GCSE

4111/01

DESIGN AND TECHNOLOGY

UNIT 1

FOCUS AREA: Resistant Materials Technology

A.M. TUESDAY, 24 May 2016

2 hours plus your additional time allowance

Surname _____

Other Names _____

Centre Number _____

Candidate Number 0 _____

	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, black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

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.

The coat rack shown opposite has been designed for use in a primary school.
Study the image of the coat rack and answer the questions that follow.

The frame is made from mild steel.

The top rail is made from laminated chipboard.

The coat rack is 1200 mm in height and 1500 mm wide.

1(a) **Before it was made, a detailed design specification was written for the coat rack. Explain how the finished product has achieved the following specification points. (ONE EXAMPLE HAS BEEN GIVEN).**

3 x [2]

PROCESSES

The coat rack should be designed to be sold in flatpack form.

Temporary fixings such as bolts and screws have been used to hold the coat rack together so it can be assembled and disassembled easily.

1(a) (i) **AESTHETIC**

The coat rack should be suitable for a primary school environment.

1(a) (ii) **FUNCTION**

The coat rack should be portable and suitable for use by children of primary school age (7-11 years old).

1(a) (iii) SAFETY CONSIDERATIONS

The coat rack must be stable when heavily loaded with coats and bags.

1(b) Explain why it is an advantage to the manufacturer that the coat rack is sold flat packed. [3]

1(c) The purchase price of the coat rack varies depending on the number that are bought as shown in the table below.

Number of coat racks bought	Price per coat rack (£)
1 - 5	125
6 - 10	120
11 - 50	110
51 - 75	105
75+	95

1(c) (i) A primary school is to purchase 17 coat racks. Calculate the total cost to the school. [1]

1(c) (ii) **Calculate the percentage (%) saving per unit for purchasing 17 coat racks compared to purchasing a single unit. [2] (SHOW ALL YOUR WORKINGS).**

1(d) Discuss why the unit cost of a product such as the coat rack changes when it is made in larger quantities. [3]

	EXAMPLE	CORRECT R
	**The latest model of this washing machine is more energy efficient.**	_____
	**These flower holders have been made from old water bottles.**	_____
	**This mousemat has been made from old car tyres.**	_____

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

(a) **Complete the table opposite by naming the correct R of sustainability for EACH example given. [3]**

2(b) Many products are now recycled. Discuss TWO advantages of recycling everyday products like plastic bags and drink cans. 2 x [2]

Advantage 1:

2(b) Advantage 2:

2(c) **A ‘Life Cycle Analysis’ (LCA) is often carried out on resistant material products.**
Explain what you understand by the term ‘Life Cycle Analysis’. [3]

3. **This question is about the Designers that you have studied. It is worth a total of 10 marks.**

During your course you have studied the work of Bethan Gray and Philippe Starck.

(a) **Name the designer responsible for each of the products shown below.** **[2]**

	
Name: _____	**Name:** _____

3(b) Select ONE of the designers and write a short essay describing their range of work and how the products reflect the designer's approach to design. [8]

Marks will be awarded for the content of the answer and the quality of written communication.

Name of Designer: _____

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Stages
1. _____
2. Brief
3. Specification
4. _____
5. Development
6. Final Idea/Technical Details
7. _____
8. Making
9. Evaluation

