A level Design and Technology

Online training

18OAT03

The session in a ‘nutshell’

Session agenda

- Log in: 3.45 – 4.00pm
- Introduction: 4.00 pm
- Overview of new specification
- Candidate responses
- Break
- Marking activity
- Plenary and questions
- Finish: 6.00 pm

Aims and objectives

- Understand the assessment requirements of the new specification.
- Explore the paper structure and new types of questions.
- Review student responses to questions and understand how to accurately apply the mark scheme.
- Understand how we can support you.
- Be able to ask questions and share good practice.

Reasons we are here today

The reasons for mock marking training

When marking examinations it is important that there is consistency between how the mark scheme is applied by the Principal Examiner and all other examiners who are marking.

Mocks marking training is intended to provide you with the knowledge of how Pearson's examiners interpret the mark schemes for a range of questions, including short open responses, extended written responses, drawings and calculations.

This will give you guidance of how to interpret mark schemes for both sample assessment materials and also, in the future, past papers. In turn, you will then be able to provide your students with more accurate marks for their mock examinations and be able to use these more effectively to set targets and estimate grades.

Polls to get to know the delegates

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1. How long have you been delivering/teaching Design and Technology?	1. I'm new to the delivery 2. 1–3 years 3. More than 3 years
2. Were any of your students entered for the 2018 A/S examination series?	1. Yes 2. No, my students will be taking exams for the first time in the next (2019) series
3. Were their results what you expected them to be?	1. Yes, we were pleased with their achievement 2. No, my students did better than expected 3. No, I expected my students to have done better
4. Did you/your students have any issues with the 2018 paper?	• Delegates enter the reasons in the chat panel
5. What are the key reasons for session attendance?	• Delegates enter the reasons in the chat panel prior to the session start
6. Is there a single most important thing you hope to take away from the session?	• Delegates enter the reasons in the chat panel prior to the session start

Examination overview

Overview

Changes to the assessment requirements of the qualification

- The key change to the assessment requirements of the qualification is that the examination is now worth 50% of the total mark, with the NEA (non-examined assessment) part also being 50%.

- Candidates will be assessed through a single examination that covers a broader specification of Design and Technology knowledge.

Structure of the examination Component 1

- Written examination: 2 hours and 30 minutes
- **50%** of the qualification
- 120 marks
- The paper consists of a variety of questions designed to test candidates' knowledge and understanding of a range of the specification.
- Candidates will be required to use a variety of writing, drawing and calculation skills in order to complete the questions.

Structure of the examination Component 1

Candidates are required to answer ALL questions.
The questions will cover a variety styles, each with a **command** word at the start of the question, designed to guide candidates towards the style of answer required.

The questions will include the following:

- Short open (1–2 marks)
- Medium open (3+ marks)
- Long open (6+ marks)
- Calculation
- Drawing

Questions will be related to contexts.
Candidates are allowed to use calculators in the examination.

Command verbs – Overview

- Papers will use a range of appropriate command verbs which will vary from paper to paper. These are consistent across both A/S and A level papers:
  - Give/State/Name
  - Describe
  - Describe using sketch and notes/annotation
  - Calcalculate
  - Explain
  - Outline
  - Construct/Produce/Draw
  - Consider/Discuss
  - Justify
  - Analyse
  - Evaluate
- A **full** definition can be found in Appendix 5 (pages 62–63 of the specification).

Link words – Overview

Examples:

- So
- Because
- Therefore
- As a result
- Resulting in
- Which means
- However

It is not essential for candidates to use these specific words, but in answers that require linked responses they can help candidates structure their responses.

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Sample assessment examples:

How the mark scheme is applied –

First SAM

Examples

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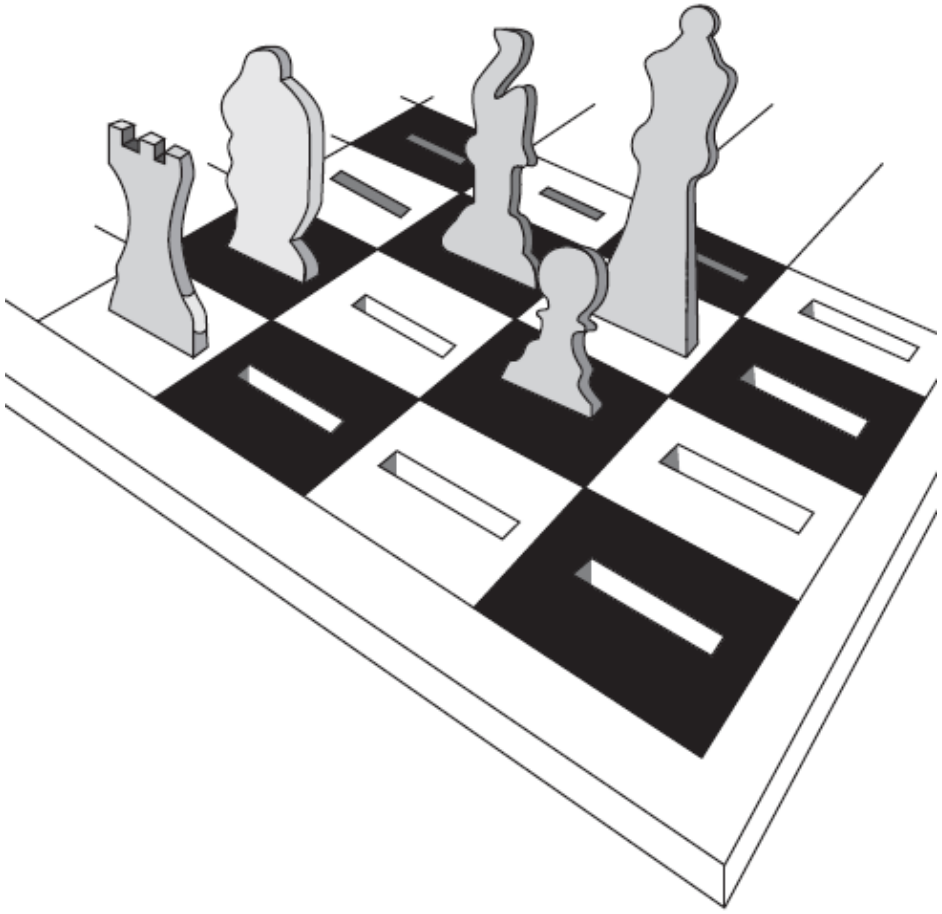
The following THREE example questions and answers come from the First SAM.

- Q1b shows a simple explain for 2 x 2 marks, requiring a point and **one** linked response.
- Q1c shows a **new** style of explain for 3 marks which requires a point and **two** linked responses.
- Q5bii shows a question which uses a levels based mark scheme (new to the A level this year).

Sample responses – Question 1(b and c)



The following sample questions relate to the chessboard shown.

Sample responses – Question 1(b)

(b) Explain **two** benefits, other than cost, of using plywood rather than solid wood for manufacturing the chess pieces.

(4)

Answer:

Plywood is made of a number of layers which are glued at right angles to each other which means it has no short grain so is equally strong in all directions.

Plywood can be made without including the knots which makes it more aesthetically pleasing.

Sample responses – Question 1(b)

Mark scheme:

Question number	Answer	Additional guidance	Mark
1(b)	Any **two** explanations that include identification of a benefit (1) and linked justification of that benefit (1). • Plywood is a dimensionally stable material (1), which means it will not twist/warp/the figures will stay flat (1). • Plywood can be knot free (1), which means there is no chance of any bits falling out/which would result in a good quality product visually/ aesthetically/functionally (1). • Plywood has no short grain/has uniform strength (1) so small details will be less likely to break off.	Allow answers written in the negative referring to solid wood, e.g. solid wood is not a dimensionally stable material (1), which means it may twist/warp/figures will not stay flat (1).	(4)

Answer:

Plywood has no short grain so is equally strong in all directions.

Plywood can be made without including the knots which makes it more aesthetically pleasing.

1 mark can be awarded for the first response as **both** parts of the answer come from the **same** marking point.
2 marks can be awarded for the second response as there is a point made which is then correctly justified from a separate marking point in the mark scheme.

Sample responses – Question 1(c)

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The chess pieces could be made from acrylic.
(c) Explain **one** advantage of using acrylic rather than plywood for the chess pieces.

(3)

Answer:

Acrylic comes in a wide range of colours so there is no need to paint the two different colours needed, which makes it quicker and cheaper to produce.

Sample responses – Question 1(c)

Mark scheme:

Question number	Answer	Mark
1(c)	An explanation that includes identification of an advantage (1) and linked justifications of that advantage (1) + (1). • The edges of the acrylic will melt/won't change colour/won't burn if cut with the laser (1), therefore they will not require any additional surface/edge finishing (1), which speeds up manufacturing time/reduces manufacturing costs (1). • Acrylic is available in a wider range of colours/ pre-coloured/coloured throughout (1), therefore no colour/surface finishing needs to be applied (1), which reduces manufacturing time/reduces manufacturing costs (1). • Acrylic is self-finished (1), therefore no surface treatment is needed (1), which speeds up manufacturing time/reduces manufacturing costs (1). • Acrylic can be cast/injection moulded (1), therefore they will not require any additional surface/edge finishing (1), which speeds up manufacturing time/reduces manufacturing costs (1).	(3)

Answer:

Acrylic comes in a wide range of colours so there is no need to paint the two different colours needed, which makes it quicker and cheaper to produce.

