charge in form of dc voltage or it is the power soure. But
(E) Bulb is a compenent that producas light energy when the switch is activated

(ii) Component A and B

(A) Fuse is a component that controls the amount of current or used to resist the flow of current in a circuit.
But
(B) Switch is a component that open and closes the circuit & in order to allow and disallow the current flow.

(c) Parallel connection of component E is preferred compared to series connection in the headlight circuit. Justify the statement by providing three reasons.

(i) In the parallel circuit there are multiple pathways of current compared to series connection which has got one path.

(ii) In the parallel connection when one bulb fails the other ones continues to light because of multiple pathways but in series when one bulb fails also the other one fails.

(iii) In parallel connection the voltage across each bulb is the same as the total voltage compared to the series connection where as the voltage is different in each bulb.

Extract 1.1: A sample of correct response to Question 5 of Auto Electrics 1.

Extract 1.1 shows that, a student identified the components A, B, C, D and E in part (a), distinguished the functions of components D and E as well as A and B in part (b) and provided three valid reasons for preferring a parallel connection of component E over a series connection in the headlight circuit in part (c).

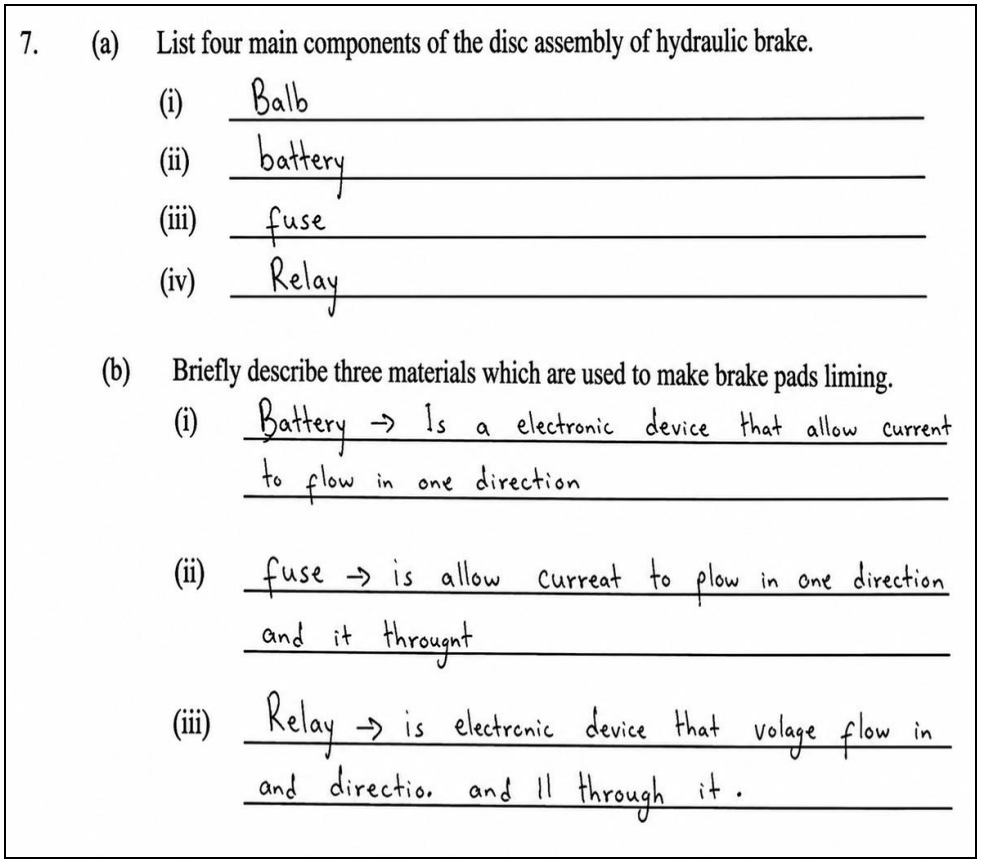
On the other hand, analysis of the students' performance shows that Question 7 drawn from the competence *Repairing Hydraulic Brake System*, had average performance of 44.26%. The question was:

(a) *List four main components of the disc assembly of hydraulic brake.*
(b) *Briefly describe three materials which are used to make brake pads lining.*

The question aimed to assess students' knowledge of automotive braking systems, understanding of hydraulic disc components and familiarity with the materials used in brake pads.

Generally, students' performance in this question was weak, with a large number of students scoring 0 to 2 marks. In part (a), only a few students were able to correctly identify key components of the hydraulic disc brake assembly, such as the brake disc, brake caliper, brake pads and caliper bracket. However, most students listed incorrect, incomplete, or unrelated components and many confused the disc brake assembly with other braking system parts. This shows limited understanding of hydraulic brake systems and limited practical exposure to automotive braking components.

In part (b), majority of students were unable to correctly describe three appropriate materials used in brake pad linings. Many provided only one material, gave vague descriptions, or mentioned incorrect materials altogether. Very few students illustrated awareness of commonly used friction materials such as asbestos, semi-metallic, or ceramic compounds and their properties. The weak performance is attributed to limited understanding of friction materials, insufficient exposure to real automotive components and inadequate practice in providing clear and accurate technical explanations. Extract 1.2 is a sample of responses from the script of a student who had weak performance.



Extract 1.2: A sample of incorrect responses to Question 7 of Auto Electrics 1.

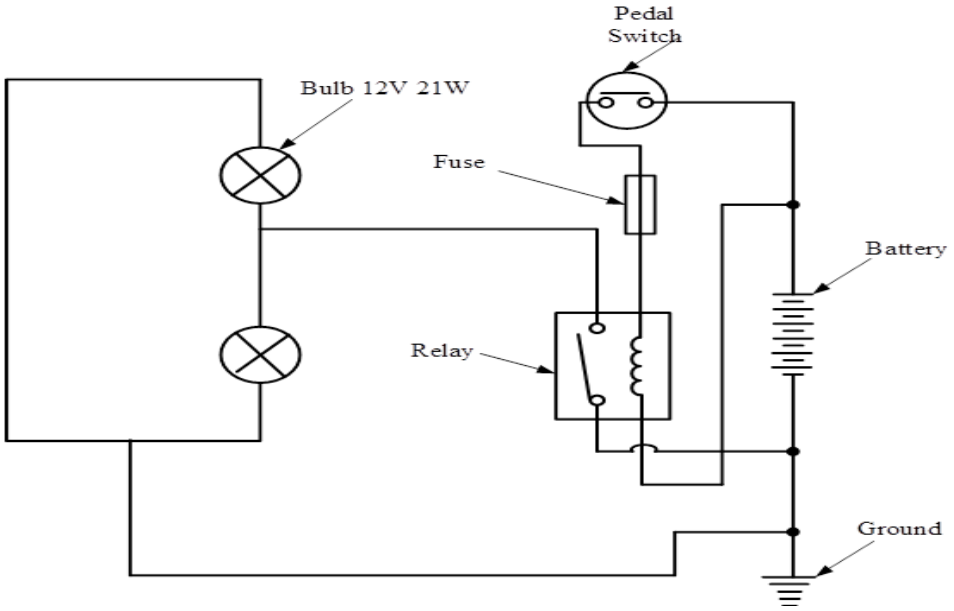
Extract 2 is a sample of a response where the student listed incorrect disc assembly components and described fewer than three brake pad lining materials, illustrating common errors observed among the students.

4.2.1.2 Auto Electrics 2

The Auto Electrics practical assessment consisted of a single question. The assessment comprised three stages: the preparation stage, which carried 10 marks; the direct assessment stage, which carried 50 marks and the product performance stage, which carried 40 marks, making a total of 100 marks. The overall results show that 88.52 per cent of students performed well, while the remaining 11.48 per cent achieved an average performance. The

question was drawn from competence of *Maintaining the lighting system.* The question was:

A customer brought a car to a school workshop for the purpose of servicing brake light circuit as shown in diagram. Study the brake light circuit carefully and do the tasks that follow:



(a) *List three tools and equipment and five materials which you will use when constructing the given circuit and installing the bulbs.*

