

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	



General Certificate of Secondary Education  
June 2015

# Design and Technology: Resistant Materials Technology

**45601**

## Unit 1 Written Paper

Monday 8 June 2015 1.30 pm to 3.30 pm

**For this paper you must have:**

- a black pen, a pencil, a ruler, an eraser, a pencil sharpener and coloured pencils.

**Time allowed**

- 2 hours

**Instructions**

- Use black ink or black ball-point pen. Use pencil and coloured pencils only for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 120.
- Section A relates to the context given in the Preliminary Material that was previously issued.
- You are reminded of the need for good English and clear presentation in your answers. Quality of Written Communication will be assessed in Question 6.



J U N 1 5 4 5 6 0 1 0 1

## Section A

Answer **all** questions in the spaces provided.

In this section you will:

- produce a Design Specification
- produce a range of ideas
- develop **one** of your ideas.

### Design Brief

- A manufacturer of interior lighting has asked you to produce a range of designs for a task light. The light should illuminate the work area on a home office desk or student desk.
- You should produce **five** design ideas for a task light for use on a home office desk or student desk.
- For **three** of your design ideas the light **must** be adjustable.

Below is a view of a typical home office desk or student desk.



Question 1 is about the Design Specification.

You are advised to spend about 5 minutes on this question.

**1** Give **three** design requirements of a task light for use on a home office desk or student desk.

Explain each of your answers.

An example has been completed for you.

Requirement: the device should be stable.

Explanation: because the light might be knocked over and become damaged.

**[3 marks]**

**1 (a)** Requirement 1 .....

Explanation 1 .....

.....

.....

**[3 marks]**

**1 (b)** Requirement 2 .....

Explanation 2 .....

.....

.....

**[3 marks]**

**1 (c)** Requirement 3 .....

Explanation 3 .....

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9

Turn over ▶



Question 2 is about creative design.

You are advised to spend about 20 minutes on this question.

- 2 (a)** Use the information in the Design Brief on page 2, and your answers in Question 1, to help you sketch **two** different design ideas for a task light.

The task lights do **not** need to be adjustable.

Marks will be awarded for creativity.

**[2 × 3 marks]**



**2 (b)** Use the information in the Design Brief on page 2, and your answers in Question 1, to help you to sketch **three** different design ideas for an adjustable task light.

Each of your task lights should use a different method of adjustment.

Marks will be awarded for creativity.

**[3 × 3 marks]**

15

Turn over ▶



Question 3 is about developing the design.

You are advised to spend about 12 minutes on this question.

**3** Choose your best idea from Question 2 (b).

On pages 6 and 7, show how you would develop your design using notes and sketches.

Marks will be awarded for:

- details of a specific material and a suitable finish (explain your choices) **[2 marks]**
- constructional details **[3 marks]**
- design features and sizes **[3 marks]**
- details of your chosen method of adjustment. **[3 marks]**





Turn over for Question 4

11

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**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**





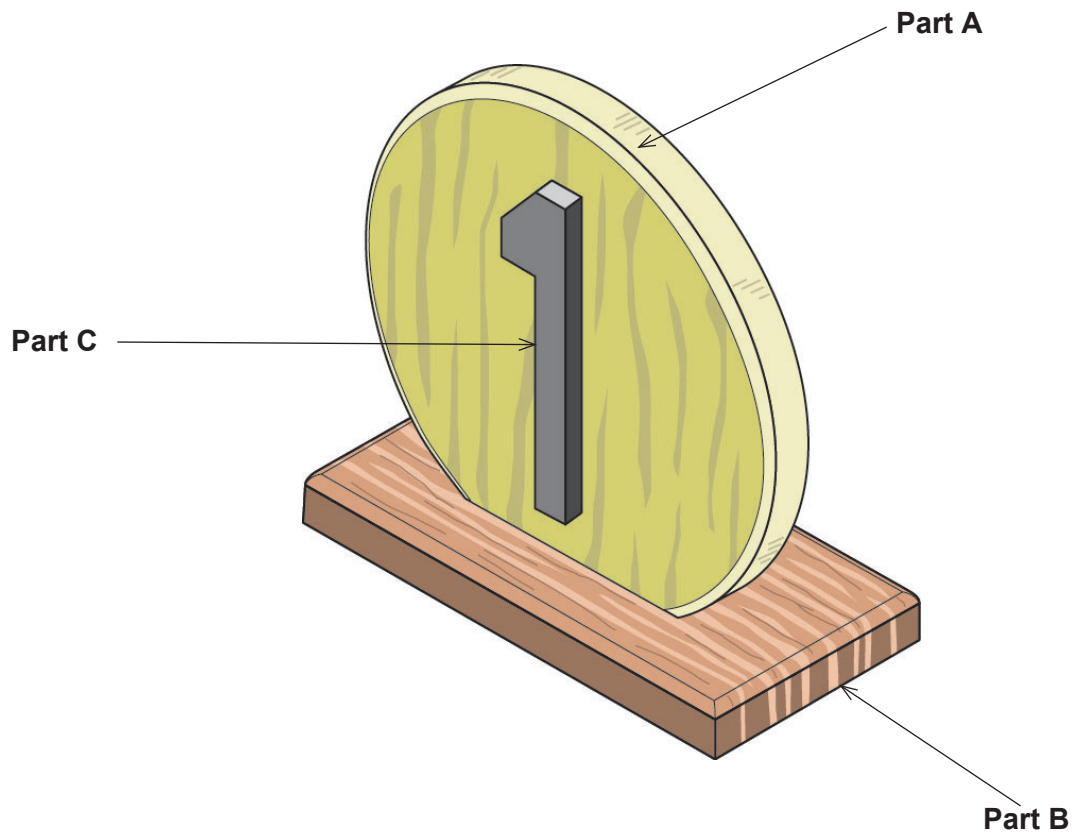
**Section B**

Answer **all** questions in the spaces provided.