Three marks can be awarded here as the candidate has made a point and then linked two justifications. The use of the connective words (shown in green) helps candidates to continue their response in a linked way.

Sample responses – Question 5(b)(ii)

This sample question relates to the scooter shown.

Sample responses – Question 5(b)(ii)

The manufacturer is considering two design options for the scooter wheels:
– Solid wheels, which would need to be replaced when damaged.
– Pneumatic (air-filled) wheels, which could be repaired when they get punctured.

(ii) Discuss the factors that need to be considered before deciding which option to produce.

(6)

Sample responses – Question 5(b)(ii)

Answer:

The manufacturer must consider a number of things. Firstly, where the scooter will be used and how it will perform on the chosen ground i.e. pavement or off road. The pneumatic tyres will give a more cushioned ride, which will make the ride smoother and also be able to take on rough ground more easily. However the rough ground may well contain things that can puncture the tyres.
Secondly the solid tyres will wear out much more slowly as there is more rubber in them. This means that there is little need for maintenance and purchase of replacement parts, thus reducing income.
Thirdly the design of the scooter may change if the wheels are made to be taken on and off for maintenance. This will have a knock-on effect on the quality of materials needed and the lifespan of the scooter, which in turn may have an effect on the environmental impact due to thrown away parts.

Sample responses – Question 5(b)(ii)

Mark scheme:

Question number	Indicative content	Mark
5(b)(ii)	**AO4 1b = 3 marks, AO4 1c = 3 marks** This question is about considerations relating to repair versus replacement and asks candidates to discuss this in the context of scooter wheels. Creditworthy responses will make connections which show understanding of factors that need to be considered, going beyond general knowledge. Candidates might refer to the following in their responses: • Durability of materials and the potential frequency of need for replacement or repair in relation to predicted lifespan of the scooter • Expertise and access to tools and equipment required of each option • Availability of and/or compatibility of generic replacement wheels • The environmental impact of each option • Effects on the performance of the product • How the design of the scooter/wheel will be affected by allowing for removal of the wheels by consumers • The potential impact of frequent removal on connected elements/parts of the scooter wheels	(6)

Sample responses – Question 5(b)(ii)

Level	Mark	Descriptor
	0	No rewardable content.
Level 1	1–2	• Superficial discussion that considers a narrow range of factors, demonstrating limited understanding. • Partial application of understanding to the context of the question.
Level 2	3–4	• Coherent discussion that makes some relevant links between a sufficient range of factors, demonstrating competent understanding. • Generally sound application of understanding to the context of the question.
Level 3	5–6	• Comprehensive discussion that makes effective links between a wide range of factors, demonstrating thorough understanding. • Considered and effective application of understanding to the context of the question.

Sample responses – Question 5(b)(ii) – marking points

The question is worded from the manufacturer's view point and the response follows this lead.

The wording in the response is **not** as per the mark scheme but covers the points in it's own words – perfectly acceptable!

The response covers a **number** of the points made in the indicative content.

The response covers a **range** of points made in the indicative content.

The points are often expanded (sometimes 2, 3 or even 4 layers) with relevant, correct and linked points.

There are both positive and negative points made.

This is a **top level** response: 6 marks can be awarded.

Marking activity

You will need to refer to the **updated** mark scheme and a question paper

Mark schemes

- The mark scheme is written with a **minimum** of one more answer than the question asks for.
- It is completed for the QPEC meeting.
- It is reviewed prior to the Pre-standardisation meeting – after seeing live scripts.
- Any correct answers examiners see during marking that are not on the mark scheme are added.
- Positive marking.

Marking activity

Short open questions

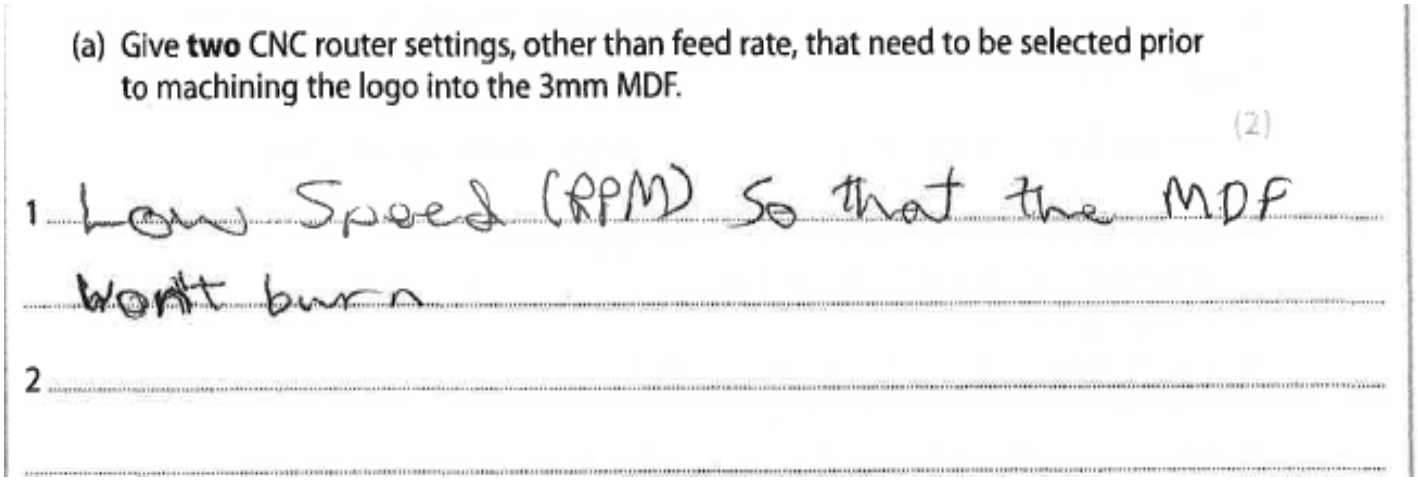
Short open questions 1–2 marks

- Q1a – Give two CNC router settings, other than feed rate, that need to be selected prior to machining the logo into the 3mm MDF.
- Q1b – MDF is a cost effective material.
  Give two further benefits of using MDF rather than solid wood for the front of the phone case.
- Q3a – A ruler and pencil are two tools that could be used to mark out the shape of the two halves of the model.
  Give two additional marking-out tools that could be used to draw out the two halves of the model.
- Q4c – Give two benefits of internet marketing for the consumer.
- Q2a – Explain one property that makes polypropylene a suitable material for injection moulding.

Q1a

0 marks

- It does not hit a correct BP in the marks scheme
- There is no need to give a justification for this type of question



(a) Give **two** CNC router settings, other than feed rate, that need to be selected prior to machining the logo into the 3mm MDF.

(2)

1 Low Speed (RPM) So that the MDF wont burn

2

Q1a

2 marks

- Type of material BP3
- Depth of cut BP1

(a) Give **two** CNC router settings, other than feed rate, that need to be selected prior to machining the logo into the 3mm MDF.

(2)

1 Type of material ~~cut~~ Router will be used in

2 ~~Depth~~ Depth/size of cutting tool that will be used in CNC Router.

Q1b

0 marks

- Neither answer hits a correct BP in the mark scheme

(b) MDF is a cost effective material.

Give **two** further benefits of using MDF rather than solid wood for the front of the phone case.