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

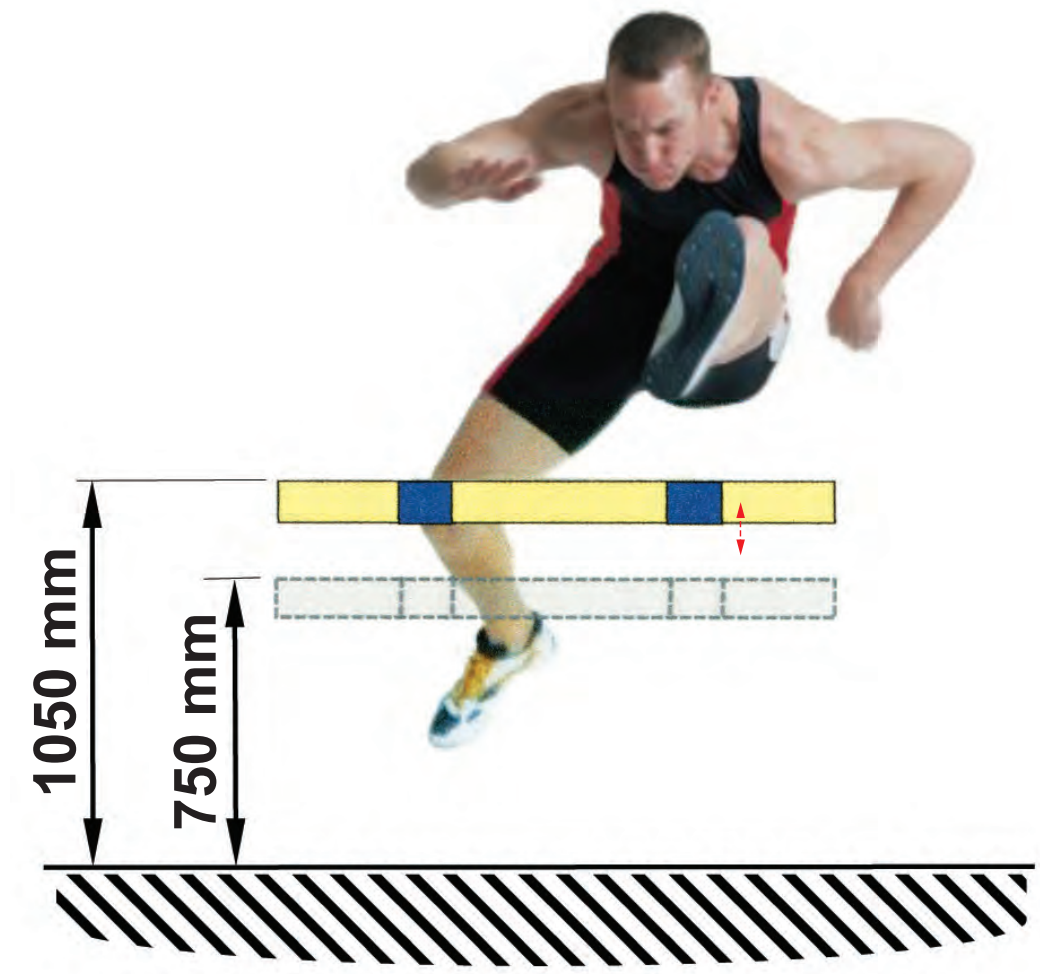
(a) **Complete the design process by adding the missing stages in the correct order to the table opposite.**

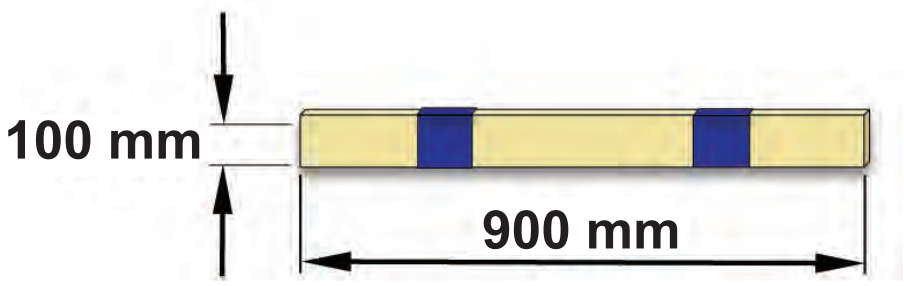
[3]

4(b) Explain why it is important to test materials when developing new products. [2]

4(c) Explain why designers compare the finished product with their design brief and specification when writing a final evaluation. [2]

4(d) **Your school's P.E. department has asked you to design a free-standing track hurdle. The hurdle bar will be 900 mm wide and the height to the top of the bar should be adjustable between 750 mm and 1050 mm.**





The hurdle bar is made from plywood 15 mm in thickness.

Specification

THE HURDLE*:*

must be height-adjustable between 750 mm and 1050 mm;

must be lightweight and free-standing;

must be stable but fall over easily if kicked by the hurdler.

4(d) Draw ONE design for the hurdle. Use notes to explain your idea.

MARKS WILL BE AWARDED FOR:

(i) including details needed to satisfy the specification; [3]

(ii) clear details showing the design and construction of a suitable, height-adjustable hurdle; [6]

(iii) labelling suitable materials, components and processes; [3]

(iv) stating TWO relevant dimensions; [2]

(v) quality of communication. [4]

Draw your design in the box opposite.