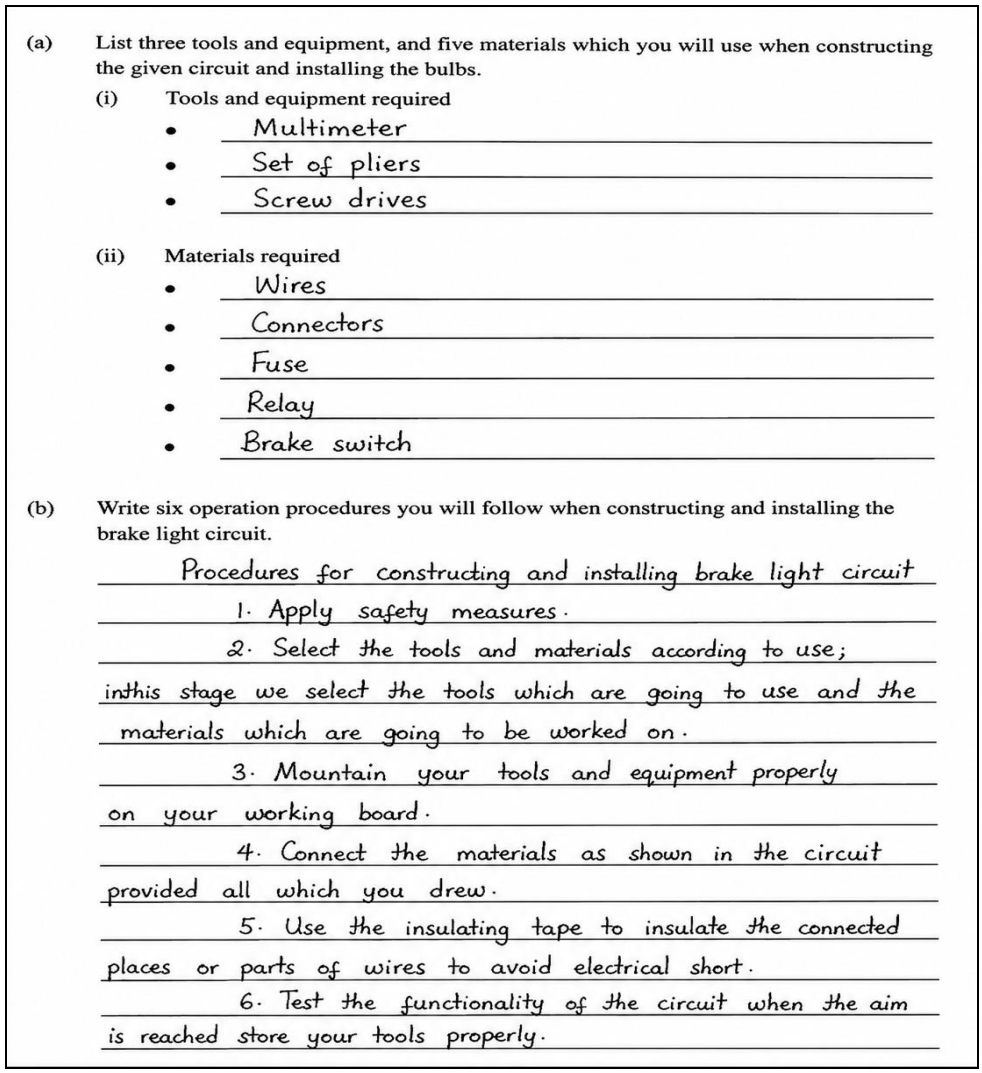
(b) *Write six operation procedures you will follow when constructing and installing the brake light circuit.*

(c) *Construct the circuit in Figure 1 with a four pins relay on the training board.*

(d) *Test the functionality of the circuits.*

The question required students to construct the circuit on the training board and test its functionality. The analysis shows that, the majority of students successfully constructed the circuit and the functionality of the circuits was satisfactory. These students illustrated a good understanding of the circuit of brake system, which can be attributed to their consistent practice during lessons, proper guidance from their instructors and familiarity with the training board and relevant tools.

In preparation stage, students were required to list three tools and equipment and five materials which are used when constructing the given circuit and installing the bulbs. The students were able to list and mention materials which they used to construct the circuit. This demonstrated the student's adequate knowledge of materials used in construct the circuit for brake system. Extract 2.1 is a sample of script from student who correct answered a question.



(a) List three tools and equipment, and five materials which you will use when constructing the given circuit and installing the bulbs.

(i) Tools and equipment required

- Multimeter
- Set of pliers
- Screw drives

(ii) Materials required

- Wires
- Connectors
- Fuse
- Relay
- Brake switch

(b) Write six operation procedures you will follow when constructing and installing the brake light circuit.

Procedures for constructing and installing brake light circuit

1. Apply safety measures.

2. Select the tools and materials according to use; inthis stage we select the tools which are going to use and the materials which are going to be worked on.

3. Mountain your tools and equipment properly on your working board.

4. Connect the materials as shown in the circuit provided all which you drew.

5. Use the insulating tape to insulate the connected places or parts of wires to avoid electrical short.

6. Test the functionality of the circuit when the aim is reached store your tools properly.

Extract 2.1: A sample of student's correct responses to Question 1 of Auto Electrics 2.

Extract 2.1 shows that the student managed to give the correct type of tools and materials required for the task and gave correctly procedures for constructing brake light circuit.

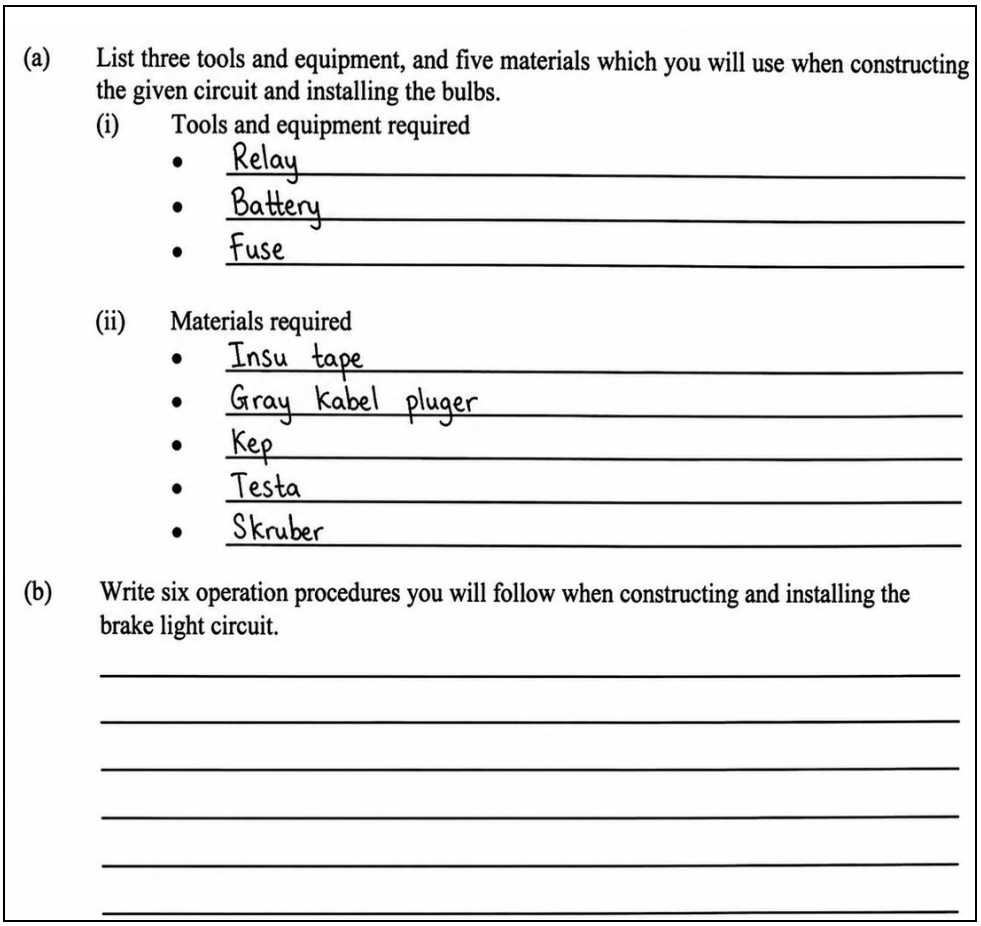
In the direct assessment stage, students were required to demonstrate how to execute the task. This include observing safety rules and precautions, planning and laying out the circuit, constructing and connecting the circuit correctly, managing their time efficiently, organising their work effectively and maintaining cleanliness. Most students showed a good understanding of the demands of the question, followed a logical sequence of steps, ensuring the circuit was constructed systematically, displayed attention to detail in component placement and connections, reducing errors, illustrated problem solving skills by identifying and correcting minor mistakes during the construction process and worked independently and responsibly, showing discipline and focus throughout the task.

Furthermore, in the product assessment stage, students were required to present a final product that demonstrate neatness of the work, proper and secure connection of components and full circuit functionality. Most students illustrated a good understanding of the demands of the task as they produced a well-organized and neatly assembled circuit on the training board, by ensuring all components were correctly connected and firmly fixed, with no loose or incorrect connections, successfully achieved full functionality of the circuit that confirming correct construction.