(2)

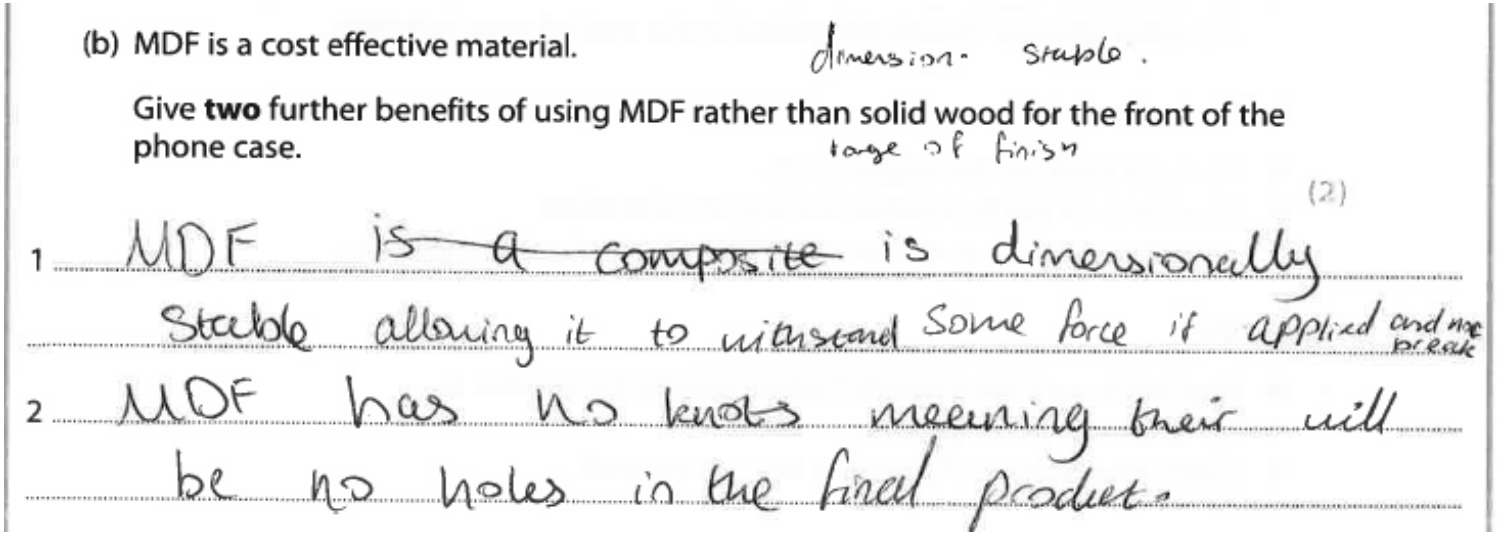
1 Durable, therefore can withstand knocks when dropped

2 easier to cut

Q1b

2 marks

- Dimensionally stable BP1
- No knots BP2
- There is no need to give a justification for this type of question



(b) MDF is a cost effective material. dimension- stable.

Give **two** further benefits of using MDF rather than solid wood for the front of the phone case. range of finish

(2)

1 MDF is ~~a composite~~ is dimensionally stable allowing it to withstand some force if applied and not break

2 MDF has no knots meaning their will be no holes in the final product.

Q3a

0 marks

1 a laser cutter to etch out the shape

2 a scalpel craft knife to etch the shape.

2 marks

- Set square BP2
- Stencil BP5

(a) Give **two** additional marking-out tools that could be used to draw out the two halves of the model.

(2)

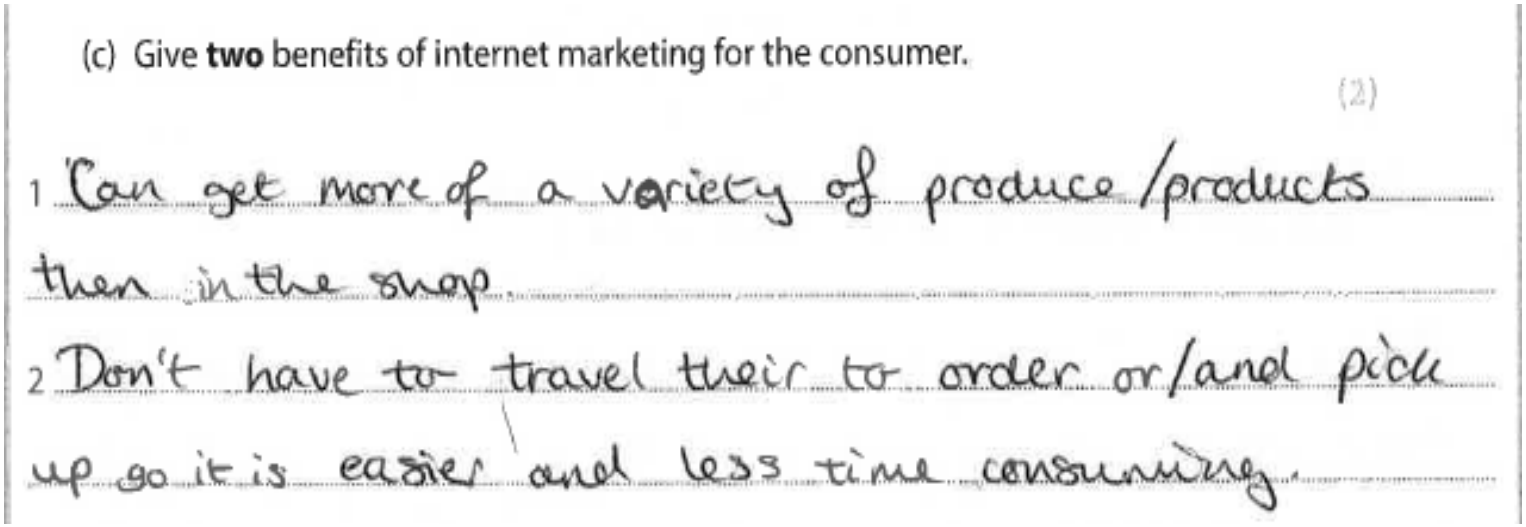
1 set square

2 stencil.

Q4c

2 marks

- More variety BP1
- Don't have to travel BP2



(c) Give **two** benefits of internet marketing for the consumer.

(2)

1 Can get more of a variety of produce /products then in the shop

2 Don't have to travel their to order or/and pick up so it is easier and less time consuming.

Q4c

1 mark

- Can be accessed anywhere BP2
- The second answer is **not** from the consumer's point of view

(c) Give **two** benefits of internet marketing for the consumer.

(2)

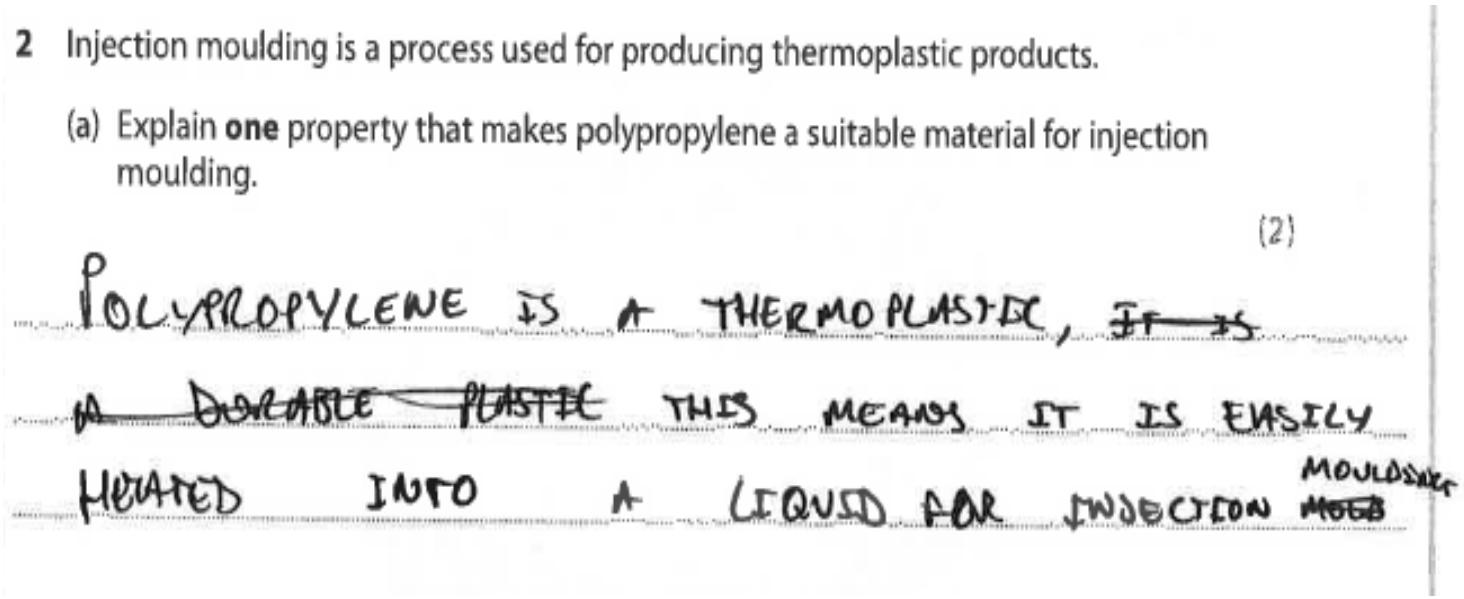
1 It has a much further reach as it can be accessed anywhere.

2 It is more eye catching to the user and is used more than other marketing techniques.

Q2a

1 mark

- Heated to a liquid BP1



2 Injection moulding is a process used for producing thermoplastic products.

(a) Explain **one** property that makes polypropylene a suitable material for injection moulding.

