

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**LEVEL 1/2**

**R105/01**

**CAMBRIDGE NATIONAL AWARD/  
CERTIFICATE IN ENGINEERING DESIGN**

**Design briefs, design specifications  
and user requirements**

**MONDAY 21 MAY 2018: Afternoon**

**DURATION: 1 hour  
plus your additional time allowance**

**MODIFIED ENLARGED**

<b>Candidate forename</b>		<b>Candidate surname</b>	
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<b>Centre number</b>						<b>Candidate number</b>				
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**Candidates answer on the Question Paper.**

**OCR SUPPLIED MATERIALS:**

**None**

**OTHER MATERIALS REQUIRED:**

**None**

**READ INSTRUCTIONS OVERLEAF**



## **INSTRUCTIONS TO CANDIDATES**

**Use black ink. HB pencil may be used for graphs and diagrams only.**

**Complete the boxes on the front page with your name, centre number and candidate number.**

**Answer ALL the questions.**

**Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).**

## **INFORMATION FOR CANDIDATES**

**The total number of marks for this paper is 60.**

**The number of marks for each question is given in brackets [ ] at the end of each question or part question.**

**Dimensions are in millimetres unless stated otherwise.**

**Your quality of written communication will be assessed in questions marked with an asterisk (\*).**

**Answer ALL the questions.**

**1 Fig. 1 shows an example of a computer mouse.**

**FIG. 1**



**(a) Shown below are four user needs.**

**Join each user need with the correct suggested product feature.**

**One has been done for you. [3]**

<b>USER NEEDS</b>	<b>SUGGESTED PRODUCT FEATURE</b>
Must fit comfortably in the hand	Optical sensor
Should be aesthetically pleasing	Bluetooth connectivity
Must be wireless	Ergonomically designed
Must work on multiple surfaces	High-gloss finish

**(b) Give TWO ways, other than the mouse must fit comfortably in the hand, that the designer has considered ergonomics in the design of the computer mouse.**

**1** \_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

**[2]**

**(c) Give TWO anthropometric measurements that would be important when designing the computer mouse.**

**1** \_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

**[2]**

- (d) The computer mouse is made from high impact plastic to ensure it is hard wearing.**

**Describe how the working environment may have influenced the choice of material for the computer mouse.**

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**[3]**

- 2 (a) Fig. 2 shows two mobile phones. Phone A is a modern 'smart' phone. Phone B is an earlier model phone.

FIG. 2



Phone A



Phone B

- (i) State TWO ways in which cultural and fashion trends have influenced the design of modern 'smart' phones like Phone A.

1 \_\_\_\_\_

2 \_\_\_\_\_

[2]

- (ii) Market research has suggested that there is a customer demand for the earlier model phone B.

Explain why some customers may want the earlier design of phone.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

- (b) Give ONE example of a legislative design requirement and describe why it is important when designing new products.**

**Example** \_\_\_\_\_

**Description** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**[3]**

- (c) Describe, using an example, the impact of sustainable design on the development of new products.**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**[3]**

**3 Manufacturers consider ease of manufacture when designing new products or components.**

**(a) The table opposite shows a range of products and the manufacturing processes used.**

**Complete the table by adding the most relevant statement given below about ease of manufacture.**

**ALLOWS THE USE OF PRE-MANUFACTURED  
AND STANDARD COMPONENTS**


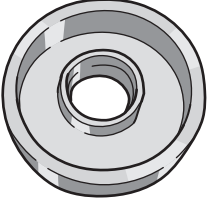
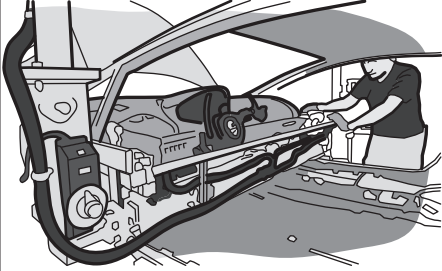
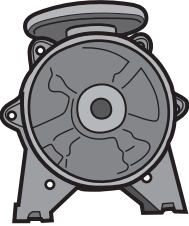

**ALLOWS FOR COST EFFECTIVE METAL  
COMPONENT PRODUCTION**

**CAN CREATE ONE-OFF COMPONENTS  
RAPIDLY**

**CREATES HIGH VOLUME, COMPLEX PLASTIC  
PARTS IN A SINGLE PROCESS**

**One has been done for you. [4]**



	<b>Example product</b>	<b>Manufacturing process</b>	<b>Ease of manufacture</b>
<b>1</b>	 <p><b>Plastic school chair</b></p>	<b>Injection moulding</b>	
<b>2</b>	 <p><b>CNC machined bearing housing</b></p>	<b>Machining</b>	<b>Creates very accurate parts with a high surface finish</b>
<b>3</b>	 <p><b>Automotive assembly line</b></p>	<b>Final assembly on production line</b>	
<b>4</b>	 <p><b>Cast pump housing</b></p>	<b>Sand casting</b>	
<b>5</b>	 <p><b>Prototype prosthetic hand</b></p>	<b>3D printing</b>	

**(b) Name ONE manufacturing process, other than those given in part (a), that could be used to produce a product.**

\_\_\_\_\_  
\_\_\_\_\_ [1]

**(c) State TWO ways that products can be designed to allow for maintenance.**

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_ [2]

**(d) Explain why the manufacturing process may have an impact on production cost.**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [3]