Question 4 is about making.

You are advised to spend about 20 minutes on this question.

- 4** Study the Year 11 inter-house football trophy shown below.



**Part A** and **Part B** will be made from wood.

**Part C** will be made from cast metal.

**Question 4 continues on the next page**

**Turn over ▶**



Use notes and sketches to show how you would make **one** Year 11 inter-house football trophy in a school workshop.

At each stage, name **all** the tools, equipment and/or software you would use.

**Stage 1: How to make Part A and Part B**

**[4 marks]**

**Stage 2: How to join Part A to Part B**

**[4 marks]**



**Stage 3:** How to produce the mould and cast **Part C**

**[6 marks]**

Blank area for writing the answer to Stage 3.

14

**Turn over ▶**





Question 5 is about fastenings and adhesives.

You are advised to spend about 15 minutes on this question.

**5 (a)** Complete the table shown below.

The first row has been done for you.

Fastening	Full Name	Function
	Washer	A washer spreads the pressure and protects the surface of the material.
<p style="text-align: right;"><b>[1 mark]</b></p>	Bolt	<p style="text-align: right;"><b>[2 marks]</b></p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
	<p style="text-align: right;"><b>[2 marks]</b></p> <p>.....</p>	<p style="text-align: right;"><b>[2 marks]</b></p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>



**5 (b)** Give a use for **each** of the following adhesives.

Give **two** advantages and **one** disadvantage of using each adhesive.

**5 (b) (i)** Polyvinyl acetate (PVA)

[1 mark]

Use .....

[1 mark]

Advantage 1 .....

[1 mark]

Advantage 2 .....

[1 mark]

Disadvantage.....

Question 5 continues on the next page

Turn over ▶



**5 (b) (ii)** Cyanoacrylate (Super Glue)

[1 mark]

**Use** .....

[1 mark]

**Advantage 1** .....

[1 mark]

**Advantage 2** .....

[1 mark]

**Disadvantage** .....



**5 (c)** Use notes and sketches to show how you would glue **two** materials together using epoxy resin.

**[5 marks]**

20

**Turn over ▶**







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8

**Turn over for the next question**

**Turn over ▶**



Question 7 is about smart, nano and composite materials.

You are advised to spend about 10 minutes on this question.

**7 (a) (i)** Explain what is meant by the term ‘smart material’.

**[2 marks]**

.....

.....

.....

**7 (a) (ii)** Complete the table.

Product	Material
<p style="text-align: right;"><b>[1 mark]</b></p> <p>.....</p>	<p>Shape memory alloys (SMA) ‘Nitinol’</p>
<p>A baby’s feeding spoon that changes colour if the food is too hot</p>	<p style="text-align: right;"><b>[1 mark]</b></p> <p>.....</p>
<p style="text-align: right;"><b>[1 mark]</b></p> <p>.....</p>	<p>Motion control gel ‘Smart grease’</p>

**7 (b) (i)** Explain what is meant by the term ‘nanomaterial’.

**[2 marks]**

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7 (b) (ii) Give an example of the use of a 'nanomaterial' and explain its advantages.

[3 marks]

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7 (c) Name a composite material used for the body of a Formula 1 racing car.

Explain why this material has been used.

[2 marks]

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**Turn over for the next question**

**Turn over ▶**



Question 8 is about health and safety.

You are advised to spend about 15 minutes on this question.

**8 (a)** Complete the table by:

- stating the meaning of each sign
- naming an activity where you would need to follow the advice of this sign
- identifying the hazard.

Sign	Meaning	Activity	Hazard
	Safety glasses must be worn	[1 mark] ..... .....	[1 mark] ..... .....
	[1 mark] ..... .....	When handling hot metal or carrying sharp objects	[1 mark] ..... .....
	[1 mark] ..... .....	[1 mark] ..... .....	You could damage your hearing
	[1 mark] ..... .....	[1 mark] ..... .....	[1 mark] ..... .....





Question 9 is about finishes.

You are advised to spend about 15 minutes on this question.

**9 (a)** Study the pine table shown below.



**9 (a) (i)** Name a suitable finish for the pine table.

**[1 mark]**

.....

**9 (a) (ii)** Give **two** reasons for choosing the finish you have named in part (a) (i).

**[2 marks]**

**Reason 1** .....

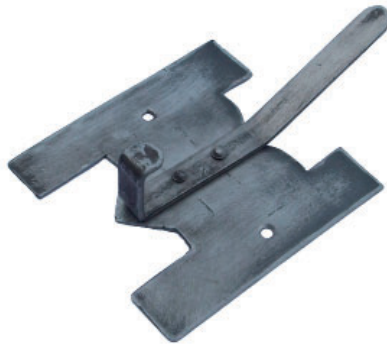
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**Reason 2** .....

.....



**9 (b)** Study the mild steel coat hook show below.



**9 (b) (i)** Name a suitable finish for the mild steel coat hook.

**[1 mark]**

.....

**9 (b) (ii)** Explain why the mild steel coat hook needs a finish.

**[4 marks]**

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**Question 9 continues on the next page**

**Turn over ▶**



**9 (b) (iii)** Use notes and sketches to describe how you would apply the finish you have named in part **(b) (i)**.

**[6 marks]**

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### END OF QUESTIONS

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