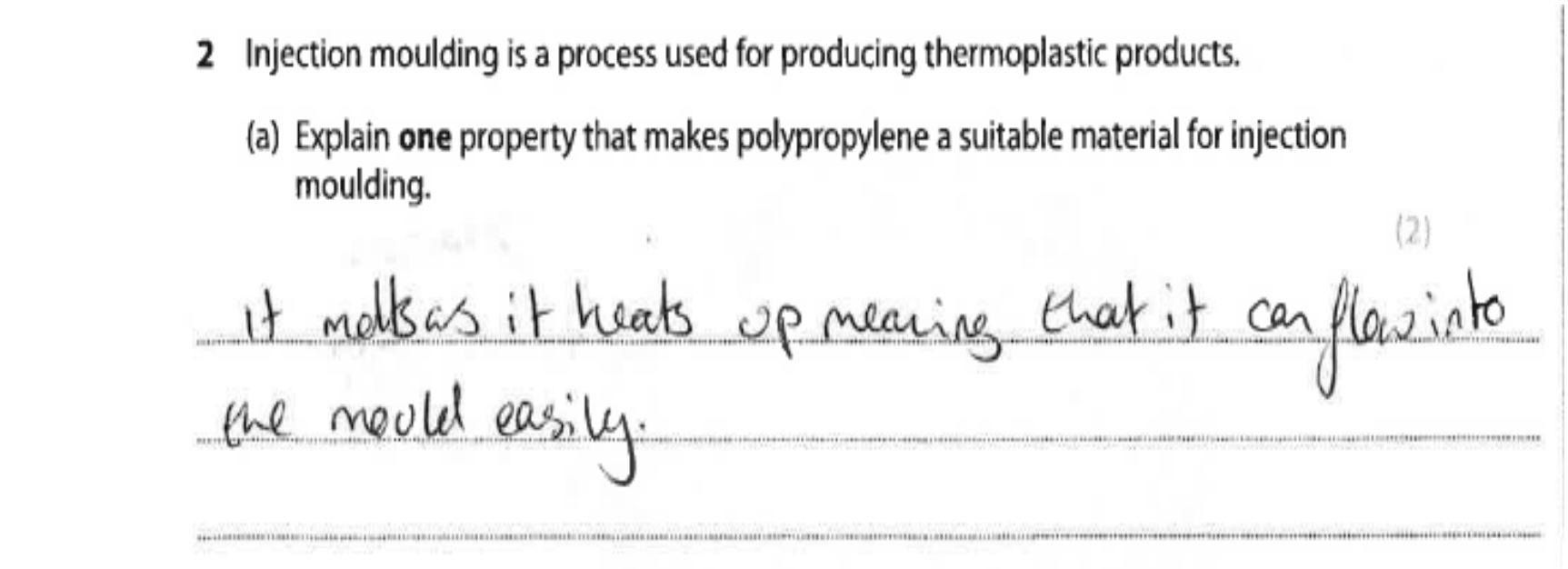
(2)

POLYPROPYLENE IS A THERMOPLASTIC, ~~IT IS A DURABLE PLASTIC~~ THIS MEANS IT IS EASILY HEATED INTO A LIQUID FOR INJECTION MOULDING ~~MOLD~~

Q2a

2 marks

- It melts (1) so can flow easily (1) BP1



2 Injection moulding is a process used for producing thermoplastic products.

(a) Explain **one** property that makes polypropylene a suitable material for injection moulding.

(2)

it melts as it heats up meaning that it can flow into the mould easily.

Q2a

0 marks

- Not correct for the question asked

2 Injection moulding is a process used for producing thermoplastic products.

(a) Explain **one** property that makes polypropylene a suitable material for injection moulding.

(2)

~~It is fluid~~ ~~It melt~~ It is coloured, and so won't require a coloured finish once the process is completed.

Marking activity

Medium open questions

Medium open questions 3–6 marks

- Q2c – Explain two advantages of using injection moulding rather than vacuum forming to manufacture the bowl.
- Q4d – Explain one reason why a company would carry out market analysis for their product.
- Q5a – Explain two characteristics of beech which make it a suitable timber for the toy train.

Q2c

1 mark

- It would be faster BP3

Explain **two** advantages of using injection moulding rather than vacuum forming to manufacture the bowl.

(6)

1 It would be faster and easier to produce. It would be moulded and then be ejected out and all thats left is to cut away excess on the bowl left from the mould. It is continuess.

2 less error, Since the mould can be used many times, with vaccum forming the mould may break or the plastic does not fit the mould in the right way.

Q2c

3 marks

- Gives even strength (1) meaning it lasts longer (1) BP2
- More complex shapes (1) BP3

Explain **two** advantages of using injection moulding rather than vacuum forming to manufacture the bowl.

(6)

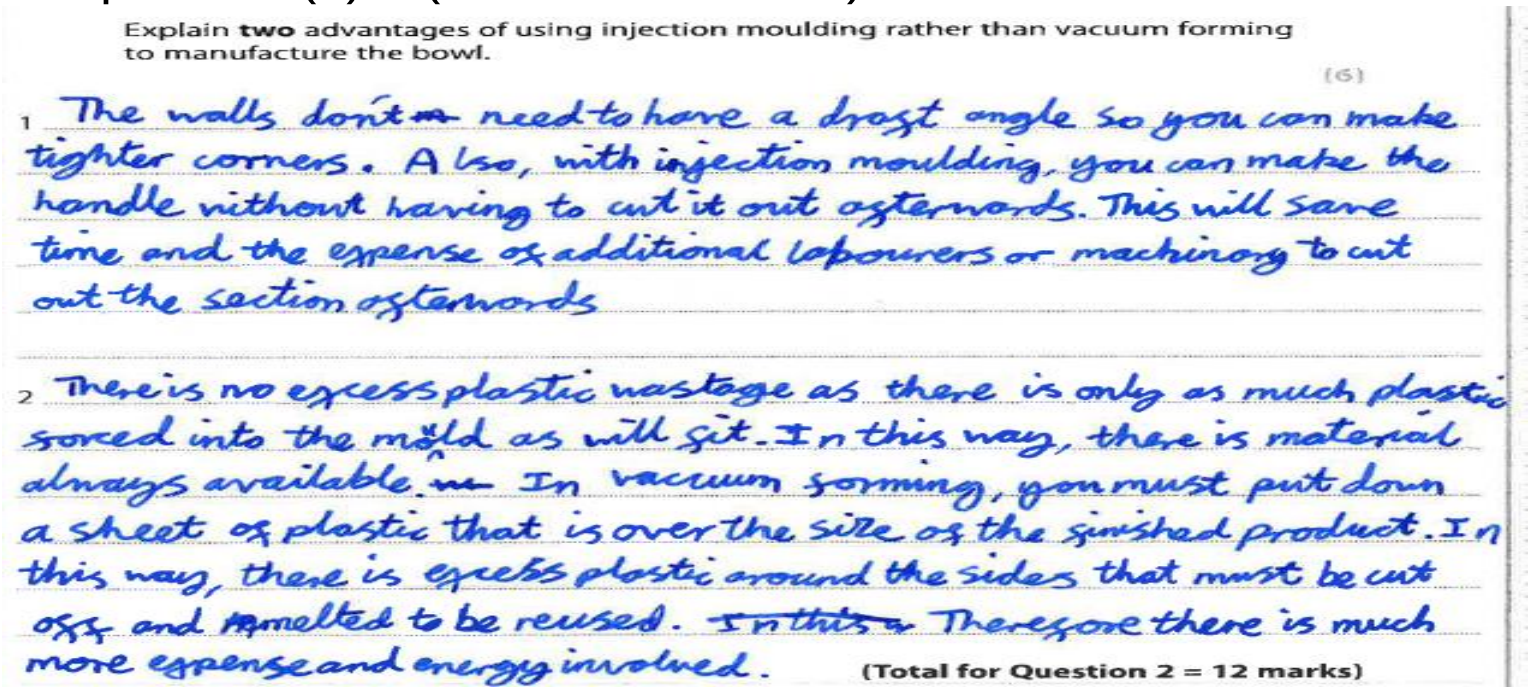
1 Injection mould gives even strength throughout the mould, meaning it is longer lasting and more durable. This is because in vacuum forming the plastic is stretched, this makes the plastic weaker at some areas.

2 Injection moulding also allows for more complex shapes to be used and where as ~~this cannot be~~ vacuum injection forming moulding can only do the outline of a mould.

Q2c

5 marks

- Make handle without having to cut it out (1) save time (1) and expense of labour (1) BP3
- No excess plastic wastage (1) so (vacuum forming) is more expensive (1) – (written in reverse) BP1



Explain **two** advantages of using injection moulding rather than vacuum forming to manufacture the bowl.

(6)

1 The walls don't ~~m~~ need to have a draft angle so you can make tighter corners. Also, with injection moulding, you can make the handle without having to cut it out afterwards. This will save time and the expense of additional labourers or machinery to cut out the section afterwards

2 There is no excess plastic wastage as there is only as much plastic forced into the mold as will fit. In this way, there is material always available. ~~we~~ In vacuum forming, you must put down a sheet of plastic that is over the size of the finished product. In this way, there is excess plastic around the sides that must be cut off and ~~re~~melted to be reused. ~~In this~~ Therefore there is much more expense and energy involved.

(Total for Question 2 = 12 marks)

Q4d

1 mark

- Can decide on target market (1) BP3

(d) Explain **one** reason why a company would carry out market analysis for their product.

