INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

DESIGN TECHNOLOGY
HIGHER LEVEL
PAPER 2

Thursday 10 May 2001 (afternoon)

1 hour 30 minutes

Name

Number

INSTRUCTIONS TO CANDIDATES

• Write your candidate name and number in the boxes 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 in a continuation answer booklet, and indicate the number of booklets used in the box below. Write your name and candidate number on the front cover of the continuation answer booklets, and attach them to this question paper using the tag provided.
• At the end of the examination, indicate the number of the Section B question answered in the boxes below.

QUESTIONS ANSWERED		EXAMINER	TEAM LEADER	IBCA
SECTION A	ALL	/32	/32	/32
SECTION B	. . . .	/20	/20	/20
NUMBER OF CONTINUATION BOOKLETS USED	. . . .	TOTAL /52	TOTAL /52	TOTAL /52

SECTION A

1. Suspended ceilings are widely used in new buildings and to refurbish older buildings. The suspended ceilings allow easy access to the roof space, provide a decorative feature that is easy to modify, conceal pipes and cables, and reduce noise transmission and reflection.
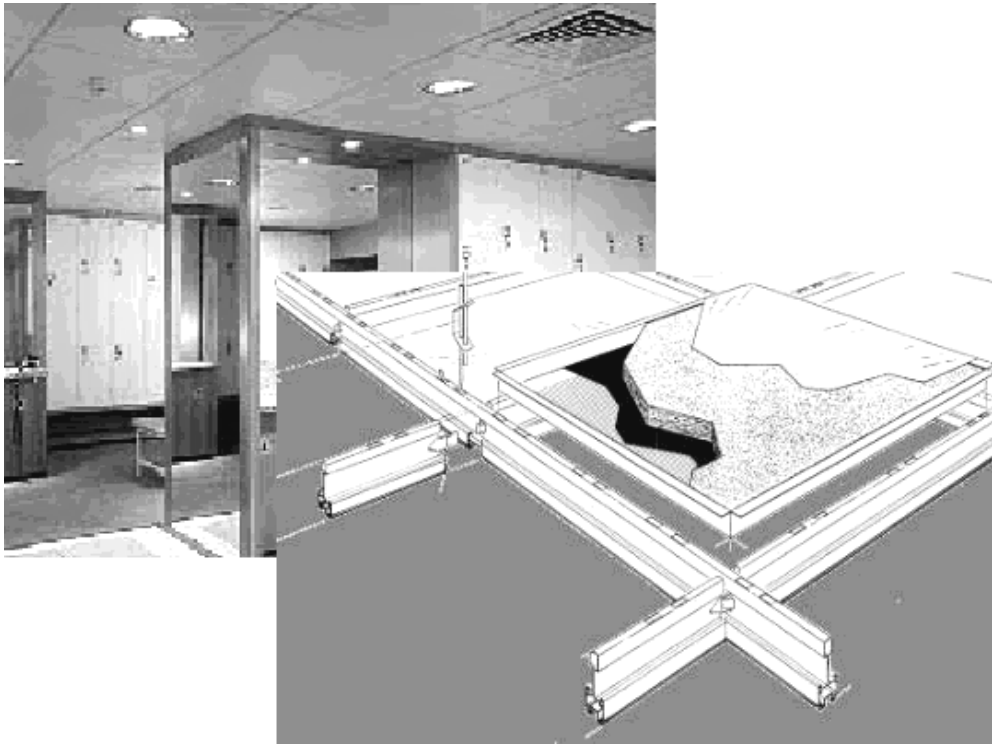
The aluminium channel is suspended from the roof structure by hangers to form a matrix into which the tiles are fixed. The tiles are 750 mm × 750 mm square and are suspended in the aluminium frame which hangs from the roof support. Combinations of materials can be assembled to achieve the required effect as shown in the table.