On the other hand, 12 (11.48%) students had an average performance. These students showed a partial understanding of the demand of the question and inadequate knowledge and skills in the execution of the practical task. Although they generally understood the task requirements, they displayed limited knowledge of electrical components and materials used in the lighting system. Most were able to correctly identify only a few components and describe their functions partially, while others omitted key components required for the circuit.

In the preparation stage, students were able to list some of the tools and materials used in constructing the circuit; however, the responses lacked

completeness and clarity. This illustrates a basic understanding of the tools and equipment and a partial understanding of the materials required for constructing the brake system circuit. Extract 2.2 is a sample of responses from the script of a student who had weak performance.



(a) List three tools and equipment, and five materials which you will use when constructing the given circuit and installing the bulbs.

(i) Tools and equipment required

- Relay
- Battery
- Fuse

(ii) Materials required

- Insu tape
- Gray kabel pluger
- Kep
- Testa
- Skruber

(b) Write six operation procedures you will follow when constructing and installing the brake light circuit.

Extract 2.2: A sample of student's incorrect response in practical question in Auto Electrics 2.

In Extract 2.2, the student provided incorrect responses to all parts of the question showing that he/she had insufficient knowledge of brake light system. For example, in part (a) the students wrote materials instead of tools for constructing brake light circuit.

Moreover, in the direct assessment stage the students who performed weakly did not understand the task requirements. Safety procedures were followed inconsistently and the planning and layout of the circuit lacked orderliness and precision. The construction process was often disorganised, with frequent errors in connections and component placement. The students relied on repeated guidance to identify and correct mistakes, time management and workspace organisation were generally weak, affecting the overall quality of task execution.

Additionally, during the product assessment stage, many final products lacked uniform quality, with some components being insecurely attached or incorrectly positioned, thereby affecting both neatness and functionality. Several components were loosely connected or improperly installed, and the overall layout of the products was untidy. Most products met only the minimum acceptable standards, indicating an average or below-average understanding of the task requirements.

4.2.2 Analysis of Students' Responses in Refrigeration and Air Conditioning

A total of 10 questions were assessed in 882/1 Refrigeration and Air Conditioning 1 (Theory paper) and one (1) question was in Refrigeration and Air Conditioning 2 (Actual Practical paper). The students had good performance in nine questions of the Theory paper and in the question of the Actual Practical paper. However, one question in the Theory paper had average performance.

4.2.2.1 Refrigeration and Air Conditioning 1 (Theory Paper)

Analysis of students' responses in the 882/1 Refrigeration and Air Conditioning 1 reveals that out of 10 assessed questions, Question 1 had the best performance of 92.86 per cent. This question was drawn from competences of Simple Electric Circuits, Maintaining Domestic Refrigeration Systems and Building Simple Electronic Circuits. The question asked.

For each of the items (i) – (x), choose the correct answer from the given alternatives and write its letter in the box provided.

(i) Which components provide an electric circuit when connected together?

A Power source, conduit and diode

B Power source, conductor and load

C Power source, rectifiers and diode

D Power source, conductor and rectifies

(ii) What is the function of an evaporator in the refrigeration system?

A To add heat to the space or product being cooled.

B To add humidity to the space being refrigerated.

C To condense super-heated refrigerant vapor to a liquid.

D To absorb heat from the space being refrigerated.

(iii) Suppose you have noticed that a refrigerator is not cooling and you suspect the thermostat is faulty, which tool is most appropriate to test the functionality of the thermostat?

A Thermometer B Multimeter C Test lamp D Ohmeter

(iv) A refrigerator is running continuously, but the interior remains warm. What could be the cause?

A Shorted thermostat B Shorted capacitor

C Loose fan blade D Clogged capillary tube

(v) Which ones are the main components of a domestic refrigeration system?

A Compressor, condenser, evaporator and expansion valve

B Thermostat, expansion valve, timer and dual compressor

C Overload, timer, expansion valve and twin evaporator

D Time, expansion valve, evaporator and condenser

(vi) During testing, it was observed that the input to the control board reads 230 V and the output to the compressor shows 0 V. What does this suggest?

A The compressor motor is shorted

B The control board is malfunctioning

C The thermostat is drawing excessive current

D The fuse in the plug is oversized

(vii) What is the main function of a parallel groove clamp joint in auto wiring?

A To join two conductors using twisting and taping
B To solder wires and apply insulation cover
C To connect two conductors without cutting them
D To hold wire ends inside a plastic housing

(viii) For smooth refrigeration, heat must be exchanged from one medium to another. Which components perform this tasks?

A Evaporator and condenser
B Condenser and expansion valve
C Compressor and condenser
D Evaporator and compressor

(ix) The expansion device is very important component in refrigeration system. What is its main function?

A It controls the operation of the compressor
B It controls the sub cooling refrigerant
C It stores refrigerant for future use
D It controls refrigerant flow into the evaporator

(x) Suppose you were assigned to design an electric circuit of a refrigeration system, which component should be incorporated to provide the initial flow of current to start the compressor motor?

A Thermostat B Overload C Capacitor D Timer

Students who performed well demonstrated a good understanding of fundamental electrical and refrigeration principles. In item (i), they correctly identified that a complete electric circuit is formed by a power source, conductor and load, showing clear understanding of basic circuit requirements. In item (ii), they accurately understood that the main function of the evaporator is to absorb heat from the space being refrigerated, reflecting good knowledge of the refrigeration cycle.

In item (iii), the students correctly selected the multimeter as the most appropriate tool for testing the functionality of a faulty thermostat, demonstrating practical awareness of diagnostic tools. In item (iv), they showed understanding of refrigeration faults by identifying a clogged

capillary tube as a possible cause of a refrigerator running continuously without cooling.

Furthermore, in item (v), the students correctly identified the compressor, condenser, evaporator and expansion valve as the main components of a domestic refrigeration system. In item (vi), they demonstrated troubleshooting skills by correctly concluding that a malfunctioning control board was responsible when input voltage was present but no output voltage reached the compressor.

The students also performed well in auto-electrical wiring concepts. In item (vii), they correctly stated that the function of a parallel groove clamp joint is to connect two conductors without cutting them. In item (viii), they accurately identified the evaporator and condenser as the components responsible for heat exchange during refrigeration.

In item (ix), the students correctly understood that the expansion device controls the flow of refrigerant into the evaporator, indicating an understanding of system regulation. Finally, they correctly selected the capacitor as the component required to provide the initial current necessary to start the compressor motor in item (x).

Overall, the high performance in this question shows that the students possessed adequate theoretical knowledge and practical understanding of electrical circuits and domestic refrigeration systems and were able to apply this knowledge accurately in assessment. The students demonstrated a good understanding of basic electric circuits, refrigeration system components and fault diagnosis. They correctly applied theoretical knowledge to practical situations, accurately identifying system functions, components and appropriate testing tools. The high performance shows effective teaching and adequate exposure to practical and theoretical aspects of refrigeration and air conditioning systems

Moreover, analysis on the students' performance statistics shows that Question 10 which tested the competence of *Building Simple Electronic Circuits***,** had an average performance of 35.71 per cent and was the lowest performed question in the assessment. The question asked:

(a) *A refrigerator electrical system has two resistors of fan and bulb connected in parallel. The fan resistor should not exceed 25 Ω for the electrical circuit of refrigerator to function properly. If the total resistance of fan and bulb is 10 Ω and the bulb resistance is 15 Ω, will this circuit function properly? Justify your answer.*

(b) If both resistors in (a) are connected in series and current across resistors is 2A, calculate total resistance and voltage across each resistor.