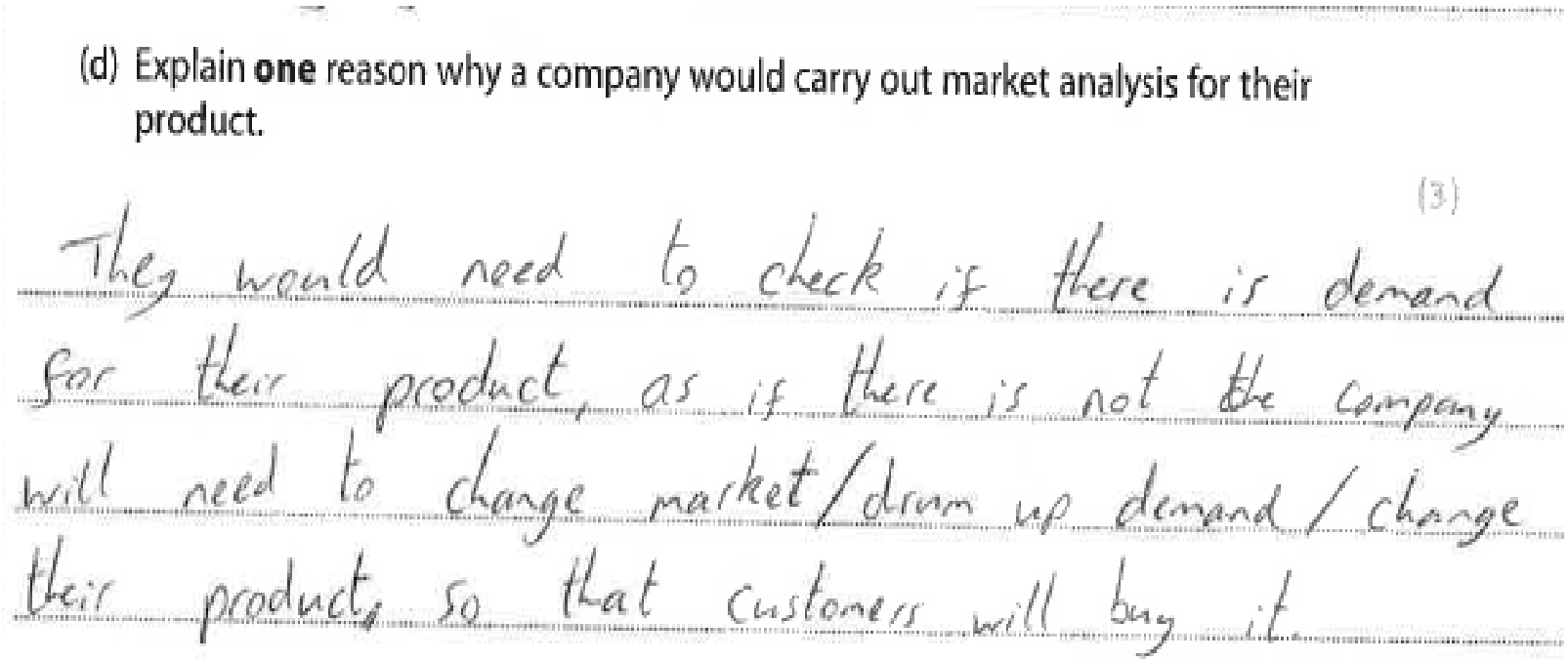
[3]

So they can decide on a target market group

Q4d

3 marks

- Check if there is demand (1) BP1 change product (1) BP2 so customers buy more (1) BP3



(d) Explain **one** reason why a company would carry out market analysis for their product.

(3)

They would need to check if there is demand for their product, as if there is not the company will need to change market / drum up demand / change their product, so that customers will buy it.

Q5a

2 marks

- Is durable so will last a long time (1) BP1
- Finishes well (1) BP2

Explain **two** characteristics of beech which make it a suitable timber for the toy train.

(4)

1 It [illegible] is durable so it will last for a long time resisting general wear

2 It also ~~[illegible]~~ finishes well

Q5a

4 marks

- Tough (1) withstand rough use (1) BP6
- Polishes well (1) BP2 would make it appealing (1) BP4

Explain **two** characteristics of beech which make it a suitable timber for the toy train.

(4)

1 Very tough material that will withstand rough use that kids may do to the product, without breaking.

2 Beech polishes really well so a coat of finish would make it very appealing to children.

Q5a

0 marks

- No awardable content

Explain **two** characteristics of beech which make it a suitable timber for the toy train.

(4)

1 Beech is a very cost efficient and very appealing. This will allow the kids to ~~beetech~~ carefully use it and if its break parents wont mind.

2 Beech comes in various shapes and sizes and can be easily cut and bent allowing the designer to make intricate designs.

Marking activity

Long open questions

Long open questions
6+ marks

- Q4e – Evaluate the decision to use rubber for the body of the remote control.

Q4e

5 marks

(e) Evaluate the decision to use rubber for the body of the remote control.

(9)

Rubber has a nice feel to it rather than that of wood or metal.

It also has a textured grip to fit and remain in the user's hand when required. So that it doesn't accidentaly fall out and potentially be damaged from the fall. Another advantage of a textured grip is that it allows the controller to be used more ergonomically, ie. the users fingers aren't slipping all over the place, allowing them to use it properly.

Q4e

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1 mark

(e) Evaluate the decision to use rubber for the body of the remote control.

(9)

Rubber was probably used because it can't get scratched so it won't get ruined and rubber lasts a long time before getting ruined so it's more sustainable.

Q4e

9 marks

(e) Evaluate the decision to use rubber for the body of the remote control.

(9)

Rubber is good for handheld devices because it gives good grip. this means that the control wont slip out of the users hands as easily however it can pick up dirt quite easily. So it would need to be cleaned using cleaning products. Rubber doesn't corrode so cleaning products would be safe to use on it, it is also good as it protects the electrics inside from weathering. It is quite a flexible material which means that it can be bent into shapes to cover the electrics inside & it wont break if it is dropped, which, again, protects the electrics inside. Rubber can come in a range of colours which means the aesthetic properties are good & the control can be sold in different colours to attract different audiences. It is also quite light so won't add very much weight ~~into the bags~~ if it's put into pockets or onto bags which makes it use friendly and finally, it is quite cheap compared to the plastics meaning that profits would be higher.

Marking activity

Calculation questions

Calculation questions 2–8 marks

- Q1d – Calculate the total volume of resin that is required to fill the logo. The logo is 0.5mm deep.

  Give your answer in mm^3 and correct to **four** significant figures.

- Q4f – Calculate how many days one battery will last.

Batteries required	Uses per day	Average use time per press	% of battery used per second
1	4	2 seconds	0.02%

Q4f

1 mark

Calculate the total volume of resin that is required to fill the logo. The logo is 0.5mm deep.

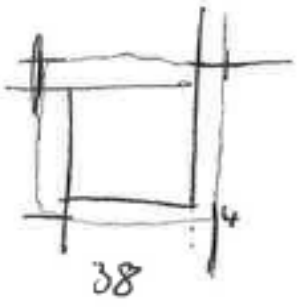
Give your answer in mm^3 and correct to **four** significant figures.

Show all of your workings.

$40 - 32 = 8$ $\quad 8 \div 2 = 4$

$40 - 4 = 38$

38



38×4

152×0.5

$= 76$

$152 + 76$

$30\ 8$

$4 \mid 120\ 32$ $\quad = 152$

Answer 228 mm^3

Q1d

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6 marks

(d) Figure 2 shows the front of the mobile phone case with the routed logo and the dimensions of the logo.

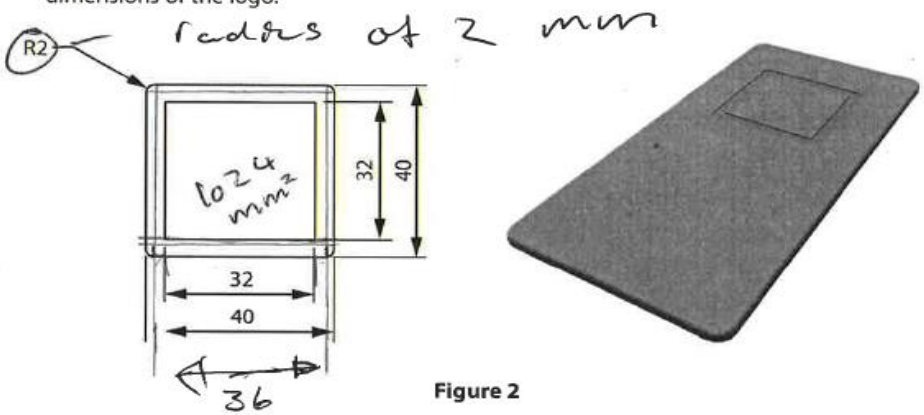

Figure 2

Calculate the total volume of resin that is required to fill the logo. The logo is 0.5mm deep.

Give your answer in mm^3 and correct to **four** significant figures.

Show all of your workings.