Tile No.	Fibre Board mm	Acoustic Fleece mm	Tissue mm	Rockwool mm	Foil mm	Perforated Panel mm	Sound Reduction dB	Mass kg m^{-2}
1	16		0.05	15	0.5		22	2.52
2	18	16	0.05	32	0.9	2.0	40	2.98
3	20		0.05	40	1.0	4.5	44	3.77
4	20		0.05	50	1.2	15.0	46	4.28

(This question continues on the following page)

(Question 1 continued)

(a)

Roof supports ----------
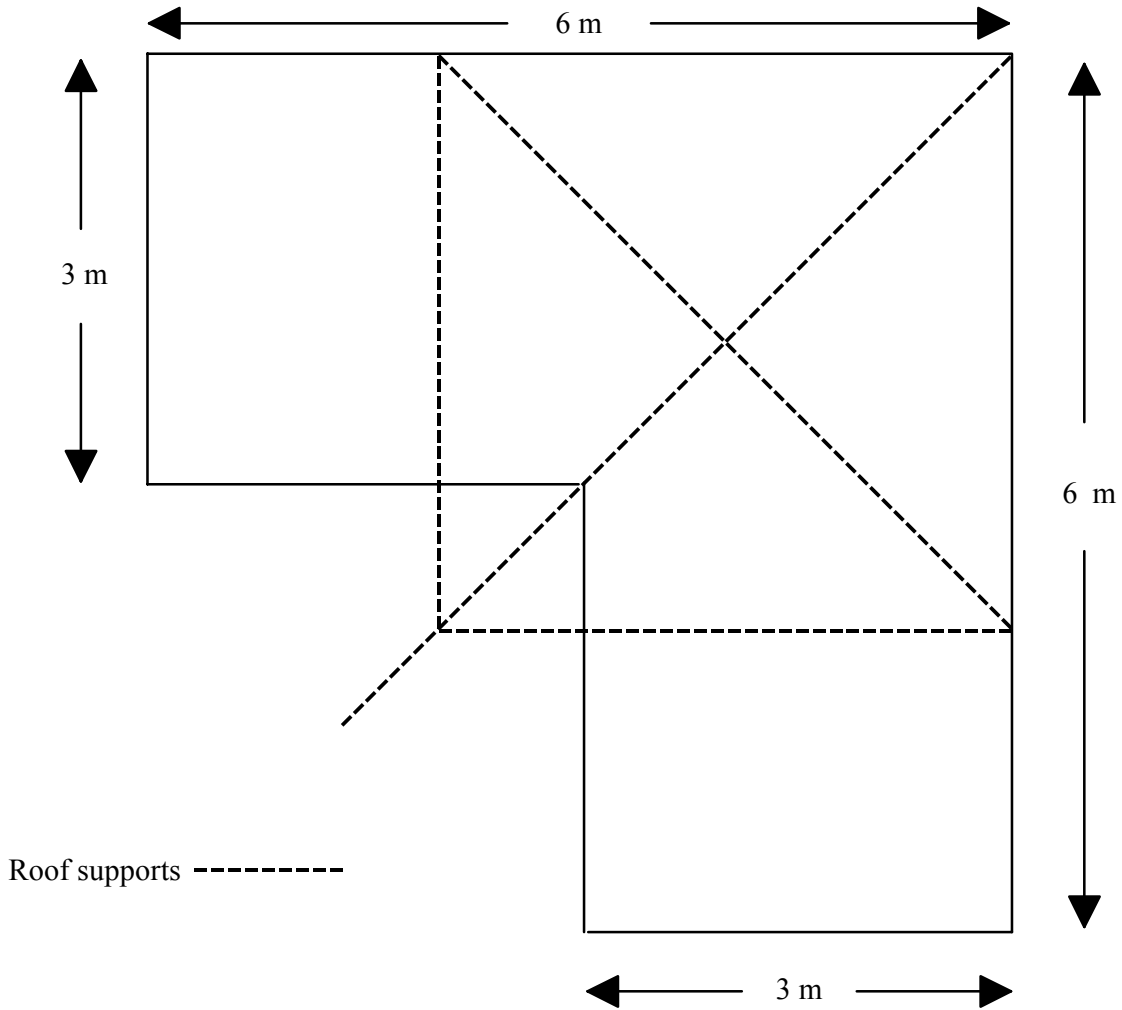
The room shown with the plan above is to be fitted with number 3 ceiling tiles.