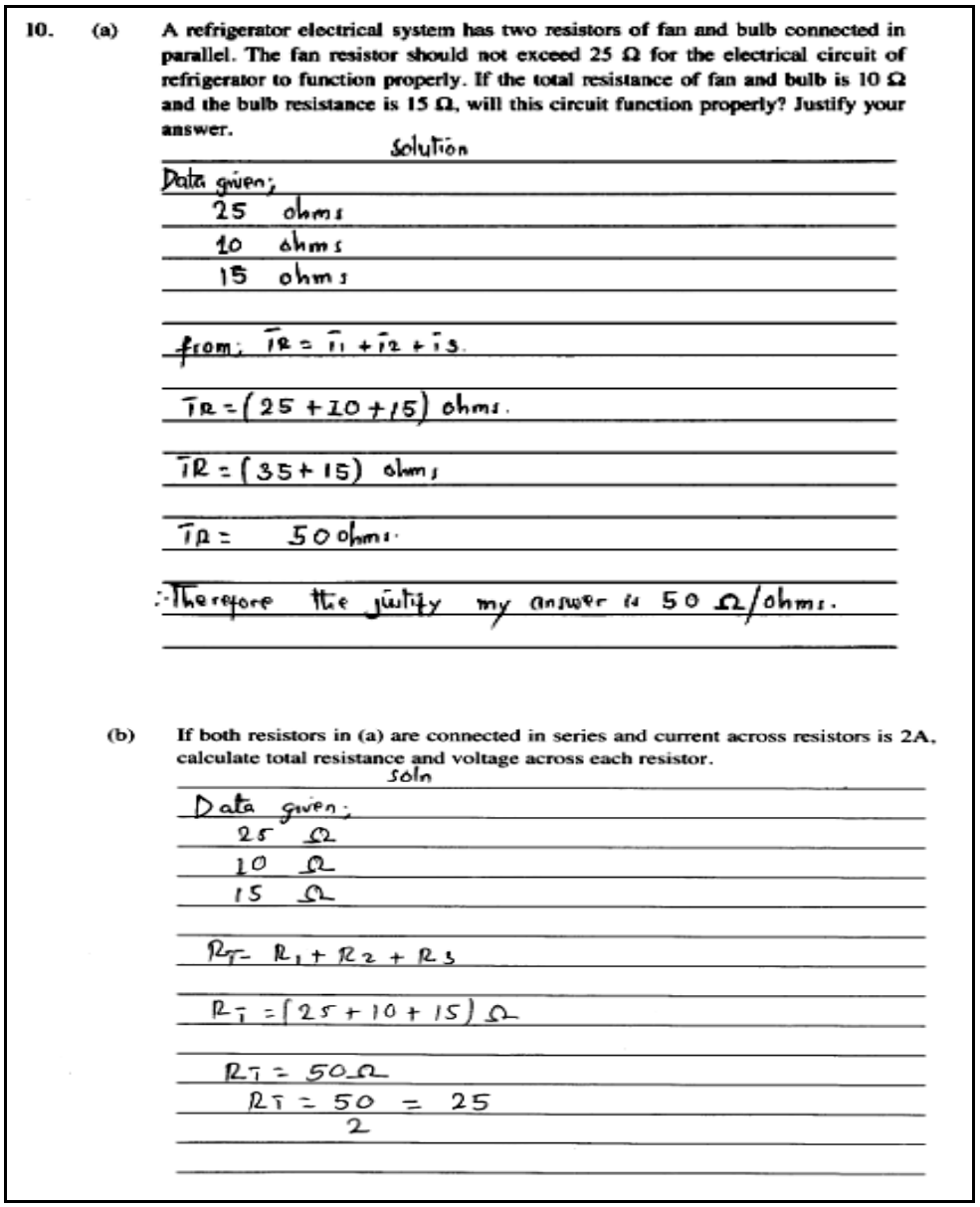
The question tested students' understanding of series and parallel resistor circuits, application of Ohm's law and ability to perform basic electrical calculations in a practical context.

Performance in this question was generally average. In part (a), only a few students correctly applied the formula for equivalent resistance in a parallel circuit to determine the fan resistance and assess whether the circuit would function properly. Most students failed to calculate the fan resistance correctly, used inappropriate formula or provided answers without proper justification. This reflects an inadequate grasp of parallel circuit principles and inadequate analytical skills.

In part (b), the majority of students were unable to correctly calculate the total resistance of the series circuit or determine the voltage across each resistor using Ohm's law. Common errors included incorrect addition of resistances, misuse of the current value, confusion between voltage and resistance and incorrect formula substitution.

The weak performance in this question was attributed to lack of conceptual understanding of basic electrical concepts, inadequate practice in numerical problem solving and limited exposure to practical applications of series and parallel circuits. In addition, shallow understanding of Ohm's law and its practical use, difficulty in interpreting given electrical data and confusion among electrical quantities such as voltage, current and resistance. There were also inadequate skills in formula manipulation, limited step-by-step problem-solving approaches and insufficient practical-based instruction involving simple circuit construction and measurement. Extract 2.3 shows a

sample of response of a student who failed to comply with the demands of a question.



10. (a) **A refrigerator electrical system has two resistors of fan and bulb connected in parallel. The fan resistor should not exceed 25 Ω for the electrical circuit of refrigerator to function properly. If the total resistance of fan and bulb is 10 Ω and the bulb resistance is 15 Ω, will this circuit function properly? Justify your answer.**

Solution

Data given;
25 ohms
10 ohms
15 ohms

from; $\bar{I}R = \bar{i}_1 + \bar{i}_2 + \bar{i}_3$.

$\bar{I}R = (25 + 10 + 15)$ ohms.

$\bar{I}R = (35 + 15)$ ohms

$\bar{I}R = 50$ ohms.

∴Therefore the justify my answer is 50 Ω/ohms.

(b) **If both resistors in (a) are connected in series and current across resistors is 2A, calculate total resistance and voltage across each resistor.**

Soln

Data given;
25 Ω
10 Ω
15 Ω

$R_T = R_1 + R_2 + R_3$

$R_T = (25 + 10 + 15)\ \Omega$

$R_T = 50\ \Omega$

$R_T = \frac{50}{2} = 25$

Extract 2.3: A sample of student's incorrect response in question 10.

In Extract 2.3, the student failed to apply series and parallel circuit principles correctly. In part (a), the fan and bulb parallel circuit was

incorrectly analyzed, while in part (b), the total resistance and voltage in series were wrongly calculated.

4.2.2.2 Refrigeration and Air Conditioning 2 (Actual Practical)

The Refrigeration and Air Conditioning 2 (Actual Practical paper) consisted of one question. The question comprised of three stages: the preparation stage, which carried 10 marks; the direct assessment stage, which carried 50 marks; and the product performance stage, which carried 40 marks, making a total of 100 marks. The overall results show that 100 per cent of students passed. The question tested students' competence on *Maintaining domestic refrigeration systems.* The question asked:

The Figure shows a basic electrical wiring circuit of a refrigerator. Study the circuit and answer the questions that follow:

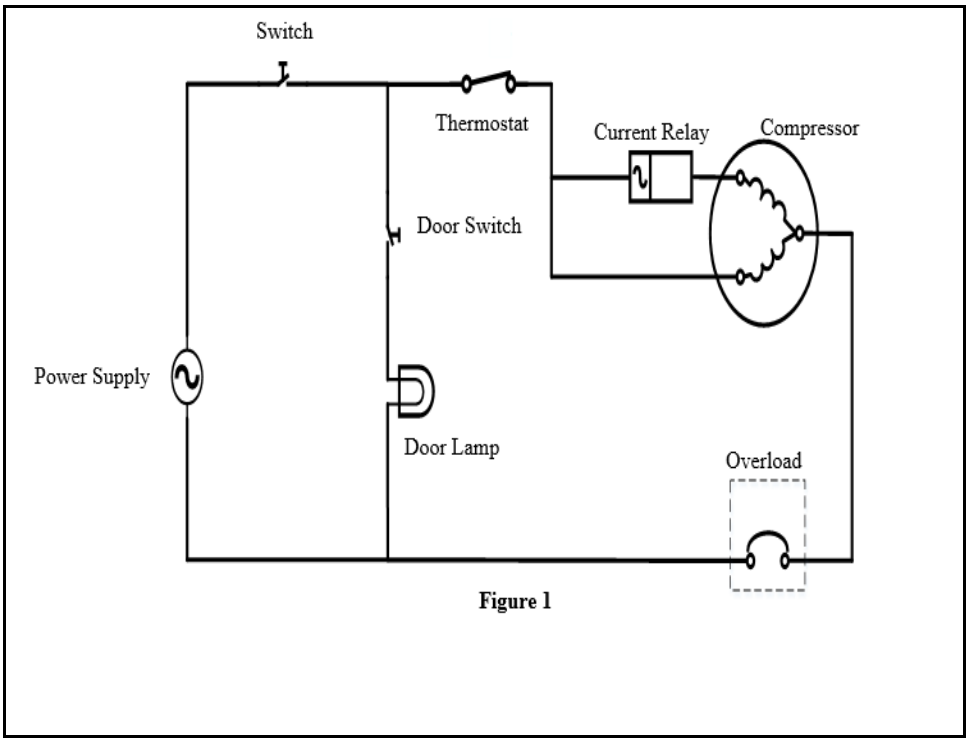


Figure 1

(a) List three tools and equipment and five materials you will use to construct a refrigerator electrical wiring circuit using the given refrigerator components shown in the figure.

(i) Tools and equipment required

(ii) Materials required.

(b) *Write six operation procedures you will follow when constructing a refrigerator electrical wiring circuit by using the materials selected in (a)(ii).*

(c) *Construct a refrigerator electrical wiring circuit in figure on the training board.*

(d) *Test the functionality of the wiring circuit.*

The question required students to construct the refrigerator electrical wiring circuit on the training board and test its functionality. The analysis shows that the majority of students successfully constructed the circuit and the functionality of the circuits was satisfactory. These students illustrated a good understanding of the refrigerator electrical circuit, which can be attributed to their consistent practice during lessons, proper guidance from instructors and familiarity with the training board and relevant tools.