PRODUCT	MANUFACTURING PROCESS
Water Bottle 	
Cutlery Tray 	
Drainpipe 	
Traffic Cone 	

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) Complete the table opposite by selecting the correct manufacturing process that was used to make the plastic products shown. [4]

BLOW MOULDING

CASTING

ROTATIONAL MOULDING

EXTRUSION MOULDING

VACUUM FORMING

5(b) ‘Quality Assurance’ is an important consideration in the production of commercial products. Explain what you understand by the term ‘Quality Assurance’. [2]

5(c) **A wood laminated table is shown below. Outline the steps involved in making the table using the laminating process. [4]**

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

(a) State the correct name of the components shown below. 3 x [1]

	_____ **screw**
	_____ **rivet**
	_____ **catch**

6(b) Complete the following sentences by inserting the correct name of the composite materials described in the table. 3 x [1]

PRODUCT	DESCRIPTION
(i) 	_____ is a very strong, lightweight polymer fibre that is used to make bulletproof clothing.
(ii) 	_____ Fibre is a very strong and lightweight material used in racing car bodies.
(iii) 	_____ Carbide is an extremely hardwearing metal composite used to make drill bits.

6(c) **Designers must consider a wide range of material properties when designing and making products.**

Explain the meaning of the following material properties.

(i) Ductility [2]

6(c) (ii) Toughness [2]

6(d) Plywood and Medium Density Fibreboard (MDF) are commonly used manufactured boards.

(i) Give TWO advantages of using manufactured wooden boards instead of solid timber. 2 × [1]

Advantage 1: _____

_____

_____

_____

Advantage 2: _____

_____

_____

_____

6(d) (ii) Explain in detail the process of manufacturing MDF. [3]

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

(a) **Complete the table by stating the correct name and use for EACH of the tools shown. [6]**

TOOL	NAME	USE
	_____	_____ _____
	_____	_____ _____
	_____	_____ _____

7(b) **Health and safety risks are involved when working on metalworking lathes such as the one shown here.**

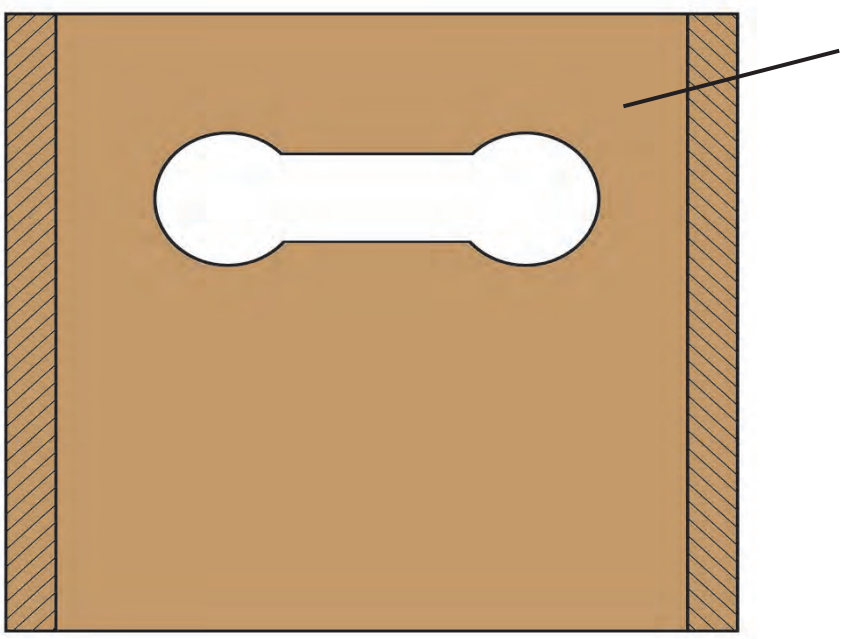
Complete the table opposite by explaining the risks and the safety precautions that should be taken.