(i)   Calculate the number of tiles needed (show your calculation).   *[2]*

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(ii) Calculate the total mass of the ceiling tiles used (show your calculation).   *[3]*

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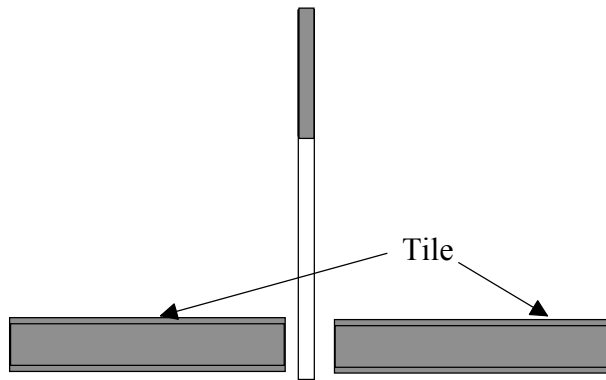*(This question continues on the following page)*

(Question 1 continued)

To calculate the number of hangers needed the following formula is used

Number of hangers $= \dfrac{\text{(Total number of tiles)} - \text{(Number of tiles touching a wall by a side or corner)}}{4}$

(b) Calculate the number of hangers required (show your calculation). *[2]*

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. . . .

. . . .

. . . .

(c) Draw, on the diagram below, a suitable fixing to attach the hanger to the steel roof support. Annotate your drawing. *[2]*

Steel roof support
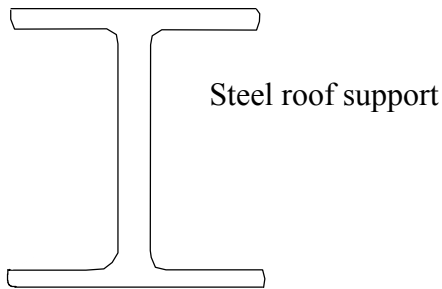
Tile

(This question continues on the following page)

(Question 1 continued)

(d)   Describe **two** factors to be taken into account when specifying tiles for use in the ceiling of a restaurant kitchen.   *[4]*

Factor 1:   . . . .

. . . .

. . . .

. . . .

Factor 2:   . . . .

. . . .

. . . .

. . . .

Turn over

2. (a) State **two** reasons for evaluating a product. *[2]*

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. . . .

(b) Explain why performance tests are more appropriate than user trials as a means of evaluating a safety helmet for the construction industry. *[3]*

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3. (a) (i) Define *manufacturing process*. *[1]*

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(ii) Explain how weaving can be used to create a composite material. *[3]*

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(Question 3 continued)

(b)   Discuss how the constraints imposed by the properties of existing materials act as a stimulus
for the development of new materials with novel properties for a named design context.   *[3]*
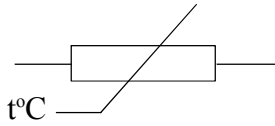
. . . .

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4. (a) State an example of negative feedback. *[1]*

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(b) Identify the components from the symbols given: *[2]*

(i)

t°C

. . . .

(ii)

. . . .
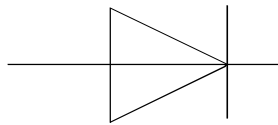
(c) Draw an appropriate, labelled, block diagram from the system description given.

