

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

4111/01



S15-4111-01

DESIGN AND TECHNOLOGY

UNIT 1

FOCUS AREA: Resistant Materials Technology

A.M. TUESDAY, 19 May 2015

2 hours

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
Section A	1.	15
	2.	10
	3.	10
	4.	25
Section B	5.	10
	6.	15
	7.	20
	8.	15
Total	120	

ADDITIONAL MATERIALS

You will need basic drawing equipment, coloured pencils and a calculator for this examination.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. Where the space is not sufficient for your answer, continue at the back of the book, taking care to number the continuation correctly.

You are reminded of the necessity for good English and orderly presentation in your answers.



INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

Section A*Marked out of 60 60 minutes*

1. This question is about Product Analysis. It is worth a total of 15 marks.

Study the image of the two products shown below and answer the questions that follow.

Product A	Product B
	
Pull-along toy	Step stool
Material: Beech	Material: Oak
Pre-assembled	Supplied in flat pack form

- (a) A specification has been written for the pull-along toy (**Product A** above). Study the headings listed below. Match the correct heading to the appropriate specification point.

4 × [1]

Aesthetic appeal

Safety considerations

Sustainability

Scale of manufacture

Target market

- (i) Heading:

An initial batch of 2000 products will be produced.

- (ii) Heading:

The pull-along toy should be suitable for children aged 1 year and older.

- (iii) Heading:

Bright, primary colours will be used for decorating the pull-along toy.

- (iv) Heading:

All edges should be smooth and rounded to prevent injury.

(b) State **two** reasons why Beech is a suitable material for the pull-along toy (**Product A**). 2 × [1]

Reason 1:

Reason 2:

(c) Both of the products display the symbol of the Forestry Stewardship Council.



Explain what the symbol tells you about the wood that has been used to make the products. [2]

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(d) The step stool (**Product B**) is sold in flat pack form. Explain **one** advantage to the consumer and **one** advantage to the manufacturer of flat pack furniture.

(i) Advantage to the consumer: [2]

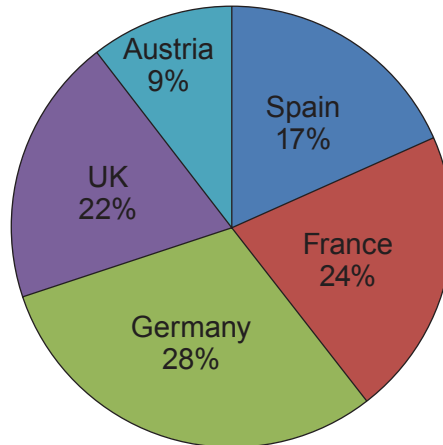
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(ii) Advantage to the manufacturer: [2]

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- (e) During the year 2013 the step stool (**Product B**) was sold in 5 European Countries.

The pie chart below shows the percentage of the total number of step stools sold in **each** of the 5 European Countries.



- (i) State in which European Country the second highest number of step stools were sold.

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[1]

- (ii) The total number of step stools sold in the 5 European Countries was 45,100. Calculate how many were sold in the UK. (Show all your workings.)

[2]

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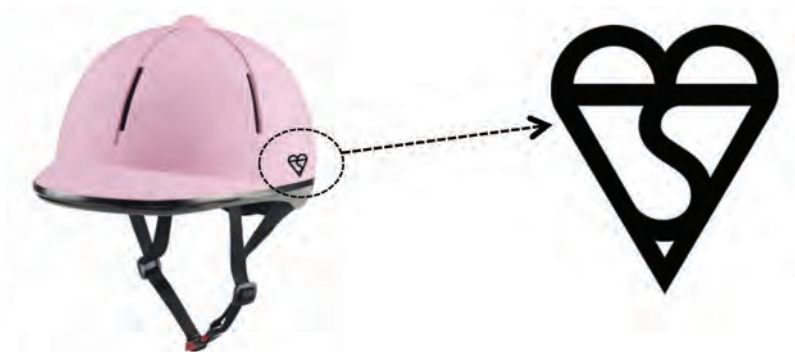
2. This question is about the general issues of Design & Technology. It is worth a total of 10 marks.

(a) Complete the table below by inserting the correct R for **each** of the descriptions.
(One example has been done for you.)

4 × [1]

<i>Description</i>	<i>R</i>
Reconsider the best way to make a product more sustainable.	
Minimise the amount of material and energy you use.	
To refill an ink printer cartridge instead of throwing it away.	Reuse
Melt scraps of pewter to use in a new product.	
Don't make a new product if you don't need it.	

(b) The riding helmet in the photograph below displays the symbol highlighted.



(i) State the correct name of the symbol.

[1]

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(ii) Explain what the symbol tells you about the product.

[2]

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(c) Discuss the impact on the environment of disposable products such as those shown below. [3]



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4. This question is about the Design Process and how it is used. It is worth a total of 25 marks.

- (a) Complete the table by inserting the correct design stage for **each** of the descriptions below. 3 × [1]
(One example has been done for you.)

