

Friday 16 June 2023 – Morning

A Level in Design and Technology: Product Design

H406/02 Problem Solving in Product Design

Time allowed: 1 hour 45 minutes

You must have:

• the Resource Booklet

You can use:

- a ruler (cm/mm)
- · a scientific calculator
- · geometrical instruments



Please write clearly in black ink. Do not write in the barcodes.							
Centre number					Candidate number		
First name(s)							
Last name							

INSTRUCTIONS

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- Answer all the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.
- Each question tells you which part of the Resource Booklet to refer to.

INFORMATION

- The total mark for this paper is 70.
- The marks for each question are shown in brackets [].
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has 16 pages.

ADVICE

· Read each question carefully before you start your answer.



Read the **Resource Booklet** before you answer the questions.

1* A large accountancy firm, OCR Accountants, is assessing the feasibility of providing home office equipment to its employees.

As part of this assessment, it wishes to understand the challenges that are experienced by employees when working at home.

Critically examine the problems experienced by employees when working at home.

In your answer you **must** consider the following:

- ergonomics
- musculoskeletal issues
- location.

Refer to information on page 2 of the Resource Booklet.	[12]

2	To ensure the combination of the ergonomic chair and standing desk shown in Fig. 4 is suitable for OCR Accountants, a designer has been tasked with checking the product specifications against anthropometric data.

Use the anthropometric data in Fig. 3A and Fig. 3B to help you answer the following questions.

(i)	Complete the table to indicate the total height range for 90% of the population:	[1]
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	Total height range (mm)
Sitting height	
Sitting eye height	
Sitting shoulder height	

	coming constant resigns
(ii)	Calculate the mean thigh thickness of the population if there are equal numbers of men and women. Give your answer in mm and show your working. [2]
	Mean thigh thicknessmm
(iii)	Calculate the maximum distance the desk must rise to maintain a comfortable elbow height position for 90% of the user population. Give your answer in mm and show your working. [3]
	Maximum distancemm

3 Smart Space has recommended a standing desk product called Stand-Hi to OCR Accountants.

Critically examine the design requirements that would have been considered when designing the standing desk shown in **Fig. 5** of the Resource Booklet.

In your answer you **must** consider the following needs and requirements of employees working at home:

- aesthetics
- functionality
- anthropometrics.

Refer to information on pages 3–5 of the Resource Booklet.	[12]

4 OCR Accountants requires an initial quantity of 100 standing desks.

You **must** focus only on the following features of the concept design:

- laminate desktop with your choice of surface finish from the options given
- mild steel frame.

Use sketches and/or notes to outline suitable methods of manufacture and assembly for the features of the standing desk concept design as shown in **Fig. 5** of the Resource Booklet.

In your answer you **must** include details of:

- manufacturing processes
- standard components to be used
- finishes

•	assembly methods.	[16]

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5* Hot-desking has become a popular trend in many modern office spaces.

Critically examine the challenges that would be faced by OCR Accountants in providing an effective open plan office with hot-desks for employees.

In your answer you **must** consider the following:

- inclusivity
- privacy
- storage of personal belongings
- digital technology.

Refer to information on page 6 of the Resource Booklet.	[12]

6 The design team has developed a concept design called Easy-Stand for a standing desk converter.

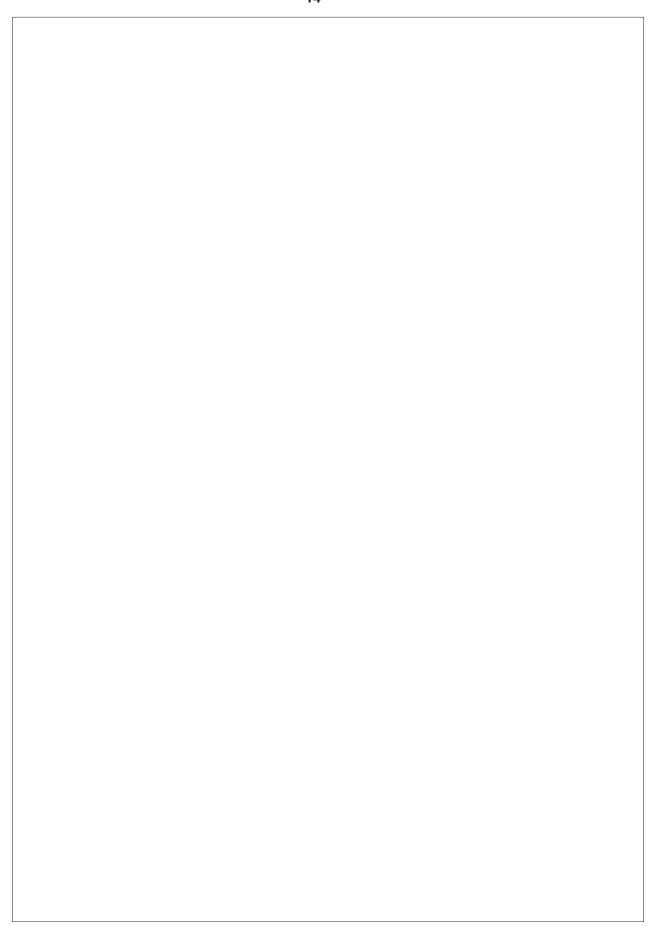
In order to reduce weight, a prototype polymer laptop shelf has been designed and made to support the laptop.

Smart Space requires an initial quantity of 100 polymer laptop shelves for consumer testing.

Use sketches and/or notes to outline suitable methods to meet the following design and manufacturing requirements for the **polymer laptop shelf only**:

- include a non-slip texture to the shelf top surface
- provide structural reinforcement
- · batch manufacture 100 polymer laptop shelves
- take account of design for manufacture (DFM).

Refer to information on pages 7–8 of the Resource Booklet.	[12]



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