"An air-conditioning system senses temperature and humidity in a room and delivers cool, dry air on demand until the programmed conditions are met." *[4]*

SECTION B

*Answer **one** question. Up to three additional marks are available for the construction of your answer. Write your answers in a continuation answer booklet. Write your name and candidate number on the front cover of the continuation answer booklets, and attach them to this question paper using the tag provided.*

5.
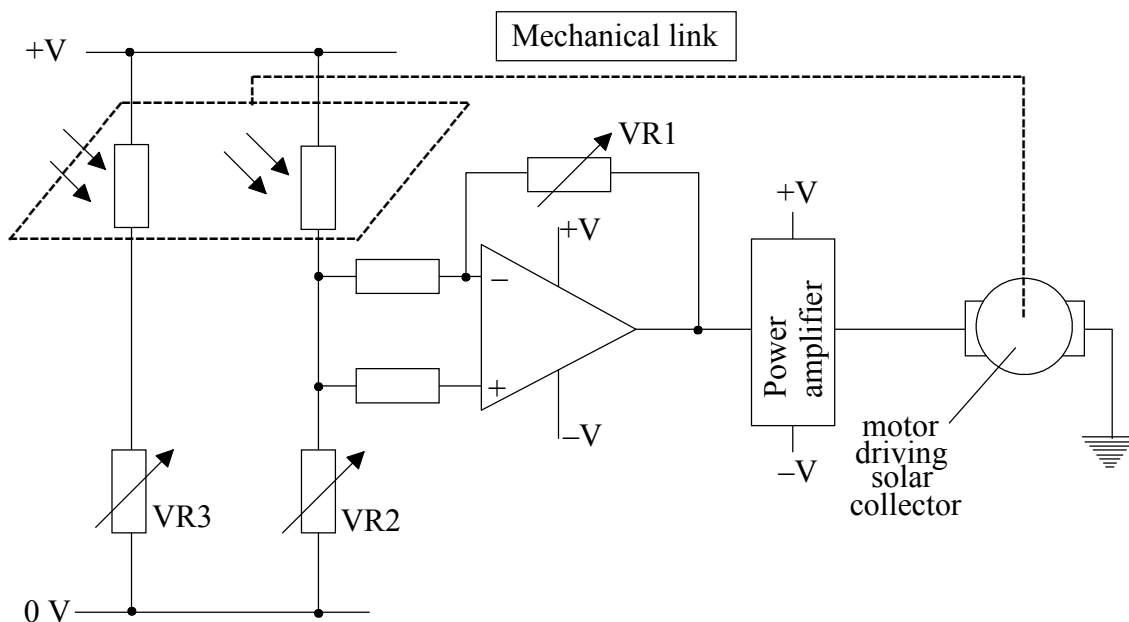
The circuit shown is used to ensure that a solar collector always points directly towards the sun. The Light Dependant Resistors are attached to the collector to move with it.

(a) (i)   Identify the purpose of VR1.   *[2]*

     (ii) Explain the need for the power amplifier.   *[2]*

(b) (i)   Explain what is meant by underdamping.   *[2]*

     (ii) Describe the effect of underdamping on the operation of the system.   *[2]*

(c) Explain why exploitation of solar energy is beneficial, identifying **one** context where it is of
     benefit and **one** where it is not.   *[9]*

6.

The photograph above shows a classic lounger chair and footstool which have a laminated timber frame and leather cushions. The wood and leather have been made from natural materials modified by human intervention.

(a) (i)   Outline the composition of plywood.   *[2]*

   (ii)   List **two** different composite timbers other than plywood.   *[2]*

(b) (i)   Outline the characteristics of hardwood trees.   *[1]*

   (ii)   Explain why laminated timber is used for the manufacture of this chair rather than natural timber.   *[4]*

(c)   Explain how the specification for material for a seat cover for a chair in a fast food restaurant differs from that for a chair in the home, identifying suitable materials for each.   *[8]*

7.   (a) (i)   Outline how stiffness of a structure can be calculated.   *[2]*

   (ii)   Outline the need for a factor of safety in structural design.   *[2]*

   (iii)   Define plastic deformation.   *[1]*

(b) (i)   Outline how iron is converted to mild steel.   *[2]*

   (ii)   Compare the mechanical properties of iron and a steel.   *[2]*

(c)   Explain why modern buildings are often constructed from reinforced concrete (a composite material combining concrete and steel).   *[8]*