At preparation stage, students were required to list three tools and equipment and five materials that they would use when constructing the given circuit and connecting the bulbs. Most students were able to correctly identify the tools like multimeter, wire stripper and pliers and materials such as relay, door lamp, thermostat and insulation tape, demonstrating awareness of the equipment and adequate knowledge of materials required for constructing the refrigerator circuit. This shows that, the students understood the demands of the question. Extract 2.4 is a sample of responses from the script of a student who had good performance.

(a) List three tools and equipment, and five materials which you will use when constructing the given circuit and installing the bulbs.

(i) Tools and equipment required

- Multimeter
- Set of pliers
- Screw drives

(ii) Materials required

- Wires
- Connectors
- Fuse
- Relay
- Brake switch

(b) Write six operation procedures you will follow when constructing and installing the brake light circuit.

Procedures for constructing and installing brake light circuit

(i) Identify the electrical wiring circuit.

→ This step will help to know and understand the brake light wiring circuit.

(iii) Select equipment, tools and materials.

→ Such as multimeter, plier, screw drivers, wires, connectors, fuse, relay and brake switch.

(iii) Prepare your work bench or board for constructing the circuit.

(iv) Connect all materials as shown in the circuit provided.

→ This step help to connect all materials such as wires, connectors, fuse, relay and brake switch.

(v) Check the continuity by using multimeter.

→ This step will help to check if the electric current is passing through the circuit.

(vi) Switch on to the power supply to test the circuit.

→ This step will help to check if the brake light circuit is working correctly. It also helps to detect any fault and ensure the circuit is safe and functional.

Extract 2.4: A sample of student's correct responses to practical question of Refrigeration and Air Conditioning 2.

Extract 2.4 shows that the student managed to give the correct tools, equipment and materials asked in part (a) and good operation procedure in constructing a circuit in part (b).

In the direct Assessment Stage, the students were required to illustrate the procedure of executing the task. This included observing safety rules and precautions, measurement and verification of electrical components, constructing the basic wiring circuit, including all refrigerator components, planning and laying out the circuit, managing time efficiently, organising work effectively and maintaining cleanliness.

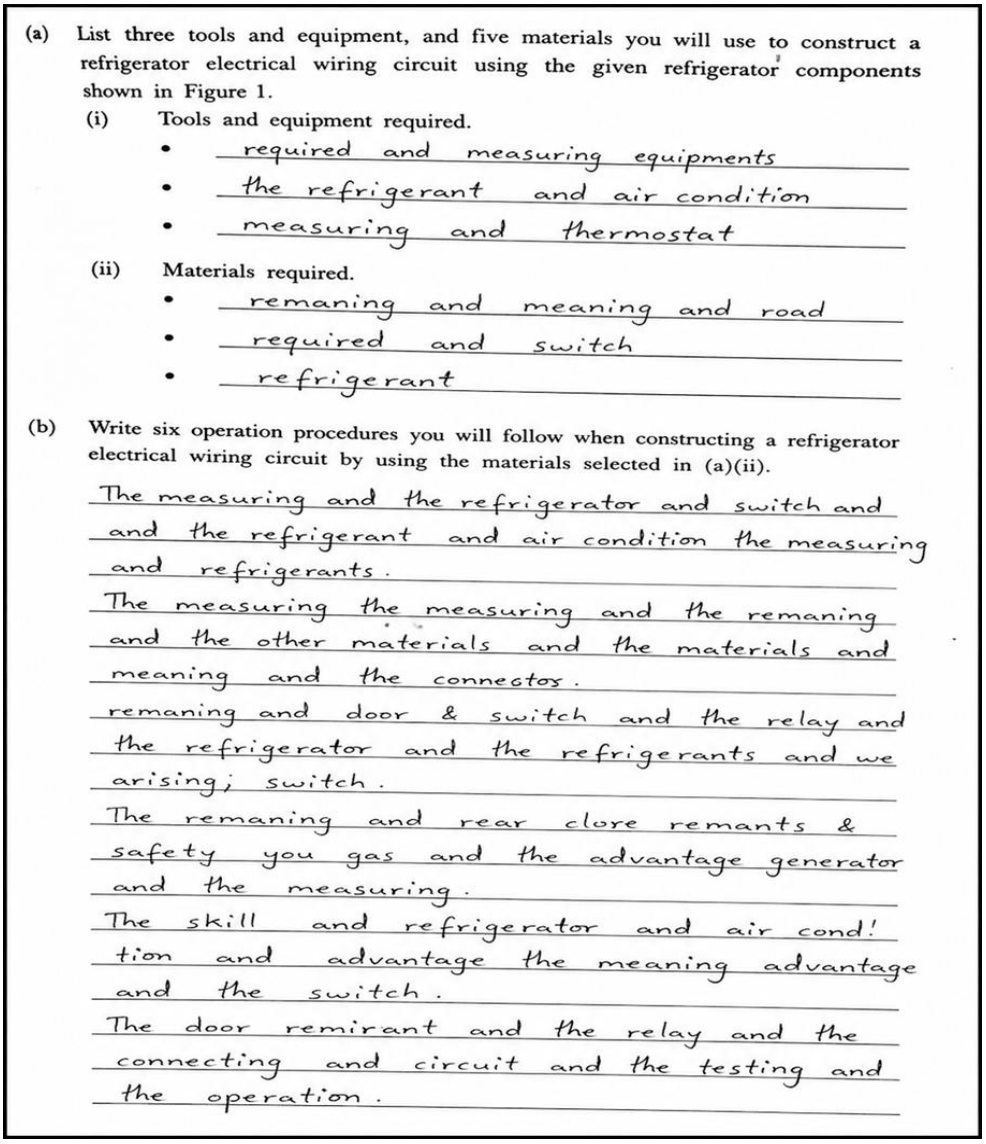
All students showed a good understanding of the demand of the question, followed a logical sequence of steps, ensured the circuit was constructed systematically, displayed attention to detail in component placement and connections, minimized errors, illustrated problem solving skills by identifying and correcting minor mistakes and worked independently and responsibly, showing discipline and focus throughout the task.

In the Product assessment Stage, the students were required to present a final product that require, neat layout of components, proper and secure connection of wires to components, use of correct wires, tightly secured and overall quality and functionality of the circuit. Most students demonstrated a good understanding of the demands of the task. They produced a well-organised and neatly assembled circuit on the training board, ensured all components were correctly connected and firmly fixed with no loose or incorrect connections and successfully achieved full functionality of the circuit, confirming correct construction.

Overall performance was good, though some students showed partial awareness of tools and materials, as they occasionally ignored safety procedures and committed errors in connections or component placement. Some circuits were constructed without proper alignment of components, with wires loosely connected or incorrectly routed, affecting neatness and the durability of the circuit.

Despite of some students producing functional circuits, their work lacked precision, organization and consistent attention to detail, suggesting

reliance on guidance and limited independent practice with practical electrical tasks. This observation implies they need continued reinforcement of practical skills and adherence to best practices, even though some achieved high marks. Extract 2.5 is a sample of responses from the script of a student who had weak performance.



(a) List three tools and equipment, and five materials you will use to construct a refrigerator electrical wiring circuit using the given refrigerator components shown in Figure 1.

(i) Tools and equipment required.

- required and measuring equipments
- the refrigerant and air condition
- measuring and thermostat

(ii) Materials required.

- remaning and meaning and road
- required and switch
- refrigerant

(b) Write six operation procedures you will follow when constructing a refrigerator electrical wiring circuit by using the materials selected in (a)(ii).

The measuring and the refrigerator and switch and and the refrigerant and air condition the measuring and refrigerants.
The measuring the measuring and the remaning and the other materials and the materials and meaning and the connectors.
remaning and door & switch and the relay and the refrigerator and the refrigerants and we arising; switch.
The remaning and rear clore remants & safety you gas and the advantage generator and the measuring.
The skill and refrigerator and air cond! tion and advantage the meaning advantage and the switch.
The door remirant and the relay and the connecting and circuit and the testing and the operation.

Extract 2.5: Sample of student's incorrect response in the Practical Question in Refrigeration and Air Condition 2.

Extract 2.5 shows a sample response from a student who failed to correctly respond to all parts of the question.

4.2.3 Analysis of Students' Responses in Motor Vehicle Mechanics

In 861 Motor Vehicle Mechanics assessment, a total of 10 questions were assessed in paper 1 (Theory paper), while one question was assessed in paper 2 (Actual Practical).

4.2.3.1 Motor Vehicle Mechanics 1 (Theory Paper)

The students had good performance in nine questions in the Theory paper. Question 10 recorded the best performance, with 83.97 per cent of students attaining high scores compared to all other questions. The question asked:

With examples, explain five functions of a vehicle suspension system

The question aimed to assess students' knowledge of evaluating a vehicle suspension system.