<i>Design stage</i>	<i>Description</i>
	Assessing the performance of the finished product.
	Gathering information useful to the project.
	A list of criteria that the product should meet.
Design ideas	A number of initial design sketches.

- (b) Before starting to make a product the final technical details should be noted.
 State **two** important technical details to include in a manufacturing specification. 2 × [1]

Technical detail 1:

Technical detail 2:

- (c) Explain why the development stage is an essential part of the design process. [2]

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- (d) You have been asked to design a storage unit for a primary school design and technology tool kit. The storage unit will be placed in the middle of the class desks during practical lessons.

The tool kit will hold one of each of the following items:



300mm Steel rule



Junior hacksaw



Pliers



Screwdriver



Hammer

Specification

The storage unit must:

- be an innovative and functional design;
- sit on the desk and be free-standing;
- hold the tools separately, securely and display the names of the tools;
- allow the tools to be removed and replaced easily;
- be portable so that the storage unit can be moved easily.

Draw **one** design for the storage unit. Use notes to explain your ideas.

Marks will be awarded for:

- | | |
|---|-----|
| (i) an innovative and functional design that satisfies the specification; | [6] |
| (ii) clear details showing the construction of a suitable storage unit; | [4] |
| (iii) labelling suitable materials and components; | [2] |
| (iv) stating two important dimensions; | [2] |
| (v) quality of communication. | [4] |

Draw your design in the box below.






Section B

Marked out of 60 60 minutes

5. This question is about Commercial Manufacturing Processes. It is worth a total of 10 marks.

(a) From the list below, select the correct production method for **each** of the metal products shown. [3]

Spinning Extruding Die Casting Welding

<i>Product</i>	<i>Production method</i>




(b) Complete the following sentence.



The image shown above is the logo of the:

F Industry R Association.

[2]

(c) Quality Control is an important activity in the production of commercial products. Explain what you understand by the term Quality Control. [2]

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(d) Discuss the advantages of using a rapid prototyping machine when developing products such as the mobile phone case shown below. [3]



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6. This question is about Materials and Components. It is worth a total of 15 marks.

(a) Woods are classified as Softwoods, Hardwoods and Manufactured Boards.

Complete the table by inserting **each** material in the correct column.

[4]

Oak	Hardboard	Balsa	Parana Pine
<i>Softwoods</i>	<i>Hardwoods</i>	<i>Manufactured Boards</i>	
.....	
.....	

(b) State the correct name of the **two** hinges shown below.

[2]



(i) hinge

(ii) hinge

(c) Study the material properties below and use lines to connect them with the correct description. [3]

Property

Description

Ductility

Ability to withstand stress without deforming.

Hardness

Resistance to scratching and cutting.

Toughness

Ability to be stretched without breaking.

- (d) (i) Melamine Formaldehyde is an example of a thermosetting plastic. Describe what the term thermosetting means. [2]

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- (ii) GRP is an example of a composite material. Describe what the term composite means. [2]

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- (e) Explain what you understand by the term Nanotechnology. [2]

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7. This question is about Tools, Equipment and Making. It is worth a total of 20 marks.

(a) Complete the table shown below by adding the name of the holding tool or its use.

4 × [1]

<i>Holding tool</i>	<i>Use</i>
Machine vice
.....	To hold a large piece of furniture together when gluing.
Mitre cramp
.....	To hold a metal bar for cutting.

(b) The image below shows a metalworking lathe.

Label the image by selecting the correct name from the list for each part of the lathe.

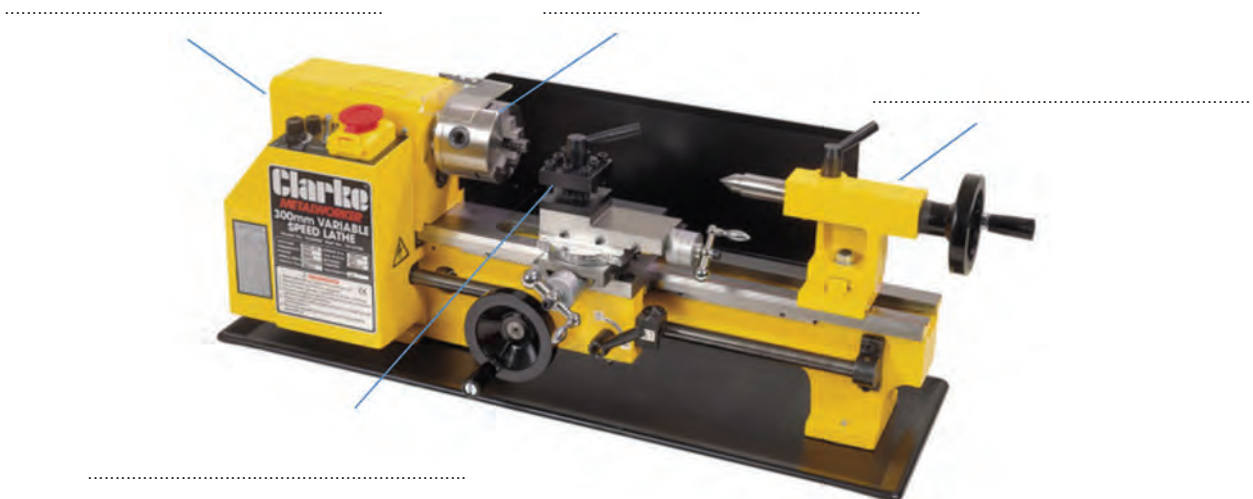
4 × [1]

