



EXAMINATIONS COUNCIL OF ESWATINI

Junior Certificate Examination

**Design and Technology (537)
Examination Report for 2024**

Table of Contents

Component	Page
Design and Technology Paper 1	3 -14
Design and Technology Paper 2	15 – 17

Paper 537/01

General Comments

In 2024 there were one thousand three hundred and eighty-six (1386) candidates who sat for the Design and Technology Paper 1, this indicates a massive decline from the number of candidates who sat for this paper in 2023. This is due to the four-year program introduced in other schools. The level of performance was slightly lower compared to 2023. Candidates were required to answer all questions in Section B for the third time running. It was observed even this year that candidates were able to finish the paper on time. In general, candidates performed much better in Section A than in Section B, and as it has always been the case in the previous years, most candidates performed better in B3 than in B1 and B2.

Section A

This section consisted of sixteen questions (16) worth 40 marks. These were questions that required short answers. The questions were from the different components of the syllabus: Resistant Materials (RM), Graphics (GP) and Systems and Control (SC). This section assessed the following objectives; knowledge and understanding, problem solving, communication and realization.

Comments on Specific Questions

Question 1

For this question candidates were given an isometric block. They were to choose the correct plan view by circling the letter.

The expected response was **A**. This question proved to be a challenge, as many candidates could not manage to come up with the expected response and this resulted in the loss of the one mark. Common error was B and these responses were not awarded a mark.

Question 2

Candidates were given a tool commonly used in a school workshop.

(a) Candidates were asked to name the tool.

The expected response was **sliding bevel**. A fair number of candidates were able to give the expected response to the question. A significant number of the candidates were giving responses such as bevel square, try square, marking knife, and these were not accepted by the examiners.

(b) Candidates were asked to state the specific use of the tool.

The expected responses were **marking lines at any angle to a true edge or side, or set bevel and chamfers**. It was only a small fraction of the total candidature that was able to give the correct response to this question. A lot of candidates gave responses such as cutting bevel, measuring 90° and 45°, unfortunately these were not accepted.

Question 3

For this question candidates were given a method of timber conversion.

(a) They were to name the method of conversion.

The expected response was **quarter sawing**. A majority of candidates were able to give the correct response, only a few number of candidates gave dissenting responses such through and through sawing and seasoning.

(b) Candidates were to state the advantage of boards produced using this method.

The expected response was **less likely to warp and have attractive grains**. It was a small fraction of the candidature that was able to come up with the correct response. Others were giving responses such as less waste, light weight, strong etc. Regrettably these responses were not awarded with a mark.

Question 4

Candidates were given a metal water pipe system.

(a) For this question they were to name a non-ferrous metal that can be used to make the water pipes.

The expected responses were **copper and brass**. A fair number of candidates were able to give the correct response. There were those however, that gave response such as zinc, aluminum, mild steel and plastic, unfortunately these could not attain the mark set aside for this question.

(b) Candidates were asked to give one property of the mater that makes it suitable for water pipes.

The expected response was **corrosive resistant**. A majority of candidates were able to give the correct response. Other candidates came up with responses such good conductor of electricity and heat, strong. However, these responses were not accepted.

Question 5

Candidates were asked to give two characteristic of a softwood trees.

The expected response was **needle- like leaves, pointed crown, rough bark, seed not enclosed, bear cone, takes shorter time to reach maturity**. A majority of candidates managed to give the correct response to the question, others gave deviating responses such as seeds covered, have broad leaves which were not accepted.

Question 6

Candidates were given a drawing of a mechanism for producing movement.

(a) They were required to name the mechanism.

The expected response was **rack and pinion**. It was a bigger fraction of the total candidature that was able to give the expected response to this question. Only a few number of candidates gave dissenting responses such bevel gear, worm gear and these were not awarded with the mark designated for this question.

(b) For this question candidates were required to name the type of motion produced by part B of the mechanism.

The expected response was **linear motion**. Very few candidates were able to give the expected response. A lot of candidates were giving different responses such as rotary motion and oscillating motion, unfortunately such responses could not attain the one (1) allocated to this question.

Question 7

Candidates were given an image of a manufactured board.

(a) Candidates were required to name the manufactured board.