[4]

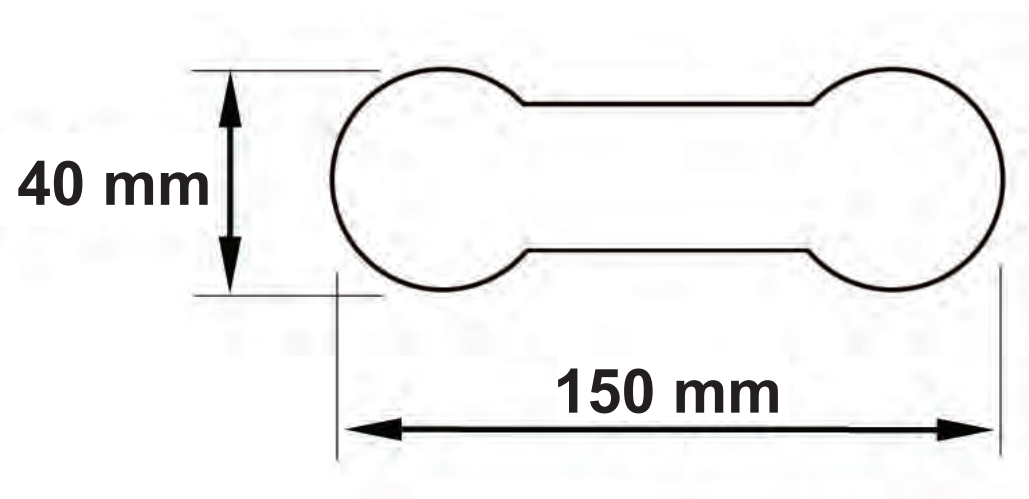
(ONE EXAMPLE HAS BEEN GIVEN.)

RISK INVOLVED IN ACTIVITY	PRECAUTION TO BE TAKEN
Waste material thrown from the lathe can injure the user's eyes.	To wear eye protection such as safety goggles or a visor.

7(c) The diagram below shows the side of a softwood storage box. The internal handle is to be cut out to enable the box to be easily carried.



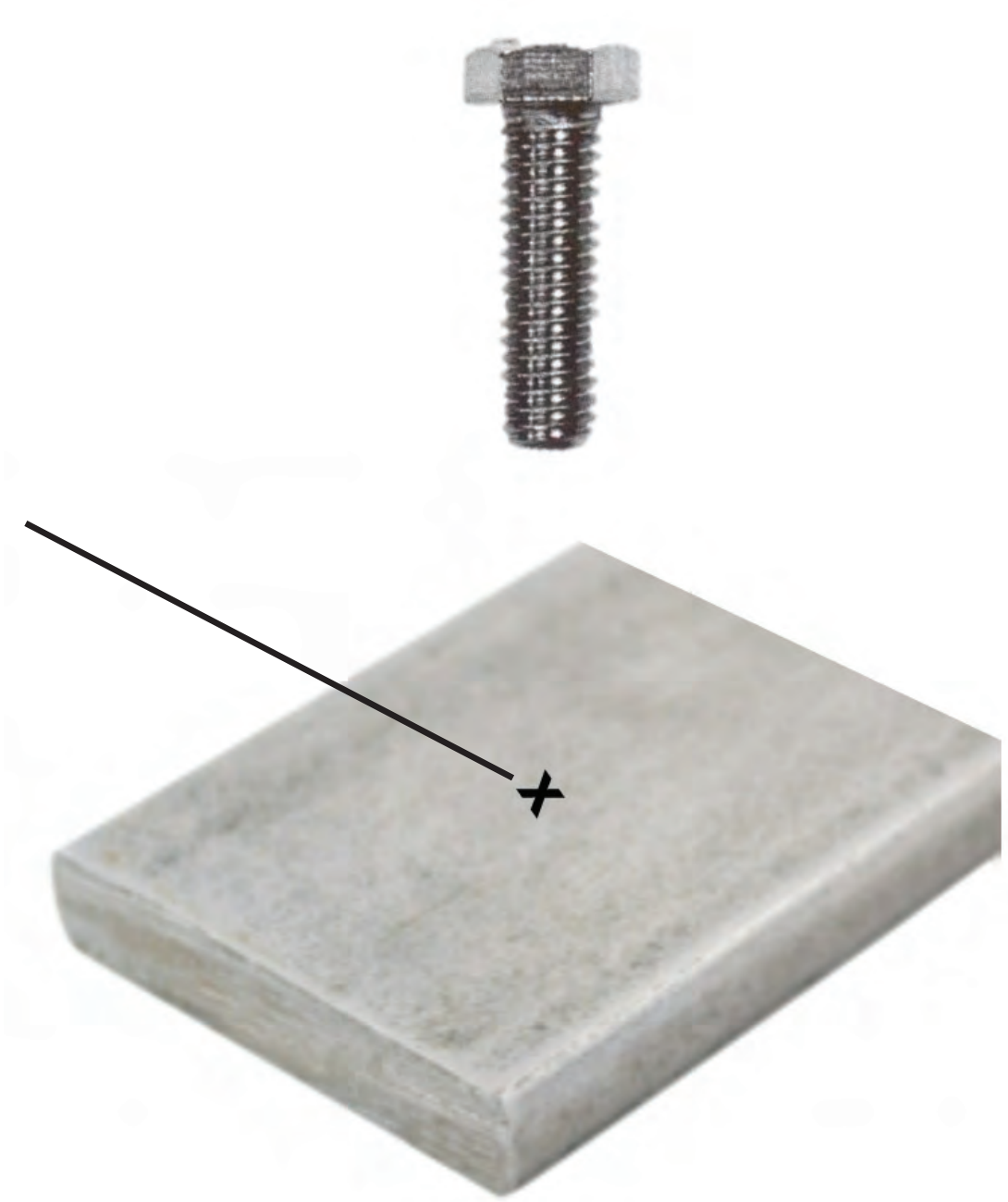
Dimensions of internal handle.