Tailstock

Tool post

Chuck

Headstock



(c) State **two** safety considerations you should observe when using a pillar drill. 2 × [1]

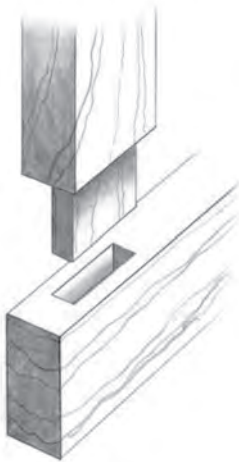
Consideration 1:

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Consideration 2:

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(d) The **two** pieces of hardwood in the diagram below are to be permanently jointed as part of a door frame.



(i) Correctly name the wood joint shown.

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(ii) Explain in detail how you would mark out the wood joint using common workshop tools and equipment. [4]

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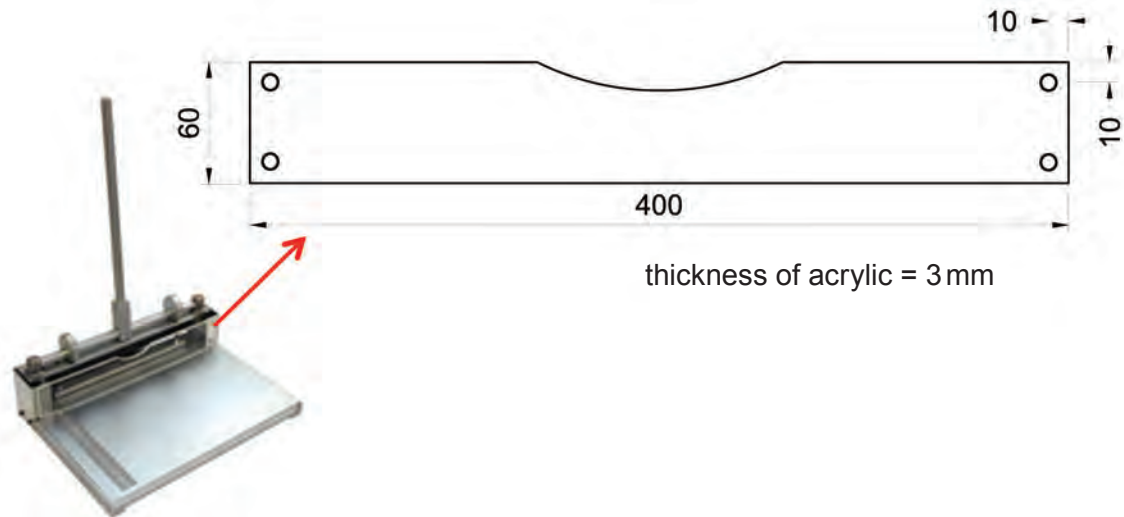
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- (e) A batch of 500 clear acrylic guards need to be produced by an engineering company that make metal guillotines.



A standard workshop pillar drill is to be used to drill the holes in the acrylic guards. Sketch a design for a suitable jig that could be used to aid the safe and accurate drilling of the 4 holes in the 3 mm acrylic.
(Use notes to explain your design.) [5]

8. This question is about ICT, CAD, CAM, Systems and Processes. It is worth a total of 15 marks.

(a) State the name of:


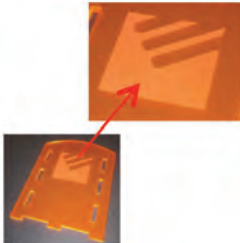

(i) a CAD programme that can be used to model design ideas. [1]

Name:

(ii) a word processing programme that can be used to create and edit text.

Name: [1]

(b) Study the images below and complete the sentences by **underlining** the correct answer. 3 × [1]

(i)		<p>The numbers on this car registration plate have been produced on a 3D printer / CAM vinyl cutter.</p>
(ii)		<p>The image on this acrylic component was engraved on a laser cutter.</p> <p>The engraving settings used were: high speed, low power / low speed, high power.</p>
(iii)		<p>The slots in this piece of Balsa were produced on a CAM router / laser cutter.</p>

- (c) The plywood bird box shown below is sold without a finishing process being applied. Explain the process needed to achieve a high quality finish to the bird box using polyurethane varnish. [3]



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- (d) Complete the table below by matching the correct heat treatment process to **each** of the definitions. [4]

Annealing **Hardening** **Tempering**
Normalising **Case hardening**

<i>Heat Treatment Process</i>	<i>Definition</i>
	Hardening the outer skin of mild steel.
	Removing excess brittleness after hardening.
	Softening a metal to make it easier to work with.
	Heating and quenching steel to increase its tensile strength.

(e) The coat hooks shown below are made from mild steel which has been plastic coated.



Discuss the factors involved in successfully plastic coating the coat hooks.

[3]

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END OF PAPER