The expected response was **3 plywood**. Very few candidates were able to give the expected response. A majority of candidates came up with unfavorable responses such as multiplied, lamin-board and MDF, and these could not obtain the allocated 1 mark.

(b) candidates were required to state one advantage of manufactured board over solid timber.

The expected responses were **warping is minimal, stable, uniform strength and comes in large sheets**. This question was poorly answered as most candidates failed to give the expected responses. Most candidates gave deviating responses such as easy to work with, it beautiful, comes in different sizes and its cheap. These were not accepted.

Question 8

For this question candidates were required to state one safety rule to be observed when using a chisel.

The expected responses were **to keep both hands behind the cutting edge or all parts of your body behind the cutting edge of the chisel**. Only a few candidates were able to give the expected response; others were giving different responses such as pass chisel with the handle, wear safety goggles, wear gloves, and unfortunately this could not be awarded with the mark.

Question 9

Candidates were required to name the process of drying timber.

The expected response was **timber seasoning**. A majority of candidates were able to give the expected response. There were some that gave responses such as removing water from the tree, unfortunately such response could not attain the one (1) allocated to this question.

Question 10

Candidates were given an image of a hammer used in a school workshop.

(a) Candidates were expected to name the type of hammer.

The expected response was **ball pein hammer**. This question was well done; a majority of candidates were able to give the correct and expected response. There were very few that gave dissenting responses such as claw hammer and Warrington pattern hammer.

(b) Candidates were expected to state one specific use of the hammer.

The expected responses were **riveting and hallowing**. This question proved to be a challenge, as many candidates could not manage to come up with the expected response and this resulted in the loss of the one mark. Common errors were driving nails and screws, hammering sheet metal etc.

Question 11

For this question candidates were given line AB representing the perimeter of a triangular frame. The sides of the triangular frame are in the ratio 2:3:4. Candidates were expected to use geometrical construction to produce a triangle according to the given ratio.

The expected responses were to draw a line at angle from A, mark 9 equal divisions, draw parallel lines from the marked ratio, draw arc from point 2 and A and draw another arc from 3 and B, finally draw the triangle. Only a small number of candidates were able to give the correct response. A majority of other candidates divided the question into nine equal parts and others simply left the question without an attempt.

Question 12

Candidates were given an image of a design for a toy loading shovel. They were then given another incomplete drawing of the toy loading shovel. They were requested to complete the drawing of the toy loading shovel by constructing the semi-ellipse ABC and add the missing outer circle of the near wheel.

The expectation was that candidates would demonstrate the skill of constructing an ellipse using auxiliary circle method or rectangle method. This question proved to be a challenge to many candidates as they failed to construct the expected ellipse. Some candidate only drew the ellipse with a freehand without showing any construction and this led to a loss of marks.

Question 13

(a) For this question candidates were required to name the type of wound caused by hitting hard on your skin with a blunt object.

The expected response was **bruise**. It was a small fraction of the candidature that was able to come up with the correct response. Others were giving responses such as scald, cut, burn etc. Regrettably these responses were not awarded with a mark.

(a) Candidates were to explain how the wound mentioned in (a) above can be treated.

The expected responses were **to place a cold piece of cloth over the bruise to ease pain, cover the bruise area to prevent further knocks**. There were few candidates who were able to give the expected response. Most candidates gave responses such as apply first aid, give him or her pain killers, take that individual to hospital. However, these responses were not accepted.

Question 14

For this question candidates were presented with an image showing a joint used on wood.

(a) Candidates were asked to name a the joint.

The expected response was **common dovetail joint**. The question was well done as most candidates were able to give the expected response and earning the allocated one (1) mark. Very few were giving deviating responses such as tee- bridle joint, corner- bridle, corner- joint etc., and these were not accepted.

(b) Candidates were required to explain how the dovetail socket on piece B can be cut after marking out.

The expected responses were **that the piece must be held in a vice, cutting the socket using a dovetail saw, cutting of waste with a coping saw and finally cleaning using a chisel**. Many candidates were able to give the expected response. A few candidates gave responses such as remove waste with jig saw, use a hacksaw or a scroll saw and these were not accepted.

Question 15

Candidates were given an image of a piece of acrylic to be bent on a line AB.

(a) Candidates were required to explain why a scribe cannot be used to mark line AB.