**4 (a) Complete the statement below.**

**There are two main reasons why designers may see an opportunity to develop new products.**

**Firstly, a gap in the market may be identified based on consumer need. This is called**

\_\_\_\_\_

**Secondly, designers may have access to new materials or manufacturing methods that allow new and improved products to be created. This is called**

\_\_\_\_\_

**[2]**

**(b) Name the FOUR phases of the design cycle in the correct order.**

**1** \_\_\_\_\_

**2** \_\_\_\_\_

**3** \_\_\_\_\_

**4** \_\_\_\_\_

**[4]**

- (c) (i) Give ONE method a designer could use to carry out market research.**

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**[1]**

- (ii) Explain why market research is an important part of developing a new product.**

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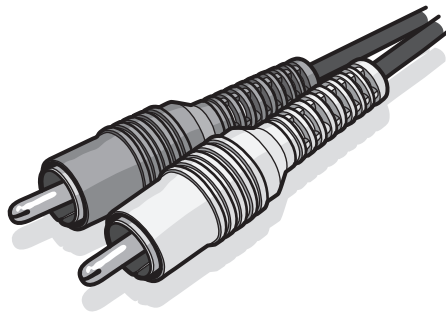
**[3]**

**5 Error proofing is an important part of developing a new product.**

**(a) Below are two products.**

**State how the operation of each product has been error proofed.**

**(i) Audio cable**

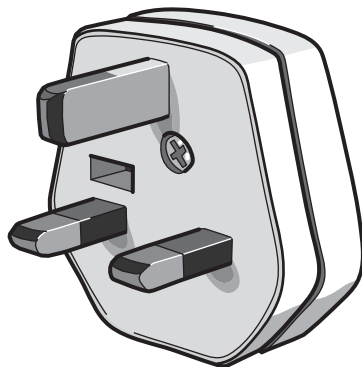


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**[1]**

**(ii) 13 amp plug**

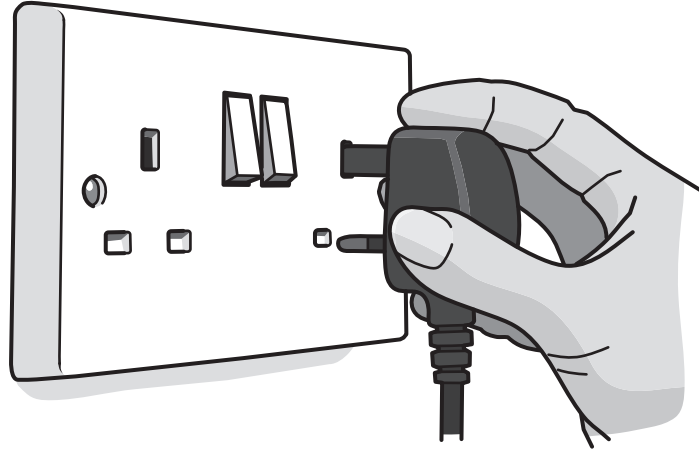


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**[1]**

- (b) A company who make plug-in electric heaters have received customer feedback that some users of their heaters find standard plugs difficult to take out of the plug socket when the heater is not being used.



Suggest TWO ways in which the design of the plug could be changed to make it easier to take out of the plug socket.

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

[2]

- (c) Give ONE type of regulation that a product must meet before being sold.

\_\_\_\_\_

\_\_\_\_\_

[1]

**(d) Give TWO types of safeguard that may protect a product.**

**1** \_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

**[2]**

**(e) Explain why it is important for products to meet regulations.**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

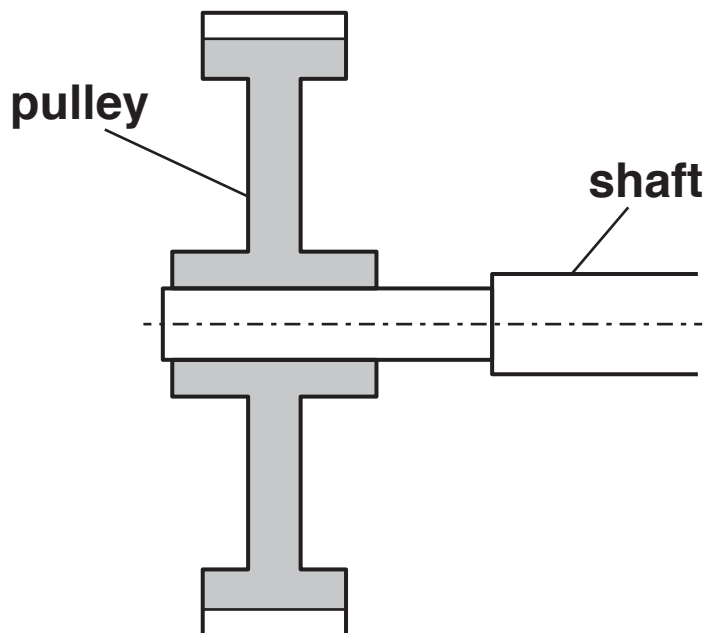
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\_\_\_\_\_

**[3]**

- 6 Fig. 3 shows a pulley and shaft assembly used on an electric motor.

**FIG. 3**



- (a) State ONE critical dimension of the pulley and shaft assembly that would require specific tolerances.

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[1]



**(b) Give TWO reasons why tolerances allow for the successful operation of the pulley and shaft assembly.**

**1** \_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

**[2]**

**(c) Give ONE reason why tolerances help to manage production costs.**

\_\_\_\_\_

\_\_\_\_\_

**[1]**

[illegible]

**END OF QUESTION PAPER**

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