(7)

$32^2 = 1024\ mm^2$

$40^2 = 1600\ mm^2$

$A = \pi R^2$

$A = \pi 2^2$

$= 12.56$

$4 \times (2^2) = 16$

$1600 - (16\pi - 12.56)$

1596.56

$1596.56 - 1024 = 572.56$

$\frac{572.56}{2} = 286.28$

Answer 286.28

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS

Q1d

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3 marks

Calculate the total volume of resin that is required to fill the logo. The logo is 0.5mm deep.

Give your answer in mm^3 and correct to **four** significant figures.

Show all of your workings.

(7)

$40 \times 40 = 1600 mm^2$ 800

$32 \times 32 = 1024 mm^2$ 512

$1600_{mm} - 1024 mm = 576$

$V = A \times L$

$576 \times 0.5 mm = 288$

Answer 288.0 mm^3

Q4f

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1 mark

Calculate how many days one battery will last.

Show all of your workings.

$2 \times 4 = 8$

8×0.02

$= 0.16$

$1 \div 0.16 =$ Answer

$\frac{1}{0.16}$

.16
.32
.48
.64
.80
.96
1.12

6.25

Answer .....

Q4f

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2 marks

Calculate how many days one battery will last.

Show all of your workings.

2 X 0.02 = 0.04% used in 1 press

0.04 X 4 = 0.16% used in 1 day.

100 ÷ 0.16 = 625 days.

Marking activity

Drawing questions

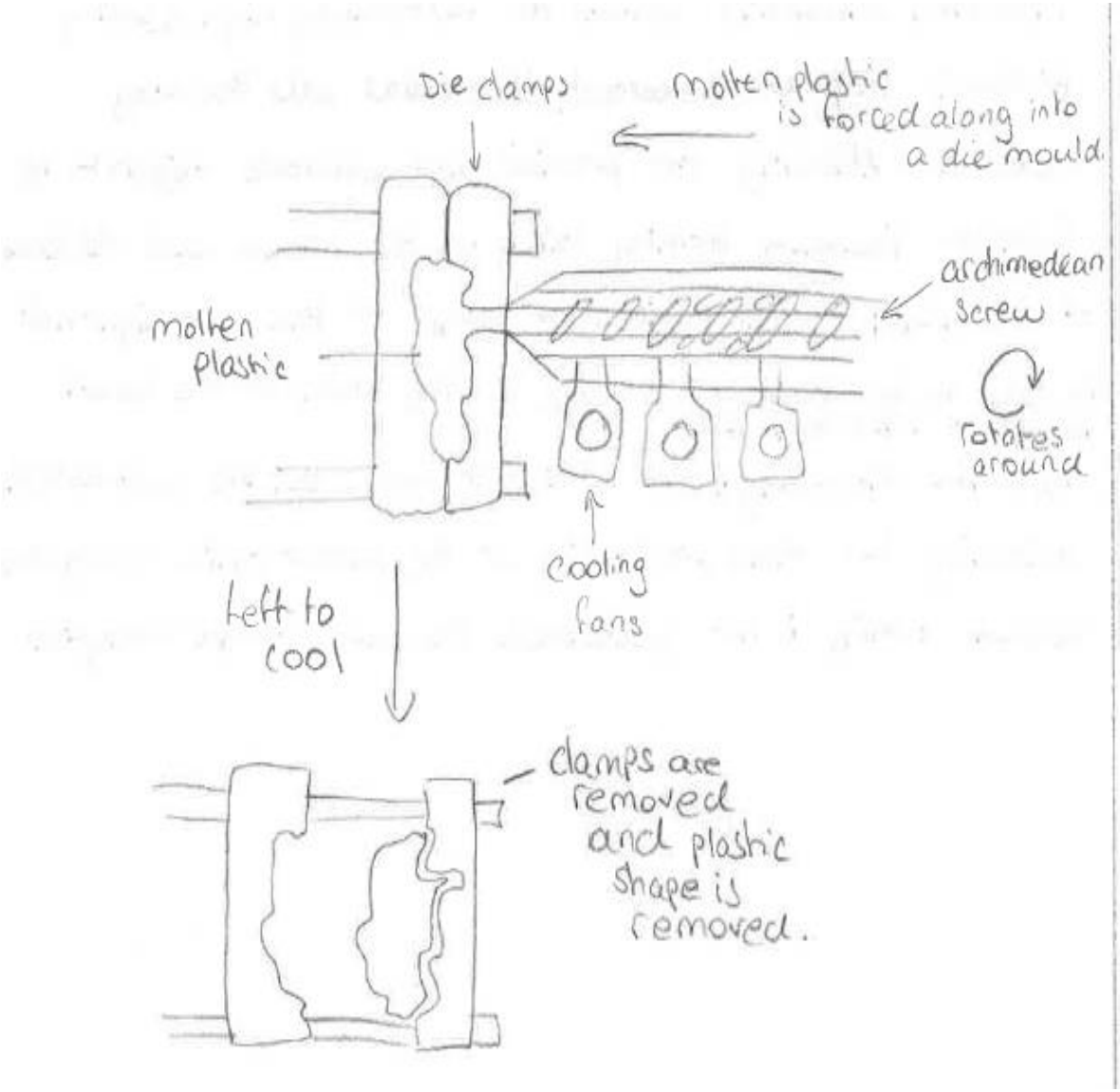
Draw/Label or Describe questions 4–8 marks

- Q2b – Describe, using labelled sketches, the process of injection moulding after the polymer has been heated.

- Q5c – Draw an accurate third angle orthographic projection of the train, to a scale of 1:2, on the grid provided.

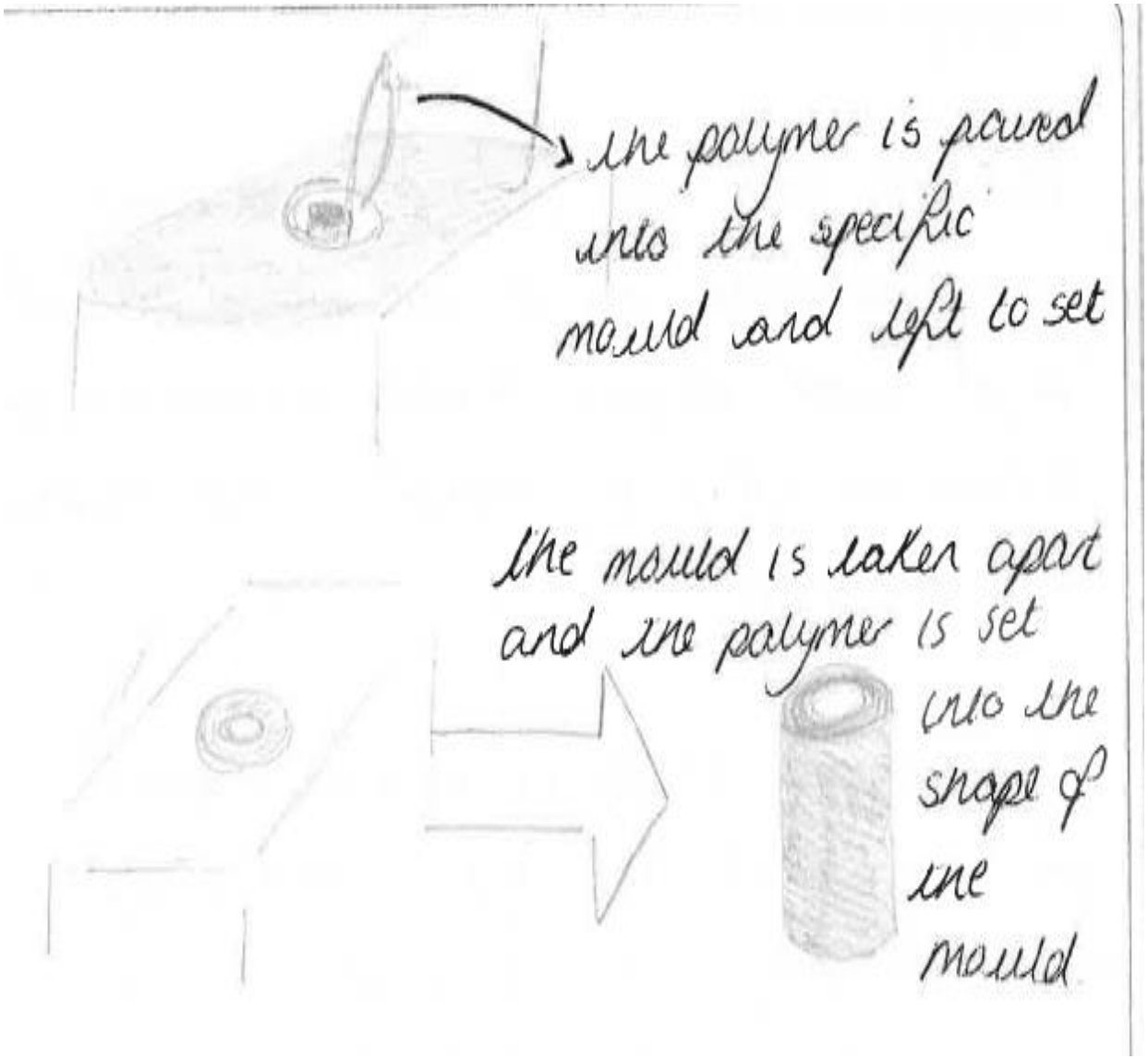
Q2b

4 marks


Die clamps
Molten plastic is forced along into a die mould.
molten plastic
archimedean screw
rotates around
cooling fans
left to cool
clamps are removed and plastic shape is removed.

