



**DESIGN TECHNOLOGY  
HIGHER LEVEL  
PAPER 2**

Candidate number

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Friday 7 November 2003 (afternoon)

1 hour 45 minutes

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**INSTRUCTIONS TO CANDIDATES**

- Write your candidate number in the box above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all of Section A in the spaces provided.
- Section B: answer one question from Section B. Write your answers on answer sheets. Write your candidate number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the numbers of the questions answered in the candidate box on your cover sheet and indicate the number of sheets used in the appropriate box on your cover sheet.

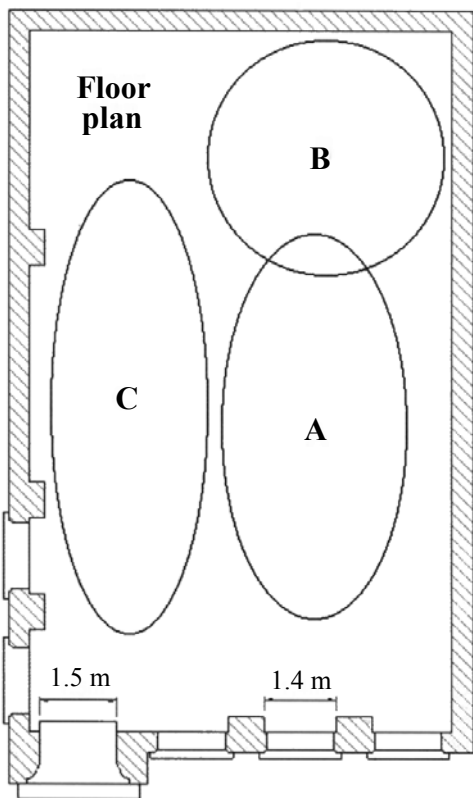
**SECTION A**

Answer *all* the questions in the spaces provided.

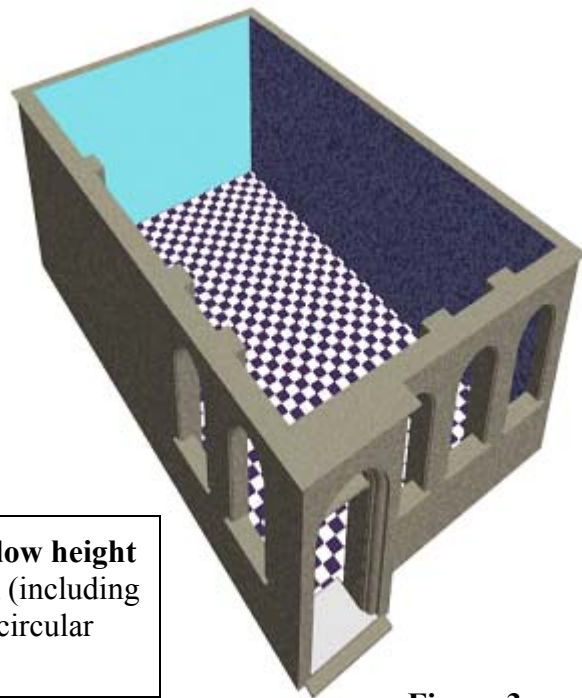
1. An international restaurant chain is famous for converting historical city centre properties, such as the one shown in Figure 1. Each restaurant is designed to have its own personality but in a way that is sympathetic to the history of and original use of the building. This means that adding an extension or changing the external facade is not an option. The design concept for the internal space tries to use as much natural light as possible, supplemented with artificial light, as necessary, to create a distinctive atmosphere.