The expected response was it **leaves a permanent mark or scratches the plastic**. There were very few candidates who were able to give the expected response. Many were giving dissenting responses such as used to mark lines on metal, these were not accepted.

(b) For this question candidates were required to name one piece of equipment that can be used to heat the plastic before bending.

The expected response was **strip heater or hot air gun**. A majority of the candidates were able to give the expected response. There were some candidates that gave different responses such as heater, burns in burner etc., and these responses were not awarded with marks.

Question 16

For this question candidates were required to give one example of a natural structure.

A. The expected responses were **spider web, tree, egg shell, snail shell, skull, human skeleton**, etc. The performance by candidates in this question was excellent a majority of candidates were able to give the expected response. Very few gave different responses from what was expected, responses such as shell, egg, human body etc.

SECTION B

This section comprised of three (3) structured questions (B1, B2 and B3) based on Graphic Products, Resistant Materials and Systems and Control. Candidates had to answer all questions. Each question was worth twenty marks (20) making the total of this section to be sixty (60) marks.

B1 – Graphic Products

Question 1

Candidates were given an elevation, plan and a 3D graphic image of a child's walker. The child walker includes holes in the shape of a square, an equilateral triangle and a regular pentagon. They were then required to complete the part of the walker by adding the three holes (square, triangular and pentagonal).

The expected responses were to equilateral triangle base 20mm and project up and a square sides 20mm, and construct a regular pentagon base 20mm. This question seemed to be a great challenge to a lot of candidates following that very few candidates were able to draw square, equilateral triangle correctly and geometrical construct a regular pentagon given a side. Some candidates drew the shapes without following the given dimensions.

Question 2

Candidates were given a pictorial image of a pawl and ratchet mechanism and a front elevation of the pawl.

Candidates were required to complete the drawing of the pawl by adding the R25mm arc, using geometrical construction to find the centre of the arc.

The expected response was to **find the centre by adding the two radii and use point A. the arc must tangential touch the circle and point A.** This question proved to be a challenge to most of the candidates. Very few were able to attain full marks. Most candidates that attempted this question were bisected the centre line and draw an arc, without geometrical construction and this resulted in the loss of marks.

Question 3

For this question candidates were given a pictorial and sectional view of two joined blocks.

The expectation was that they would use two sets of hatching running in opposite direction, and lines which were to be of equal distances. This question was poorly done. Very few candidates were able to amass the maximum three (3) marks. Most of the candidates could only attain 1 mark. Common errors committed by candidates were; drawing the hatching lines facing the same the direction yet there were two different blocks which needed to be hatched differently, secondly, most candidates could not draw the hatching lines to be equal distances.

Question 4

For this question candidates were given a drawing of a metal plate with a circular hole.

Candidates were expected to dimension the drawing with the length 70mm, height 40mm and diameter 20mm. Very few candidates were able to collect the maximum marks. Others failed to draw dimension lines with arrows head, dimensions were inaccurate positioned.

B2 – Resistant Materials

Question 1

This question required candidates were given a partially exploded wooden table. The top was made from boards glued edge to edge.

(a) Candidates were required to name the type of cramps that can be used to hold the boards together while the glue sets.

The expected response was **sash cramp**. This question was well done; a very large number of candidates were able to come up with expected response. There were very few who deviated from the expected response. The common error was G cramp, and this was not awarded with the allocated one (1) mark.

(b) Candidates were required to state one purpose of applying finish onto to the fable.

The expected responses were to **enhance appearance and for protection**. This question was not very well done, only a minority of the total candidature was able to come up with expected response. Other candidates gave responses such as to be water resistant, to be strong, and these were not accepted.

(c) Candidates were required to state a solvent that can be used to clean the brush after using varnish.

The expected response was **turpentine**. Very few candidates were able to come up with correct response. Most candidates were giving responses such as petrol, paraffin, water etc. This resulted in the loss of marks.

(d) Candidates were to name and sketch a joint that can be used at A on the table.

The expected response was a **housing joint, dowel joint** and a neat sketch of the joint. This question was poorly done; a majority of the candidates were not able to give expected response. Many candidates were giving deviating answers such butt joint, edge to edge, screws, mortice and tenon and many more that were not awarded the allocated one (1) mark.