Generally, the students' performance in this question was good, in which 131 students (83.97%) performed well. The majority of students correctly explained functions of a vehicle suspension system with examples, such as it supports vehicle weight in a loaded pickup truck, the suspension (leaf spring or coil springs) carries the extra weight of goods without allowing the chassis to touch the ground, it absorbs shocks and vibrations example when driving over a speed bump, the shock absorbers and springs reduce the sudden jolt, keeping the ride smooth, it maintains wheel contact with the road example on a rough gravel road, suspension keeps the wheels from bouncing excessively, improving grip and safe handling, it enhances vehicle stability and safety example when taking a sharp corner at high speed, the suspension stabilises the car, preventing it from rolling over and it improve passenger comfort example in a luxury car with advanced suspension, passengers can hardly feel road imperfections, making long journeys comfortable. Extract 2.6, is a sample of responses from the script of a student who had good performance.

10. With examples, explain five functions of a vehicle suspension system.

(i) Protects the vehicle from road irregularities: Suspension system plays a crucial role in protecting the vehicle from road rough surfaces such as bumps and other factors. Suspension system works with the components like springs, shock absorbers, stabilizer bars and others. These components function together and reduce the vehicle damags occurs from road irregulanties like damage and many other things related. Hence, Suspension system helps the vehicle to avoid excessive damage and other interelated factors.

(ii) It minimizes vibrations: Suspension system is equiped in vehicles so as to minimize vibrations on the vehicle. The spring bounce helps to avoid those vibrations to reach the vehicle and affect the vehicle. Also, shock absorbers convert those vibrations and change them in the form of heat energy. Hence, the vibrations in the vehicle are minimized because of equiped Suspension system in the vehicle. Therefore, suspension system plays a crucial role in minimizing the vehicle's vibrations.

(iii) It ensures proper wheel alignment: Suspension system in the vehicle can lead to ensure a proper vehicle wheel alignment.

Improper wheel alignment in the vehicle has multiple benefits in the vehicle, hence suspension system helps to ensure a proper wheel alignment and overall vehicle performance. Suspension system consists of various components and parts that helps the vehicle to stay flexible and proper alignment of wheels. Therefore, Suspension system ensures a proper wheel alignment.

(iv) It improves the vehicle performance: Suspension system helps to improve the vehicle performance by absorbing vibrations and damping, since it is equipped with dampers which perform damping mechanisms. Proper maintenance of suspension can improve the overall vehicle performance since the vehicle is avoided from vibrations and bumps that can damage the vehicle and cause repairing that may lead to additional costs that may arise, hence, ensuring the vehicle performance is done by suspension system in Automobile.

(v) It improves vehicle handling and stability: Suspension system in the vehicle helps to improve vehicle handling and its stability since it is equipped with various components that avoid vehicle damage during vibrations and hence can improve vehicle stability and handling effectively. Hence, suspension system helps the vehicle to last for a long period of time that helps to extend the life span of the vehicle. Therefore, equipping suspension system in the vehicle helps to improve stability and handling.

Extract 2.6: A sample of a student's correct response to Question 10 of Motor Vehicle Mechanics 1.

In Extract 2.6, a student correctly explained functions of vehicle suspension system such as protects vehicle from road irregularities, minimises vibrations, ensures proper wheel alignment, improves vehicle performance and improves vehicle handling and stability.

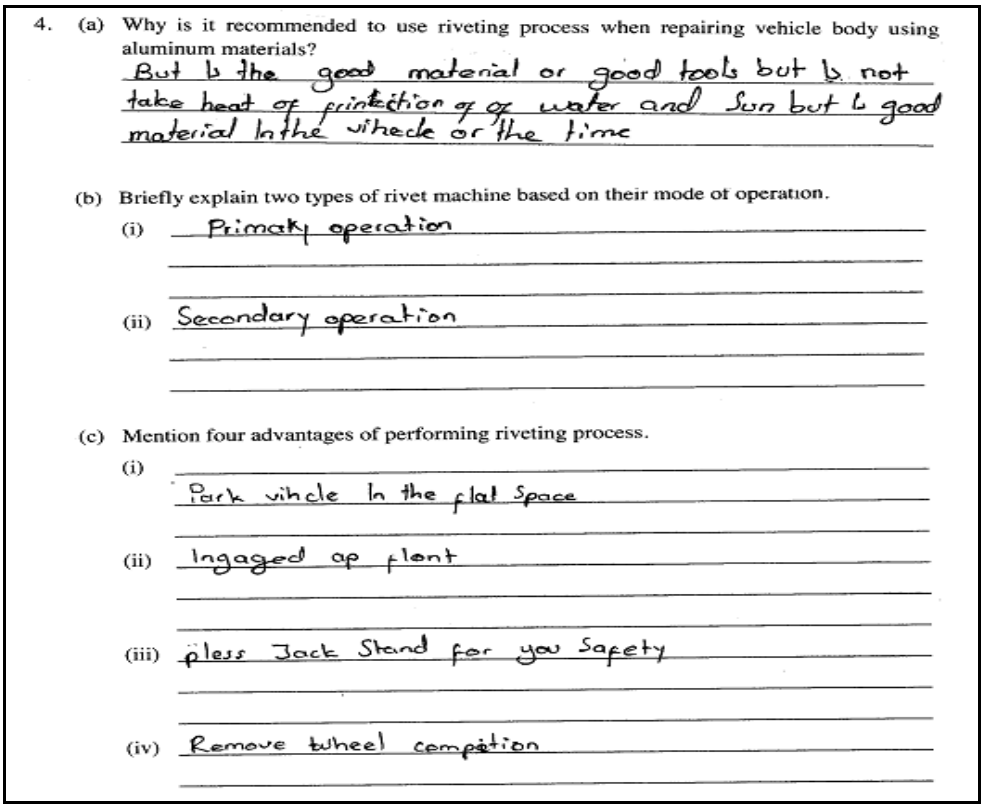
On the other hand, question 4 drawn from the competence of *Performing Bench Works* had average performance of 55.77 per cent. The question asked:

(a) Why is it recommended to use riveting process when repairing vehicle body using aluminium materials?

(b) Briefly explain two types of rivet machine based on their mode of operation.

(c) Mention four advantages of performing riveting process.

In this question, 44.23 per cent of students who scored low marks did not understand the concept of riveting process when repairing vehicle body using aluminum materials, thus they failed to provide correct answers to item (a). Instead of providing reason for using riveting process when repairing vehicle body using aluminum materials, some of them provided other reasons which are irrelevant such as when repairing a vehicle body, you are supposed to use aluminum and other materials, which showed a limited understanding of important concepts in riveting process. In item (b), instead of explaining two types of rivet machine based on their mode of operation, some of them provided irrelevant explanations such as wheel cylinder. In item (c), instead of mentioning four advantages of performing riveting process, some of them answered by mentioning incorrect advantages; such as control fuel tank in modern vehicle, prevent fuel and fumes from escaping and determine the fuel pump delivery pressure, which is incorrect response. This response showed a limited understanding of important concepts in riveting process. Extract 2.7 is a sample of responses from the script of a student who had weak performance.


4. (a) Why is it recommended to use riveting process when repairing vehicle body using aluminum materials?

But b the good material or good tools but b not take heat of printection of or water and Sun but b good material In the vihecle or the time

(b) Briefly explain two types of rivet machine based on their mode of operation.

(i) Primaty operation

(ii) Secondary operation

(c) Mention four advantages of performing riveting process.

(i) Park vihcle In the flat Space

(ii) Ingaged op plant

(iii) pless Jack Stand for you Safety

(iv) Remove tuheel compétion

Extract 2.7: A sample of student's incorrect response to question 4

In part (a) of Extract 2.7, the student incorrectly provided reason for using riveting process when repairing vehicle body using aluminum materials as a good material or good tool but is not take heat. In part (b), the student failed to explain two types of rivet machine based on their mode of operation such as primary operation and secondary operation. In part (c), students failed to mention advantages of performing riveting process.

4.2.3.2 Motor Vehicle Mechanics 2 (Actual Practical)

The question that was assessed in the Motor Vehicle Mechanics 2 (Actual Practical) assessment comprised of two stages: The direct assessment stage and the product performance stage. The analysis shows that, students had a performance of 100 per cent. The question was:

After completing the brake system maintenance, it is necessary to remove the air in the braking system. From the given hydraulic braking system model, perform the following tasks:

(a) Select tools, equipment and materials you will need to remove the air from braking system.

(b) Remove the air from braking system.

The question aimed to assess students' understanding of braking system and ability to remove the air from braking system.