**Figure 1**



**Figure 2**



**Window height**  
3.3 m (including  
semi circular  
area)

**Figure 3**  
3D View

*(This question continues on the following page)*

*(Question 1 continued)*

(a) (i) State the width of the window. [1]

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(ii) Calculate the total area of windows. (The area of a circle =  $\pi r^2$ .  $\pi = 3.142$ .) [3]

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(b) (i) In relation to ergonomics, state the **dominant** psychological factor identified as part of the design concept. [1]

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(ii) Identify in which of the areas A, B or C (marked on the floor plan) the levels of natural light would need to be supplemented with the highest level of artificial lighting. [1]

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(iii) Outline **one** limitation of collecting ergonomic data relating to light in the restaurant. [2]

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(c) (i) State which of the three figures would be most appropriate for undertaking user research with potential customers. [1]

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(ii) Explain **one** reason for your choice. [3]

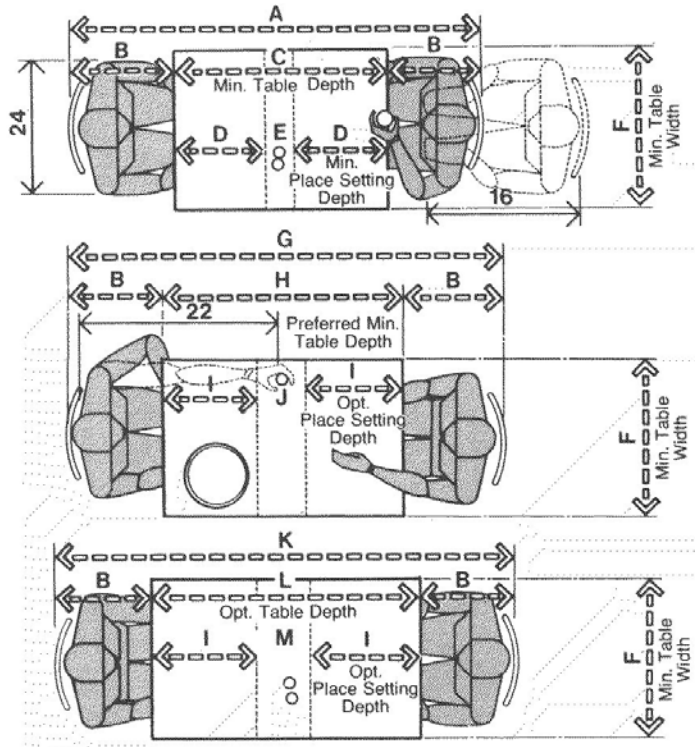
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(Question 1 continued)

Figure 4 below shows dimensions for minimum table width with minimum, preferred minimum, and optimum table depths.

Figure 4.



	cm
A	167.6 – 198.1
B	45.7 – 61.0
C	76.2
D	35.6
E	5.1
F	61.0
G	182.9 – 213.4
H	91.4
I	40.6
J	10.2
K	193.0 – 223.5
L	101.6
M	20.3

Table sizes / minimum table width with minimum, preferred minimum, and optimum table depths.

(d) (i) State the constant minimum width dimension.

[1]

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(ii) State the minimum place setting depth.

[1]

.....

(iii) Outline **one** reason for providing designers with three options for the table depth dimension.

[2]

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 .....

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*(Question 1 continued)*

- (e) (i) State the relationship between the range of dimensions in B and the range of dimensions in A, G and K. [1]

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- (ii) Explain why dimensions A, B, G and K are stated as ranges while all other dimensions are expressed as absolute values. [3]

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- 2. (a) State the type of bonding in a thermoset. [1]

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- (b) Explain the effect of temperature on a thermoset. [3]

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3. (a) State **two** advantages of sintering superconductors. [2]

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(b) Suggest **one** reason why it would be advantageous to design superconductors that operate at higher ambient temperatures than they do at present. [2]

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4. (a) Define *constructive discontent*. [1]

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(b) Explain how constructive discontent contributes to greening of consumer products. [3]

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5. (a) List **two** nutritional advantages of mycoprotein. [2]

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(b) Outline **one** reason for the increased popularity of mycoprotein as a consumer product. [2]

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6. (a) State **one** variable cost that contributes to the final cost of a product. [1]

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(b) Explain why variable costs might rise in a company that adopts a green design policy. [3]

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### SECTION B

Answer **one** question. Write your answers on the answer sheets provided. Write your candidate number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.