(e) Candidates were also required to sketch the joint mentioned. .

Only a fair number of the total candidature was able to give the expected response. Some candidates drew a different joint from what they stated, others lost a mark for showing one part clear and the other not so clear.

Question 2

For this question candidates were required to name type of screw.

The expected response was **round head screw**. A fair number of candidates was able to give the expected response. There were some candidates who gave responses such as half round screw, raised head screw, countersink head screw and these responses could not be awarded the mark.

Question 3

Candidates were asked to explain the process of annealing mild steel.

The expected responses were **to heat the metal red hot and allow it to cool slowly**. This question was poorly done; many of the candidates were not able to give expected response. Many candidates were giving deviating answers such as galvanizing, case hardening and many more that were not awarded the allocated one (1) mark.

Question 4

(a) Candidates were required to describe a thermoplastic.

The expected responses were that **it can be heated and reformed several times, not cross linked, it has a plastic memory**. A minority of candidates were able to give the expected response. Others gave many different answers such as once heated it become permanently hard. and this response could not be awarded with the one mark available for the question.

(b) Candidates were asked to give an example of a thermoset.

The expected response was **polyester resin, epoxy resin, Urea- Formaldehyde, melamine** etc. This question was poorly done, most candidates were not able to come up with expected response; instead they gave responses such as ABS, acrylic, PVC etc. This resulted in the loss of marks.

Question 5

For this question candidates were given a sketch of a mild steel piece that cracked during bending. Candidates were required to explain what could be done to the mild steel to prevent cracking while bending.

The expected answer was **to bend it while red hot**. A majority of candidates were not able explain what could be done to prevent cracking. Most candidate were giving answers like painting, varnishing and using a mallet. which were unfortunately not accepted.

Question 6

For this question candidates were to complete the table by naming and classifying the metals used to manufacture the products shown.

The expected response for the water tap was **copper or brass**. This question was fairly done, almost half of the candidates were able to come up with the expected response. There were those however, who came up with responses such as aluminum gold and plastic. These responses were not accepted and this resulted in the loss of the one (1) mark allocated to this question.

The expected responses for the plane blade were **high carbon steel, cast steel or tool steel and classified as ferrous metal**. A fair number of the total candidature was able to give the expected response. The other fraction gave dissenting responses such as mild steel, cast iron and others which were not welcome for this question. The expected response for the saucepan was **aluminum and stainless steel** and classified as **non-ferrous** metal. A majority of candidates performed fairly well in this question. There were those few who gave deviating responses such as copper, brass, etc. and these could not attain the mark.

Question 7

Candidates were given an image of a product made of plastic.

(a) This question required candidates to name a plastic forming process that can be used to produce such a product.

The expected response was **vacuum forming**. A very small fraction of the candidates was able to come up with the expected response. So many of the candidates gave stray answers such as press forming, heating and these were not rewarded with the allocated one (1) mark

(b) For this question candidates were required to name a suitable plastic for making such a product using the process named in (a).

The expected response was **ABS**. This question was poorly done; most of the candidates were not able to give expected response. Many candidates were giving deviating answers such as PVC, thermoplastic, acrylic plastic and all these were not accepted by the examiners.

B3 – Systems and Control

Question 1

Candidates were to define a mechanism.

The expected response was **a device that changes input motion to a desired output motion**. A slightly less than half of the total candidature was able to come up with the correct response.

Question 2

Candidates were given an image of a pair of scissors.

(a) Candidates were asked to name the class of levers into which a pair of scissors belong.

The expected response was **class.1** This question was fairly done, as reasonable number of candidates were able to give the expected response. Some candidates gave varying responses such as second class or third class and unfortunately these responses could not be rewarded.

(b) Candidates were required to name the types of motion produced by the handles as the scissors is in use.

The expected response **was oscillation motion**. Only small minority of the total candidature was able to come up with correct response. Common wrong responses were reciprocating motion, rotary motion, and linear motion, obviously these were not awarded with marks.

- (c) For this question candidates were required to name the type of force exerted by the blade on the material being cut.

The expected response was **shear force or shearing force**. A majority of candidates were able to give the expected response. Other common responses that were off the mark were compression force and torsion force.

Question 3

Candidates were given two visual showing types of mechanism.