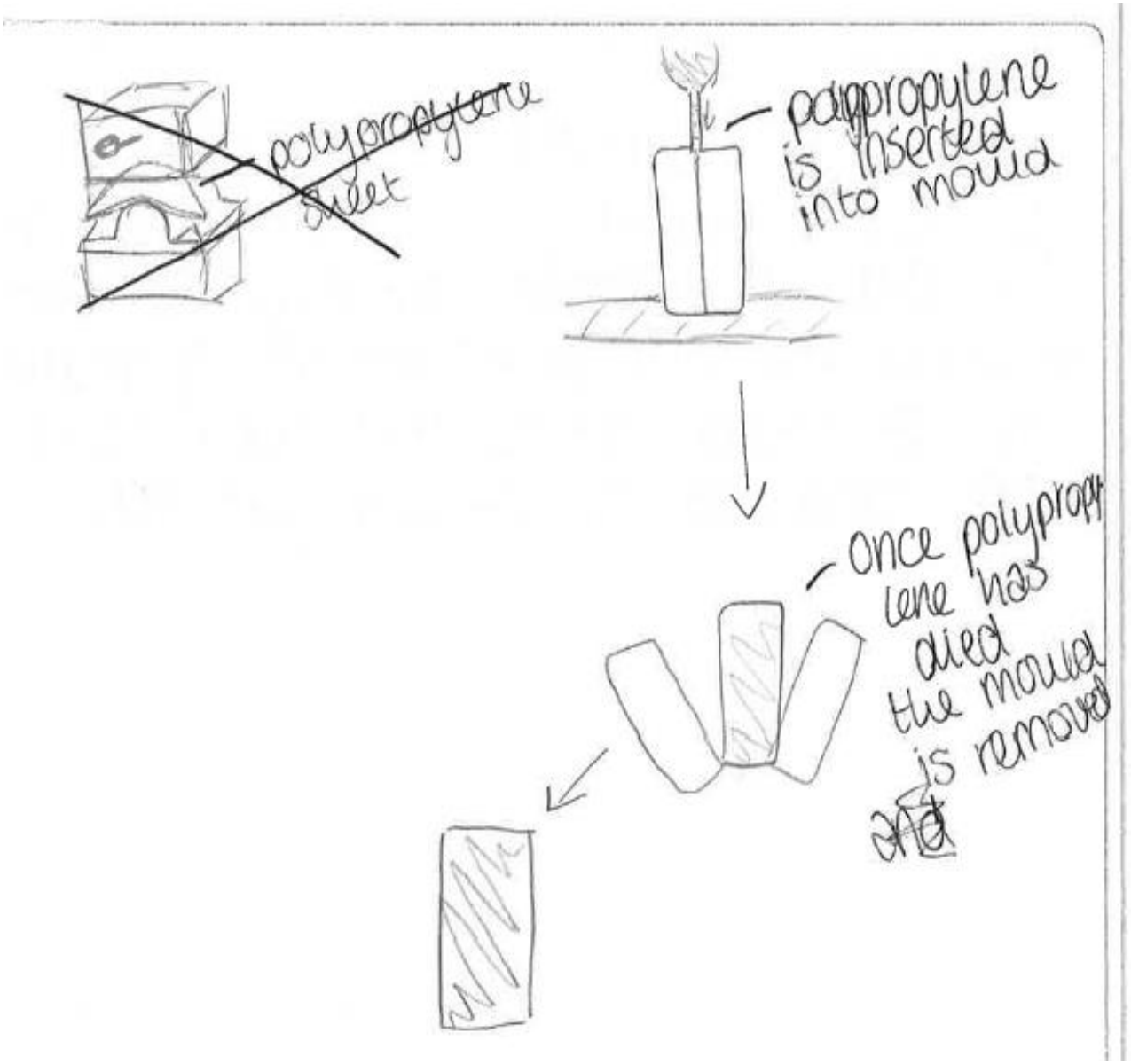
Q2b

0 marks


the polymer is poured into the specific mould and left to set
the mould is taken apart and the polymer is set into the shape of the mould

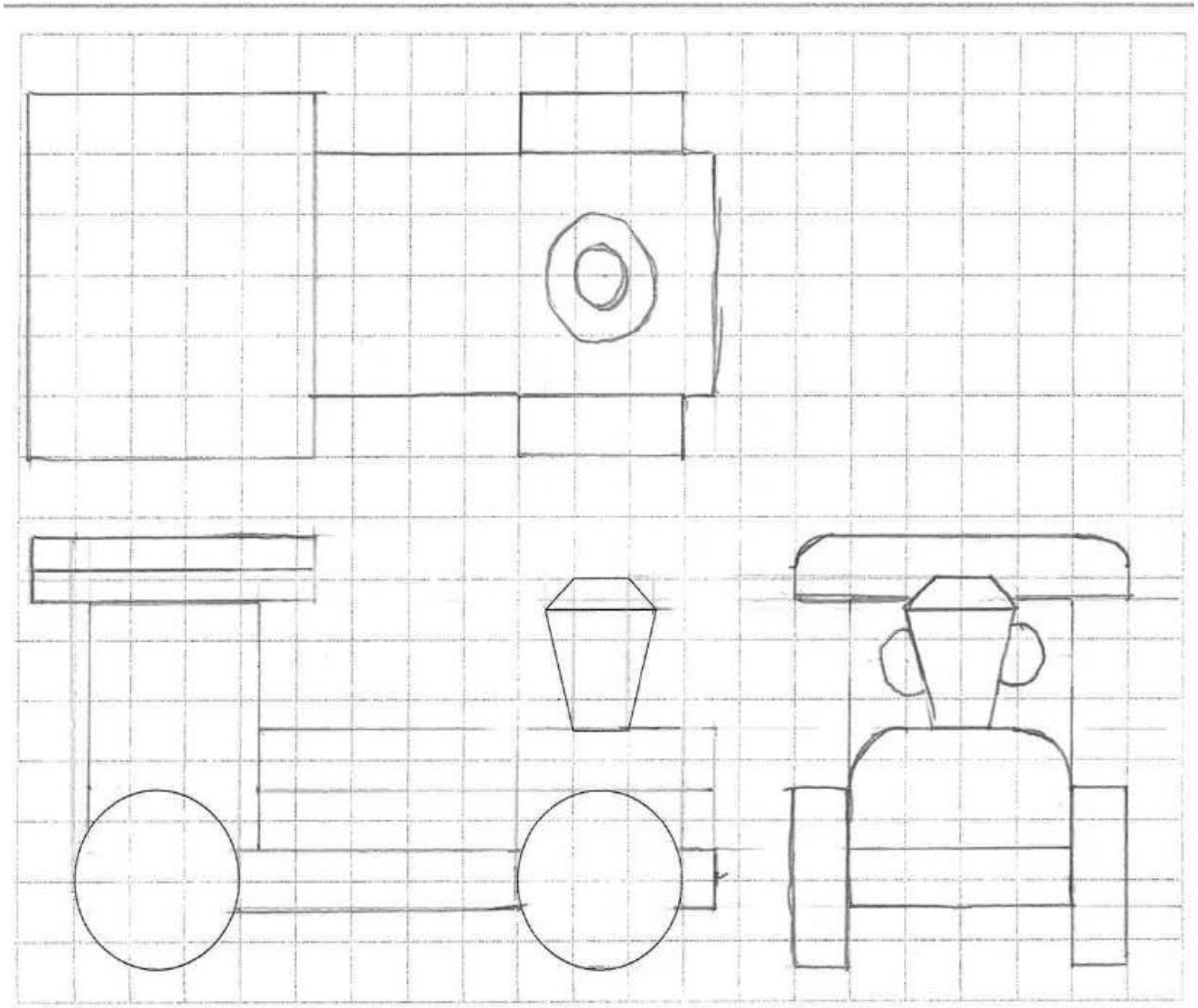
Q2b

2 marks


polypropylene sheet
polypropylene is inserted into mould
once polypropylene has cooled the mould is removed