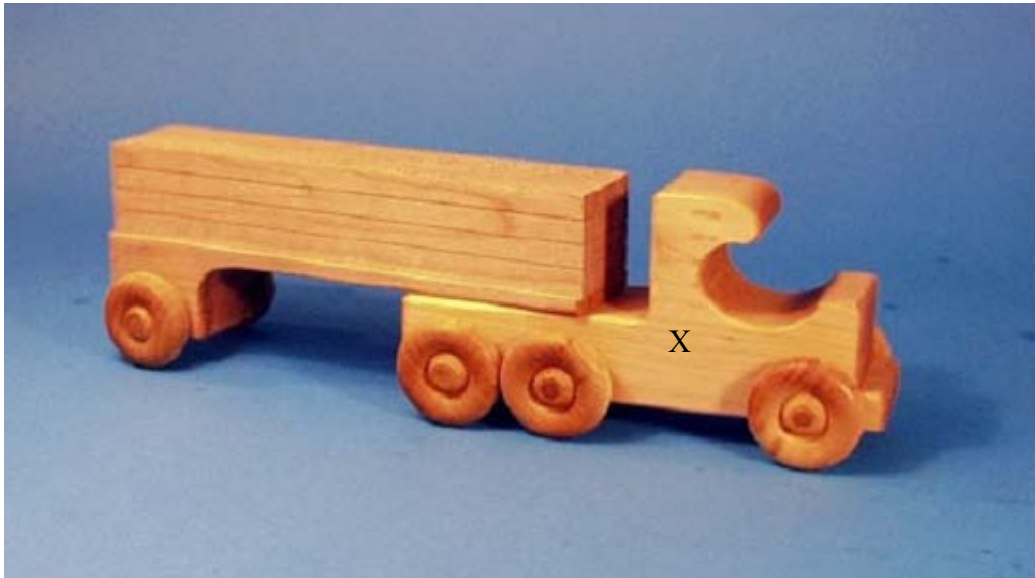
7. The picture below shows a solar-powered electric car, the body of which is made of steel.



- (a) (i) Describe how iron is converted to steel. [2]
- (ii) Outline why plastic deformation is important in the volume production of the car body. [2]
- (b) (i) Define *assembly-line production*. [1]
- (ii) Outline **one** way in which robots contribute to the cost-effectiveness of assembly-line production. [2]
- (iii) Outline how the solar-powered electric car can be described as a combination of radical and incremental design. [2]
- (c) Discuss the extent to which the solar-powered electric car is an example of appropriate technology. [11]



8. The picture below shows a child's toy made from wood. Some parts of the toy are volume produced, other parts could be craft or batch produced.



- (a) (i) List **two** characteristics of a wood that make it appropriate for manufacturing the toy. [2]
- (ii) Outline **one** safety consideration in the design of the toy. [2]
- (b) (i) State which part of the toy would be volume produced. [1]
- (ii) Describe how the direction of the wood fibres in part X assist the manufacture of the shape. [2]
- (iii) Outline **one** criterion for the finish applied to the toy. [2]
- (c) Discuss the extent to which the toy is an example of intermediate technology. [11]

9. The photograph below shows a prototype kettle comprising a borosilicate glass body. The kettle's halogen element heats the water by radiation. The designer identified the idea for the heat source by observing how the sun heated the sea.



- (a) (i) List **two** characteristics of glass that make it suitable for this design context. [2]
- (ii) Outline why the borosilicate glass is used rather than soda-lime glass for the kettle body. [2]
- (b) (i) State **one** ergonomic consideration for the design of the kettle. [1]
- (ii) Distinguish between adaptation and analogy as the stimulus for the development of the idea for this prototype. [4]
- (c) Evaluate how the prototype meets the design objectives of green products. [11]
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