Using notes and/or sketches, explain in detail opposite how you would manually mark out, cut and finish the internal handle using common workshop hand tools. [5]

7(d) **A piece of mild steel and a 5 mm diameter bolt are shown below.**

A 5 mm diameter threaded hole is to be produced at point X to fit the bolt.



(i) **Give the correct name of a suitable threading process.** **[1]**

_____

_____

7(d) (ii) Explain in detail how you would accurately produce the threaded hole in the piece of mild steel.

[4]

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

(a) **Complete the table by selecting the most suitable adhesive from the list below to join the materials shown.**

[3]

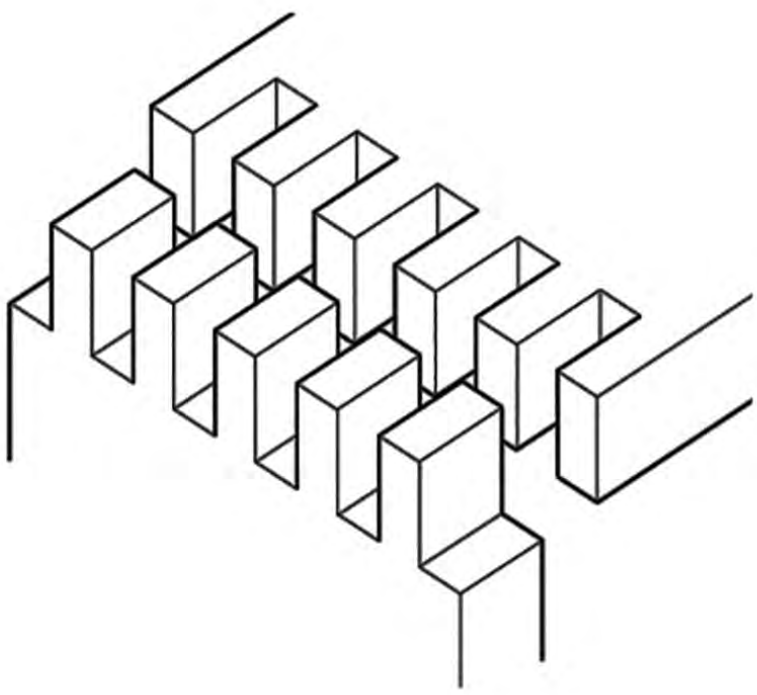
PVA **CONTACT ADHESIVE**

EPOXY RESIN **TENSOL CEMENT**

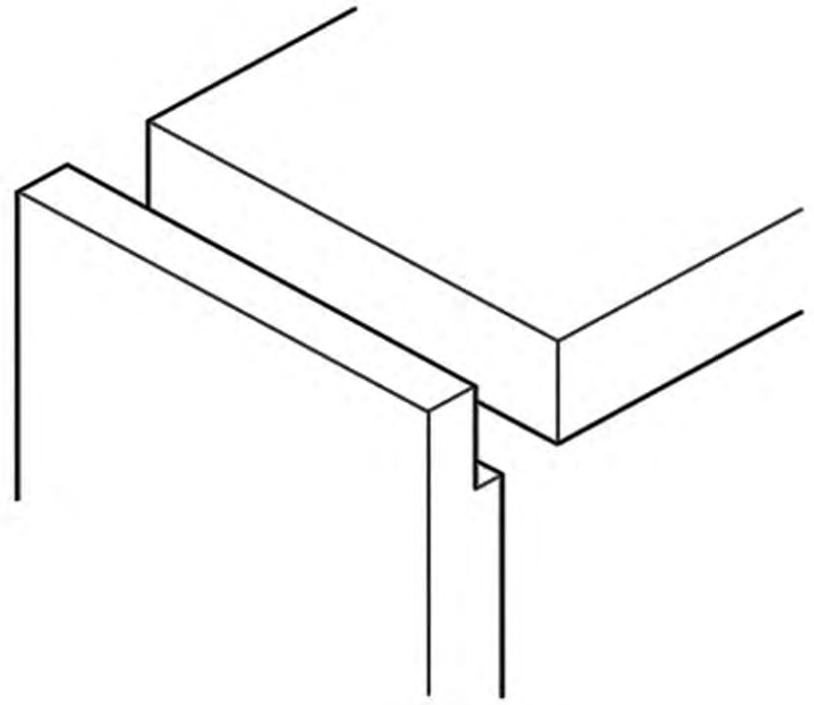
MATERIALS TO BE JOINED	ADHESIVE
Wood to Metal	_____
Plastic Laminate to Wood	_____
Acrylic to Acrylic	_____