Q5c

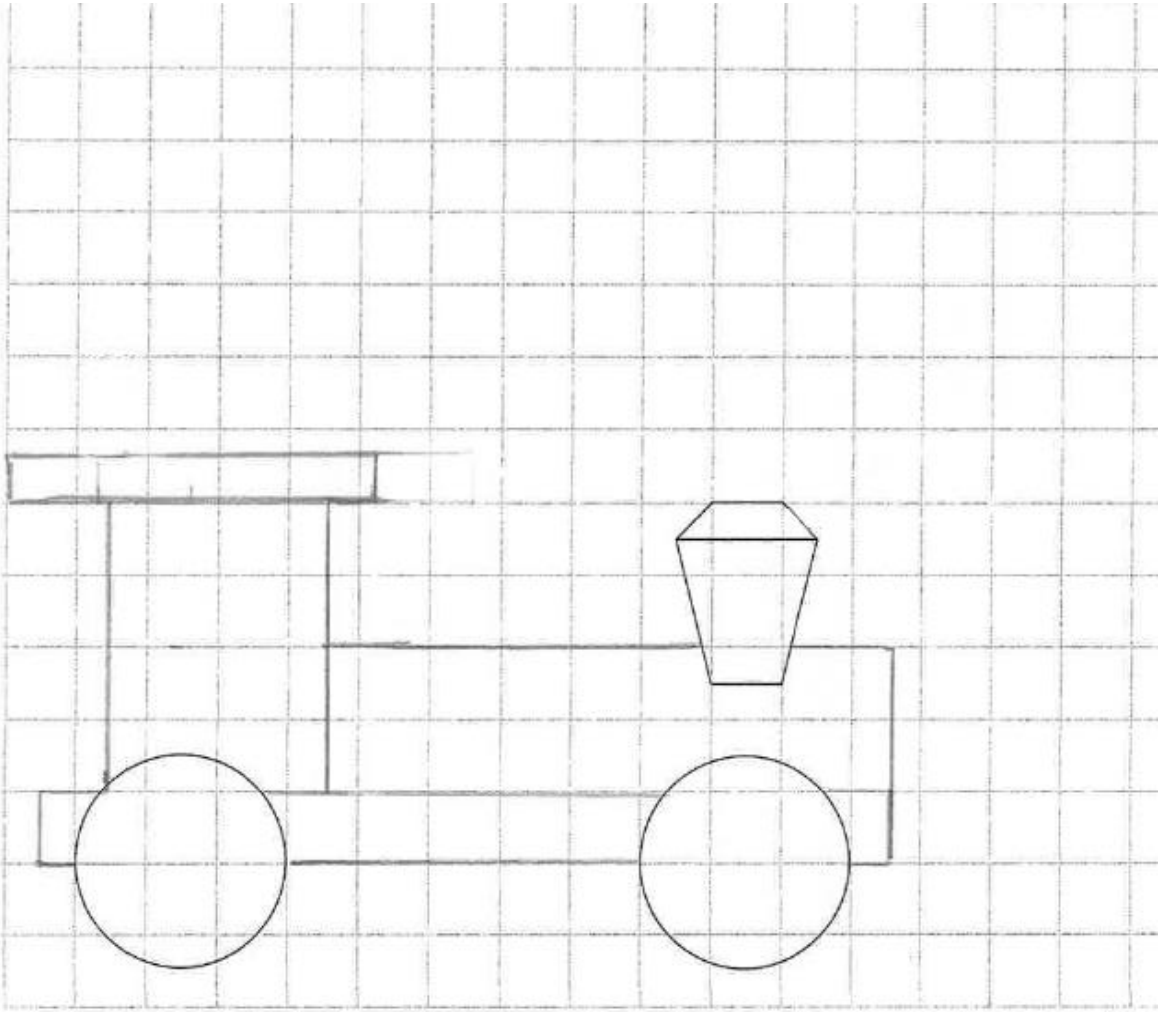
7 marks



Q5c

Pearson Edexcel

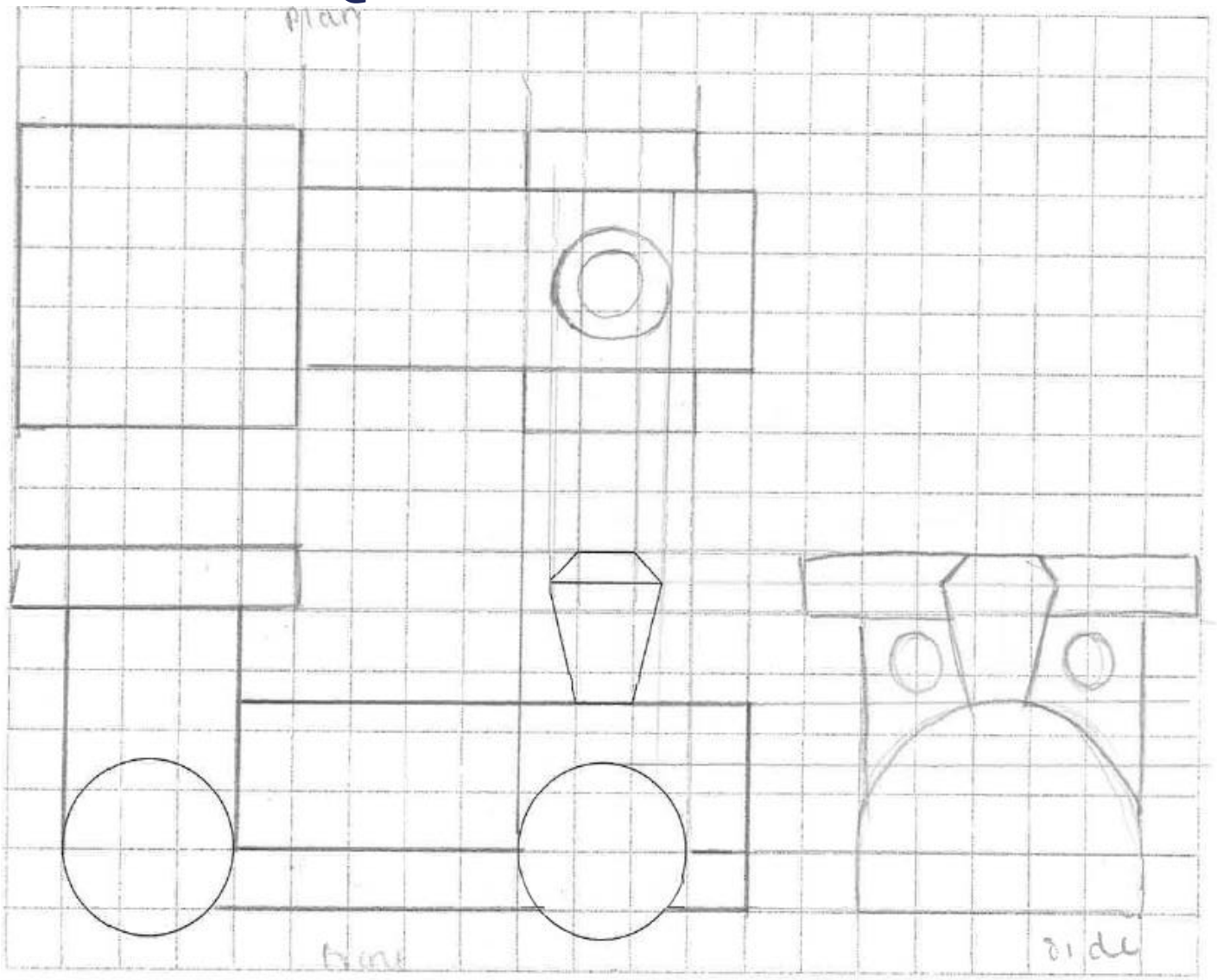
2 marks



Q5c

Pearson Edexcel

4 marks



Overview and helpful hints/tips

Common issues/changes

- Explain questions, both 2 and 3 mark type, must have linked responses to gain full marks.
- Maths questions could be answered in a number of alternative ways – a correct answer should always gain full marks, however follow through (error carried forward) rules should be applied for arithmetic errors.
- Drawing questions.
- Levels based mark schemes.
- Only the FIRST relevant (number determined by question) responses will be marked.
- The use of bullet points/tables for extended writing answers is to be discouraged.

Hints and tips

- Make sure that candidates understand the command verbs in the question.
- Avoid unstructured answers with repetition.
- Questions will come from **all** parts of the specification so ensure that the candidates have covered **all** of the specification.
- Make sure that candidates use technical language where appropriate.

Hints and tips

- IF at all possible, candidates should **not** go outside of answer space with their answers.
- Candidates should think/plan **before** answering.
- Justify/give examples for questions which require them.
- There are generally **two** lines provided (per mark awarded) for an answer.
- There should be sufficient space given in order to score **full** marks.

Hints and tips

- If word processing the answers, structure them so that they are in the same format as the question paper i.e. if there is a ‘give **four**’ type of question, put the answers on four **separate** lines.

- The most common ‘fault’ is repeating facts in different words, which wastes time and often results in **unnecessary** extra pages.

- If an answer exceeds the space provided, the candidate should put some sort of indicator for the examiner.

- Candidates must **NOT** hand in **ANY** rough notes.

Support

Subject Advisor : Evren Alibaba

- Email: teachingdesignandtechnology@pearson.com
- Telephone: +44 (0) 207 010 2166
- Twitter: @PearsonTeachDT

For more information, please contact subject advisors, subjects pages/communities and ask the expert.

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Thank you for attending this mocks marking training event.