In the direct assessment stage, students correctly wore all safety equipment, selected tools, equipment and material and properly handled, dismounting, replacing and mounting of components was done perfectly and kept the work area tidy and tools arranged.

In the product assessment stage, the fitting accuracy, compliance to specification, functionality and neatness was observed. Most students demonstrated a good understanding of the demands of the task, in which they performed well to remove air in the braking system as required.

In part (a), the students correctly selected tools, equipment and materials as follows; spanner, screw driver, wire brush, brake fluid, transparent bottle, transparent pipe for brake fluid and cotton waste. Their responses showed good knowledge of braking system.

In part (b), the students checked the brake fluid level, connected a pipe to the bleed valve, pumped a brake pedal, opened the valve to release air, observed air bubbles, closed the valve, refilled brake fluid and repeated the process until the brakes became firm.

4.2.4 Analysis of Students' Response in Welding and Metal Fabrication

A total of 10 questions were assessed in Welding and Metal Fabrication 1 (Theory paper) and one question in Welding and Metal Fabrication 2 (Actual Practical).

4.2.4.1 Welding and Metal Fabrication 1 (Theory Paper)

The students had good performance in four questions and average performance in six questions. Question 1 had good performance, with 75 (93.75%) students passing compared to all other questions. The question asked:

For each of the items (i) – (x), choose the correct answer from the given alternatives and write its letter in the box provided.

(i) During filling process, which method is used for efficient removal of maximum amount of metal in a short period of time?

A Cross filling *B Longitudinal filling*
C Draw filling *D Double filling*

(ii) Which explanation best describes acetylene cylinder as used in gas welding?

A It is either painted red, brown or maroon
B It is either painted blue, green or white
C It is either painted green, yellow or white
D It is either painted blue, yellow or white

(iii) What does the term PPE stands for as safety is concerned?

A Personal Preventive Equipment
B Personal Proactive Equipment
C Personal Productive Equipment
D Personal Protective Equipment

(iv) A machine operator was doing a normal regular maintenance on a shearing machine by checking the shear blade. What was the aim of such maintenance?

A Cleaning the shear blade on the machine
B Aligning the shear blade on the machine
C Checking for wear and damage
D Applying lubricant on the shear blade

(v) *Recommend the angle range of a welding tip to a work-piece when welding by a leftward technique in a flat position.*

A 60^{o} - 70^{o} *B* 50^{o} - 60^{o}

C 40^{o} - 50^{o} *D* 30^{o} - 40^{o}

(vi) *What is the primary use of a bench vice while filing a mild steel work piece?*

A Marking B Cutting C Holding D Measuring

(vii) *Two pieces of low carbon steel of 80 mm thickness are to be welded together butt joint flat position using conventional electrodes. What is the correct angle and edge for the joint?*

A Single V, 30^{o} *included angle*

B Single V, 45^{o} *included angle*

C Single V, 60^{o} *included angle*

D Single V, 90^{o} *included angle*

(viii) *The students were assigned to select the best type of welding machine depending on the availability of power, most of them chose a.c welding machine. Why most of them chose a.c welding machine over d.c welding machine?*

A It is heavy in weight *B It has high efficiency*

C It has high power consumption *D It has stable arc*

(ix) *The presence of small cavities in the weld metal occur when gas bubbles accumulate and get trapped inside a weld bead. What is the name of this defect?*

A Cracks *B Oxidation*

C Slag inclusion *D Porosity*

(x) *During welding and metal fabrication works, the fire accident occurred due to burning of diesel placed near the a.c welding machine. Identify the class of the fire and the type of extinguisher to eliminate it.*

A Class F and Carbon dioxide Extinguisher

B Class D and Dry Powder Extinguisher

C Class B and Foam Extinguisher

D Class A and Water Extinguisher

Students who performed well answered the questions correctly with a good understanding of the key concepts. They understood that the method used for efficient removal of maximum amount of metal in a short period of time was cross filling in item (i). Also, they understood that the explanation which best describes acetylene cylinder as used in gas welding was either painted red, brown or maroon in item (ii).

Similarly, they understood that the term PPE stands for Personal Protective Equipment as safety is concerned in item (iii) and they knew that the aim of normal regular maintenance on a shearing machine by checking the shear blade was checking for wear and damage in item (iv).

These students also understood that recommended angle range of a welding tip to a work-piece when welding by a leftward technique in a flat position was 60^{o}-70^{o} in item (v).

They understood that the primary use of a bench vice while filing a mild steel work piece was Holding in item (vi) and they also understood that the correct angle and edge for the joint of two pieces of low carbon steel of 80 mm thickness to be welded together butt joint flat position using conventional electrodes was single V, 60^{o} included angle in item (vii).

In the question regarding the students assigned to select the best type of welding machine depending on the availability of power, most of them chose a.c welding machine. Most of them chose a.c welding machine over d.c welding machine because it has high efficiency in item (viii). They also knew that the name of the defect due to presence of small cavities in the weld metal occur when gas bubbles accumulate and get trapped inside a weld bead was porosity in item (ix) and they identified that during welding and metal fabrication works, the fire accident occurred due to burning of diesel placed near the a.c welding machine was Class B and type of extinguisher was Foam Extinguisher in item (x). This shows students effectiveness in understanding and applying welding and metal fabrication concepts.

Furthermore, analysis shows that Question 9 and 10 which tested competence of Performing Arc Welding of Alloy Steels and Ferrous

Metals, had average performance of 38.75 per cent which is low compared to other questions. The question asked:

(a) What does the term "hard facing" imply in welding practice?
(b) State four functions of hard facing on the metal components

The question aimed to assess students' knowledge of performing arc welding of alloy steels and ferrous metals, understanding of hard facing and familiarity with the functions of hard facing on the metal components.

Overall, the students' performance in these competencies was average, with a performance of 38.75 per cent. In part (a), some students confused *hard facing* with personal protective equipment. A number of them incorrectly described hard facing as the process of making a steel surface rough or "unsmooth." This misconception reflects a limited understanding of arc welding, particularly in relation to alloy steels and ferrous metals. In part (b), several students failed to state four functions of hard facing on the metal components. Some students mentioned only one or two functions, while others gave incorrect responses. The average performance was caused by limited understanding of hard facing on the metal components. Extract 2.8 is a sample of responses from the script of a student who had average performance.

9. (a) What does the term "hard facing" imply as the welding is concerned?

It the helmet used to protect head from the danger ous source, or Is the term defined as the head prote ction during welding process when offer the sustaini bility to in the certain area.

(b) State four functions of hard facing on the metal components.

(i) Hard facing give ability of doing all work without any problem.

(ii) Promoting the safety in workplace, hard facing helps to promoting safe in workshop because of [illegible]

(iii) Enhance the Comfortability in the workplace, which deals and metal component.

(iv) Offer the head for protection to the workp lace.

Extract 2.8: A sample of a student's incorrect response to question 9 of Welding and Metal Fabrication 1

In Extract 2.8, part (a), the student incorrectly explained hard facing as the helmet used to protect head from dangerous sources. In part (b), the student stated functions of hard facing such as ability of doing work without any problem, promoting the safety in the workplace, enhancing comfortability in the workplace and offer the head protection in the workshop which are incorrect responses.

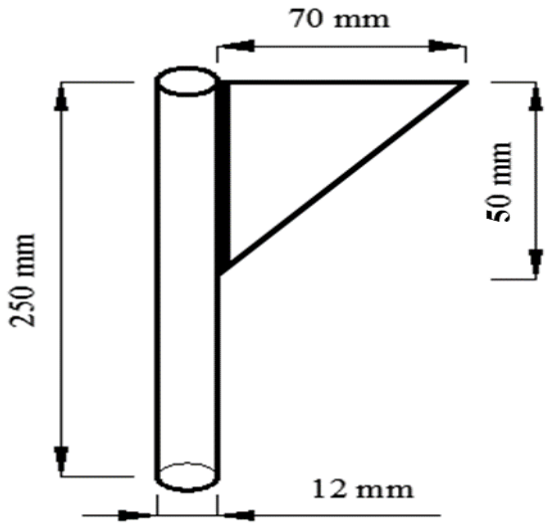
4.2.4.2 Welding and Metal Fabrication 2 (Actual Practical)

The assessment in 881/2 Welding and Metal Fabrication 2 (Actual Practical) comprised one question which had two stages of assessment namely direct performance and the product performance stage. The analysis shows that, all students (100%) attained good performance. The question asked:

A school workshop needs to fabricate chipping hammer for cleaning slag after arc welding operations. You are required to fabricate one hammer using round bar of 12 mm diameter and flat bar of 6 mm thick as shown in the given diagram. Study the diagram and perform the following tasks:

(a) Prepare mild steel flat and round bar as illustrated in the diagram.