8(b) The diagram below shows the drilling stages involved in preparing to screw two pieces of wood together using the woodscrew shown.
Complete the labelling of the diagram. 3 x [1]

8(c) **Study the wood joints shown below. Explain why the Comb joint is a stronger joint compared to the Lap joint. [2]**



Comb joint



Lap joint

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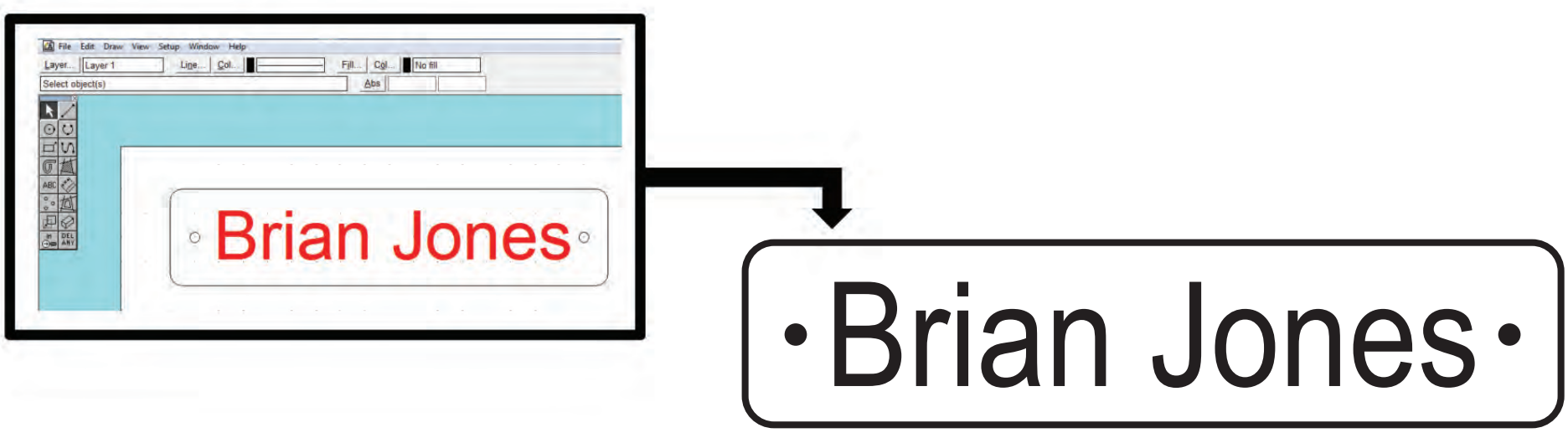
8(d) A nameplate made out of 1.5 mm plastic laminate and the CAD drawing that was used to produce it are shown below.



Describe the processes that were followed to successfully manufacture the nameplate on a laser cutter. [4]

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8(e) **The mild steel spanner shown below needs to be hardened in order to prolong its durability. Describe how the spanner could be hardened in a school workshop. [3]**

END OF PAPER

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FOR CONTINUATION ONLY.

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