- (a) Candidates were asked to name a machine that uses mechanism A.

The expected response was **a bicycle**. This question was well answered as a majority of the candidates were able to give a positive response. There were fewer candidates who gave dissenting responses such as chain and sprocket, and this response could not be rewarded.

- (b) Candidates were asked to state advantage of mechanism A when compared to mechanism B.

The expected response was **it has a positive engagement or does not slip**. Quite a majority of the candidates were able to come up with expected response, in essence this question was well done. There were some, however, who gave deviating responses such as does not tear, strong, does not slid, and unfortunately these responses were not accepted resulting in the loss of the one (1) mark allocated to the question.

- (c) For this question candidates were required to give specific names for the two mechanism.

The expected response were **mechanism A chain and sprocket and mechanism B belt and pulley**. A fair number of the total candidatures was able to give the specific names of the two mechanisms. Others gave dissenting responses such as chain mechanism, chain drives for mechanism A and for mechanism B the gave responses such as pulley drive or system mechanism etc., which were not accepted.

Question 4

For this question candidates were given visual of a chain of gears.

- (a) This question required candidates to explain the purpose of the idler gear.

The expected response to **transfer motion without changing the direction**. Only a minority of the total candidature was able to give the expected response. Other candidates gave dissenting responses such as rotate in oppose direction, improve speed, and these responses were not awarded with any mark.

Question 5

Candidates were given two visual of beams each supported on two stands.

(i) Candidates were required to state type of force each beam subjected to.

The expected response was **bending force**. This question was fairly done, as a reasonable number of candidates were able to give the expected response. Some candidates were giving response such as compression force, unfortunately this response could not be rewarded.

(ii) Candidates were required to name the beam which is likely to fail easily as the force is increased.

The expected response was **B**. A significant number of candidates were able to give the expected response. Other candidates gave A as their response to this question, and were not awarded a mark.

Question 6

For this question candidates asked to name the two types of structures that are combined to form a wheel barrow.

The expected responses were **a frame and a shell structure**. A majority of candidates were able to get this question right. However, there were those that came up with other responses such as natural structure, man-made structure and were not accepted.

Question 7

This question required candidates to define a structure.

The expected response was **anything that resists loads and forces**. A majority of candidates were able to give the expected response.

Question 8

Candidates were given an image of a roof structure.

(a) Candidates were required to label a struct and a tie.

The expected response was to draw arrows and label struct and tie on the roof structure. This question was fairly done as almost half of the candidates were able to come up with the expected response.

(b) Candidates were required to explain why this structure is very rigid.

The expected response was **triangulation has been used or a triangle is a very rigid structure**. This question was poorly answered, only a minority of the candidates were able to come up with the expected response. Other candidates gave deviating responses such as strong, because it has many members, it has a struct and a tie. Other candidates left the question unanswered.

Question 9

Candidates were given an image of a mechanism.

(a) This question required candidates to name the type of mechanism.

The expected response was **cam and follower**. There were fewer candidates who were able to give the expected response, other candidates gave deviating responses such as pear- shaped cam, off centre cam.

(b) For this question candidates were asked to complete the sentence.

The mechanism converts rotary motion to **reciprocating** motion. This question was fairly done as almost half of the candidates were able to come up the expected response. The other half of the total candidature gave dissenting responses such as oscillation motion, linear motion, and they were not accepted.

(c) Candidates were required to state the specific name of the part of the mechanism indicated by arrow A.

The expected response was **pears shaped cam**. This question was poorly done, only a minority of the candidates were able to come up with the expected response. Most of the candidates left the question unanswered.

Paper 537/02

COURSEWORK

Eighty-one (81) centres registered candidates for the coursework. Of the centres, one thousand three hundred and eighty-seven (1387) candidates were registered but one thousand three hundred and fifty-four (1354) submitted work for the 2024 examination. Thirty-three (33) candidates did not submit their coursework. The number of candidates who submitted their work indicates a decrease when compared to the year 2023 where one thousand six hundred and fourteen (1614) submitted their work.

The coursework for the Junior Certificate is similar to the EGCSE in that it is a school-based component of the syllabus that is compulsory to all candidates registered for Design and Technology. Each candidate undertakes a personally identified project centered on the chosen prescribed theme (**CONTAINERS**). The coursework is expected to be worked over the final two terms of the year. Candidates' folders are then presented for marking.