(b) Fabricate the chipping hammer in flat grooved edge position as shown in the diagram using arc welding machine.



The question aimed to assess students' understanding of performing shielded metal arc welding and arc cutting.

In the direct assessment stage, students were required to observe safety measures, select tools, equipment and materials, prepare work piece by required dimension, assess proper connection of welding machine, setting of proper current, welding process and cleanliness and storage of tools and equipment.

In the product assessment stage, uniformity of joint was observed, cutting accuracy, welding surface finish and final product produced. Most students demonstrated a good understanding of the demands of the task, they performed well to fabricate the chipping hammer in flat grooved edge position and produced the required final product.

In part (a), the students correctly prepared mild steel flat and round bar as illustrated in the diagram. Their responses showed good acquired skills of arc welding and arc cutting. In part (b), the students fabricated the chipping hammer in flat grooved edge position required using arc welding machine.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The overall performance in the Form Two National Assessment (FTNA) 2025 for Mechanical Engineering assessment (Vocational Stream) was good. The report reveals that, students who passed were 308 (99.04%) and 3 (0.96%) students failed. The performance in all subjects was generally good. They include Motor Vehicle Mechanics, Welding and Metal Fabrication and Refrigeration and Air Conditioning and Auto Electrics. This performance was influenced largely by student's ability to understand and apply fundamental concepts, formulas and calculations, ability to identify the requirements of each question and adequate subject knowledge. A considerable number of students attained good and average performance levels. The gaps observed imply that more emphasis should be placed in practical application and problem solving skills.

Improving performance in Mechanical Engineering subjects requires deliberate efforts to strengthen foundational knowledge, enhance practical and learner centered teaching approaches and ensure adequate learning resources. Through the collective involvement of all education stakeholders and the effective implementation of the recommended measures, students will be better prepared to acquire the intended competencies and achieve improved performance in future assessments.

The National Examinations Council of Tanzania (NECTA) believes that the challenges outlined in this report will be addressed properly. In turn, the teachers will gain sufficient expertise, thereby improving the performance in future assessment.

5.2 Recommendations

In order to improve student performance in Mechanical Engineering subjects, the following measures are recommended.

5.2.1 Recommendations to Students

(a) Students should be engaged in practical activities to effectively link theory with practice so as to be familiar with the application of workshop tools.
(b) Students should participate in Mechanical Engineering subject clubs so as to develop interest, teamwork and creativity through activities such as technical projects, exhibitions and peer mentoring.
(c) Students should enhance their English language skills to improve communication, understanding of technical content and assessment performance by participating in debates, group discussions, presentations and written assignments.
(d) Students should emphasize regular practice of technical drawings to ensure clarity, accuracy and correctness.

5.2.2 Recommendations to Teachers

(a) Teachers should increase practical-based teaching to effectively link theory with real workshop applications.
(b) Teachers should encourage and supervise students to participate in Mechanical Engineering subject clubs and projects.
(c) Teachers should provide students with regular exercises and assignments, to improve their competence in calculations, technical drawing and interpretation of engineering problems.
(d) Teachers should support students in developing communication skills through presentations, discussions and written tasks.
(e) Teachers should enhance instruction in basic engineering concepts, highlighting mathematical applications and problem-solving and integrate real life engineering examples into classroom teaching.
(f) Teachers should place greater emphasis on practical work, laboratory experiments and hands-on activities to enhance students' understanding of theoretical concepts. They should also ensure the

effective use of available laboratories, tools and equipment relevant to engineering subjects.

(g) Teachers should use visual aids, real vehicle systems and demonstrations to enhance students' understanding, particularly in electrical competences.

Appendix I:

A Summary of Students' Performance Per Competence in Refrigeration and Air Conditioning Subject

Theory Paper

S/N	Competences	Question Number	Percentage of Students with a Score of 30% or Above	Average Percentage of Students with a Score of 30% or Above	Remarks
	Simple Electric Circuits, Maintaining Domestic Refrigeration System, and Building Simple Electronic Circuits	1	92.86	92.86	Good
	Building Simple Electric Circuits	2	78.57	71.43	Good
		3	78.57		
		9	s57.14		
	Maintaining Domestic Refrigeration Systems	5	50	69.05	Good
		7	92.86		
		8	64.29		
	Performing Bench Works	4	57.14	67.86	Good
		6	78.57		
	Building Simple Electronic Circuits	10	35.71	35.71	Average

Actual Practical Paper

S/N	Competence	Question Number	Percentage of Students who Scored an average of 30% or Above	Remarks
1	Maintaining Domestic Refrigeration Systems	1	100	Good

Appendix II:

A Summary of Students' Performance Per Competence in Auto Electrics Subject

Theory Paper

S/N	Competences	Question Number	Percentage of Students with a Score of 30% or Above	Average Percentage of Students with a Score of 30% or Above	Remarks
1	Maintaining The Lighting System	5	93.44	93.44	Good
2	Performing Bench Works, Carrying out General Maintenance On Electrical and Electronic Systems, Building Simple Electronic Circuits, Carrying out General Maintenance on Electrical and Electronic Systems, Carrying out General Maintenance on Electrical and Electronic Systems, Building Simple Electronic Circuits, Building Simple Electric Circuit, Performing Bench Work and Building Simple Electric Circuits	1	91.80	91.80	Good
3	Building Simple Electric Circuit	4	77.05	85.25	Good
		10	93.44		
4	General Maintenance on Electrical and Electronics Systems	9	77.05	77.05	Good

5	Maintaining Safety of the Workshop and Surroundings	8	77.05	77.05	Good
6	Building Simple Electric Circuits	3	73.77	73.77	Good
7	Carrying out General Vehicle Services	6	72.13	72.13	Good
8	Maintaining Safety of The Workshop and Surroundings	2	72.13	72.13	Good
9	Repairing Hydraulic Brake System	7	44.26	44.26	Average

Practical Paper

S/N	Competence	Question Number	Percentage of Students with a Score of 30% or Above	Remarks
1	Maintaining the Lighting System	1	100	Good

Appendix III:

Students' Performance Per Competence in Motor Vehicle Mechanics Subject

Theory Paper

S/N.	Competence	Question Number	Percentage of Students who Scored 30% or Above	Remarks
1	Repairing Wheels and Tyres, Maintaining the Health, Safety of Workshop and Surroundings, Performing Bench Works, Carrying out General Vehicle Service, Carrying out General Maintenance on Electrical and Electronic System, Maintaining Brake System, Performing Welding and Fabrication, Maintaining Suspension System	1	83.97	Good
2	Maintaining Suspension System	10	83.97	Good
3	Maintaining Brake System	6	79.49	Good
4	Performing Welding and Fabrication	9	73.72	Good
5	Carrying out General Vehicle Service	3 and 5	70.52	Good
6	Maintaining Steering System	2 and 8	69.24	Good
7	Carrying out General Maintenance on Electrical and Electronic System	7	69.23	Good
8	Performing Bench Works	4	55.77	Average

Actual Practical Paper

S/N	Competence	Question Number	The Percentage of Students who Scored an Average of 30% or Above	Remarks
1	Maintaining Brake System	1	100	Good

Appendix IV:

A Summary of Students' Performance Per Competence in Welding and Metal Fabrication Subject

Theory Paper

S/N	Competences	Question Number	Percentage of Students with a Score of 30% or Above	Average Percentage of Students with a Score of 30% or Above	Remarks
1.	Performing Bench Works, Performing Gas Welding and Brazing on Ferrous and Non-Ferrous Metals, Maintaining Safety of Workshop and Surroundings, Performing Sheet Metal Work, Performing Shielded Metal Arc Welding and Arc Cutting, Performing Arc Welding of Alloy Steels and Ferrous Metals	1	93.75	93.75	Good
2	Performing Gas Welding and Brazing on Ferrous and Non-Ferrous Metals	2	75.00	75.00	Good
3	Performing Bench Works	7	75.00	75.00	Good
4	Maintaining Safety of Workshop and Surroundings	3	72.50	72.50	Good
5	Performing Shielded Metal Arc Welding and Arc Cutting	4	63.75	63.75	Average
		8	63.75		

S/N	Competences	Question Number	Percentage of Students with a Score of 30% or Above	Average Percentage of Students with a Score of 30% or Above	Remarks
6	Performing Gas Welding and Brazing on Ferrous and Non-Ferrous Metals	5	47.50	47.50	Average
		6	47.50		
7	Performing Arc Welding of Alloy Steels and Ferrous Metals	9	28.75	38.75	Average
		10	48.75		

Actual Practical Paper

S/N	Competence	Question Number	The Percent of Students who Scored an Average of 30% or Above	Remarks
1	Performing Shielded Metal arc Welding and Arc Cutting	1	100	Good