OCR
Oxford Cambridge and RSA

Monday 21 May 2018 – Afternoon

LEVEL 1/2 CAMBRIDGE NATIONAL AWARD/ CERTIFICATE IN ENGINEERING DESIGN

R105/01 Design briefs, design specifications and user requirements

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
None

Duration: 1 hour

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes above 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).
- Do **not** write in the barcodes.

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 (*****).
- This document consists of **16** pages. Any blank pages are indicated.

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.

User needs	**Suggested product feature**
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

[3]

(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.

.....

.....

.....

.....

.....

.....

..... **[3]**

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

Phone **A** Phone **B**

Fig. 2

(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]**

Question 3 begins on page 6

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

(a) The table below 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.

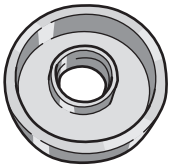
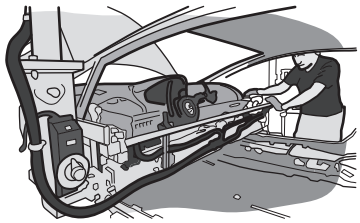
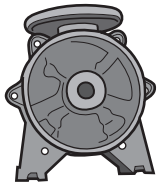
Allows the use of pre-manufactured and standard components

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.

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

[4]

(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.

.....

[1]

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

.....

.....

.....

.....

.....

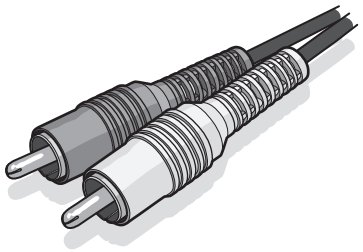
..... **[3]**

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.

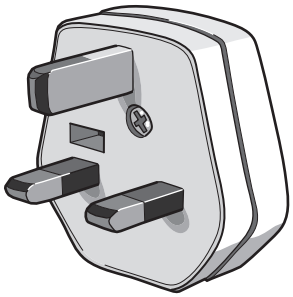
(i) Audio cable



.....

..... **[1]**

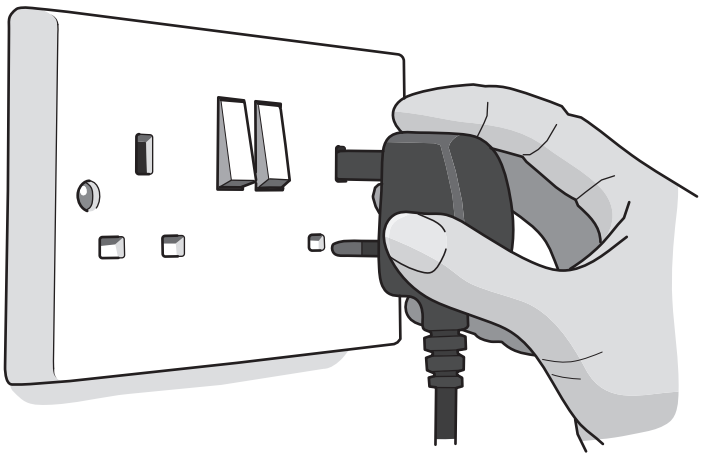
(ii) 13 amp plug



.....

..... **[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.

.....

.....

.....

.....

.....

.....

..... **[3]**

Question 6 begins on page 12

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

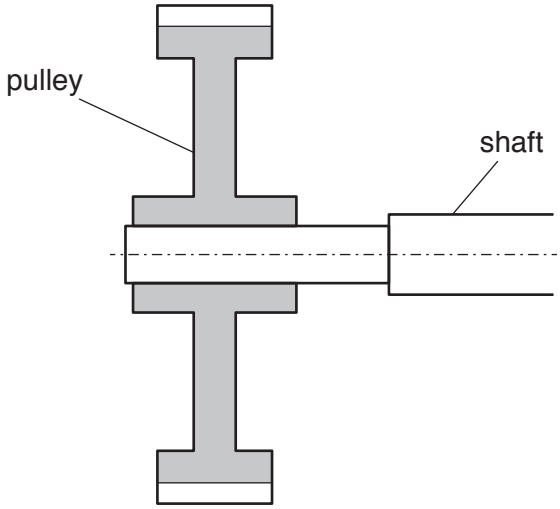


Fig. 3

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

.....

..... **[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]**

(d)* Discuss how environmental pressures can impact the development of a new product.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

END OF QUESTION PAPER

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

PLEASE DO NOT WRITE ON THIS PAGE