COMMENTS ON INDIVIDUAL ASSESSMENT OBJECTIVES

Theme analysis: The theme for this year was 'CONTAINERS'

- Definition – this part of objective was well done by most candidates. Most candidates defined the theme by providing two definitions which is highly commendable.
- Bubble chat – in this part of the objective candidates were expected to place the theme in the centre and link it to the general areas around. The general areas were to be linked to specific areas. Most candidates did well in this part, however there were those who placed areas that were specific around the theme as a result lost some marks.
- Area of interest – most candidates indicated the area of interest. There were some who did not indicate the area of interest and as a result lost marks for that part.

Identification of the need

- Situation – most candidates performed well in this part of the objective. However, there were those whose situation lacked some elements that make a well written design situation. Such elements are location, need, user(s) and function. Statements that lacked any one or more of these elements resulted in the loss of marks.
- Problem – most candidates performed well in this part of the objective. However, candidates that did not outline a clear problem lost marks in this part.
- Design Brief – most candidates produced a clear statement of intent which was highly commendable. However, there were instances where candidates named the product they intended to make which resulted in the loss of marks.

Research into design brief resulting in specifications

- Existing ideas - Very good work was seen that demonstrated an excellent understanding of the requirements. Candidates should note that research should cover a wide range of existing ideas; ideas must not be of single concept and also include relevant identified and collected data. However, it is no use pasting in pictures without making meaningful evaluation of the existing ideas (stating two advantages and two disadvantages).
- Conclusion - Most candidates' conclusions on existing ideas lacked meaning. They did not draw their conclusion in relation to the design brief. Some were choosing the best ideas instead of concluding on the existing ideas.
- Design Specifications - It was good to note that most candidates included the design specifications in their research, although to some candidates it was less specific. Design specifications has many sub-topics; however, function is the most important. It is highly recommended that the function should not be left out when providing specifications.

Generation of ideas

- Ideation - Many candidates produced a wide range of ideas which were properly evaluated. Some candidates displayed good graphic skill. However, some candidates did not produce their own ideas but tried to copy and draw the existing ideas, as a result lost some marks in this part. Candidates should be discouraged from focusing on a single concept and producing ideas similar to the existing products. Candidates are advised to indicate their chosen idea and justify their choice. Candidates used common methods of drawing techniques, including two-dimensional and pictorials, effectively. Colouring and shading help improve the quality of presentation. Candidates who did not annotate and show constructional details in this part lost marks.
- Selection matrix - A lot of candidates lost marks due to failing to provide evaluation notes of the possible solutions against the specifications. In this space, most candidates repeated the specifications instead of commenting on how each idea performs against each specification. Candidates are also advised to produce a key for the evaluation matrix.
- Chosen idea – most candidates were able to state the chosen idea which was good. However, most candidates were not able to justify using the specifications, as a result lost some marks.

Development of proposed solution

Even this year, this objective was a challenge to most candidates. Most candidates were drawing exploded views and showing constructional details instead of showing details that clearly indicate suggested changes to improve the chosen idea and justify the changes. Most candidates made mock-ups which is highly commendable. Candidates were expected to draw and render the final idea with all justified changes included. However, most candidates did not do this part of the objectives, and as a result lost some marks. Only a few candidates made reasoned decisions about form, materials, construction methods etc.

Planning for production

Most candidates produced some good clear working drawings which is highly commendable. Few centres performed poorly in this section. Candidates had well drawn, well dimensioned working drawing. Some candidates did not produce the planning for the production part as a result lost some marks. Candidates are encouraged to include tools needed to produce the artifact and the processes involved.

Product realization

The level of performance in general was quite good for this objective which was highly commendable. Candidates should be encouraged to produce artefacts of good standard and quality.

Testing and evaluation

This objective was not done well. Most candidates' testing was superficial in that it did not consider the environment for which it was designed. The use of pictures with comments to show the evidence for testing is to be encouraged. Candidates were expected to evaluate their products against the specifications. Many candidates lost marks in this section because they did not evaluate but simply re-wrote their design specifications. In these objective candidates were also required to suggest future modifications and give justification. This part was done well by most candidates, which was highly commendable.