IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
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88046203

DESIGN TECHNOLOGY
HIGHER LEVEL
PAPER 3

School code

Thursday 18 November 2004 (morning)

Candidate code

1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

- Write your school code and candidate code in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all of the questions from two of the Options in the spaces provided. You may continue your answers on answer sheets. Write your school code and candidate code 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 letters of the Options answered in the candidate box on your cover sheet and indicate the number of answer sheets used in the appropriate box on your cover sheet.

Option D – Food Technology

D1. **Figure D1** is a photograph of a tomato spoiled by microbial growth. **Figure D2** shows a can of tomatoes.

Figure D1: Photograph of rotten tomato

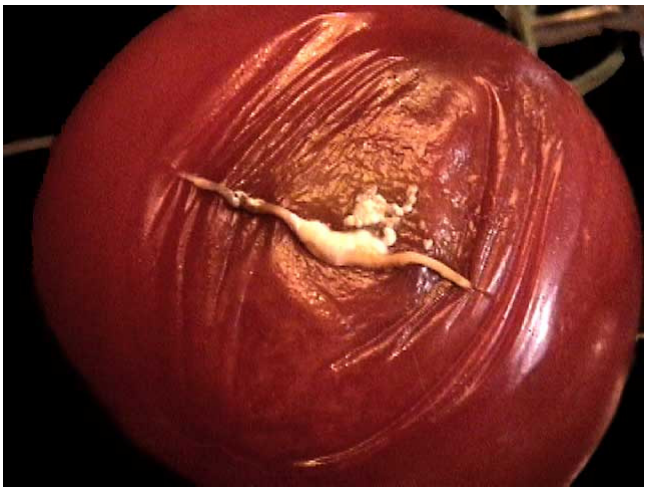

Figure D2: Can of tomatoes

(a) List **two** factors that influence the ease of microbial spoilage. *[2]*

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(b) Describe how canning extends the safe storage life of tomatoes. *[2]*

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(c) Outline how canning of tomatoes influences **one** organoleptic property of tomatoes. *[2]*

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D2. Outline **one** alternative packaging option for tomatoes. *[2]*

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D3. Explain **one** way in which on-farm processing of food can enhance the sustainability of rural communities. *[3]*

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(Option D continued)

D4. Explain **three** problems associated with existing agricultural practices that have led to increased interest in organic agriculture. *[9]*

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Option E – Computer-aided Design, Manufacture and Production

E1. **Table E1** lists five different mass customization strategies relating to the extent of customer involvement in the design of the product. In *Design to Order* the customer is involved in the design of the product whereas, in *Post Delivery*, modifications are made to the product after delivery.

BespokeComputerSolutions.com is a computer company which holds a stock of computer components and maintains a web site enabling it to develop a computer in response to an individual customer's specification.

A second company, JustForYourDolls.com, also runs a web site on which from a series of menus, a customer can design a doll with hair colour, eye colour, *etc.* of the customer's choice. The appropriate components are produced and the doll assembled, packaged and delivered.

Table E1: Mass Customization Strategies

Strategy	**Description**
Post Delivery	Products are stocked at retail outlets. The design of the product facilitates customer involvement and modifications after delivery.
Deliver to Order	Products are assembled and stocked. The product is then packaged and distributed in response to individual customer delivery requirements.
Assemble to Order	A database of raw material and components held in stock is maintained. Assembly of the product commences once an order is placed.
Fabricate to Order	The manufacturer holds only raw materials inventory. The company responds to individual customer requirements which enable product customization prior to assembly.
Design to Order	No inventory is held. The customer is involved at the design stage.

(a) Identify which mass customization strategy is being used by BespokeComputerSolutions.com. *[2]*

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(b) Identify which mass customization strategy is being used by JustForYourDolls.com. *[2]*

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(Question E1 continued)

(c) Explain how mass customization transforms the relationship between the manufacturer and the consumer. *[3]*

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E2. List **two** advantages of Just-in-case (JIC) for BespokeComputerSolutions.com. *[2]*

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E3. Outline **one** way in which virtual reality would help consumers using JustForYourDolls.com. *[2]*

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(This option continues on the following page)

(Option E continued)

E4. Explain **three** advantages **and/or** disadvantages for countries hosting BespokeComputer Solutions.com production units. *[9]*

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Option F – Invention, Innovation and Design

F1. **Figure F1** shows the prototype for a new refrigerator-computer that contains a computer and has a computer display screen mounted in its door. The display screen uses touch screen technology. As well as standard computer programmes, the computer runs a database on which the user can maintain a record of the refrigerator contents including the sell-by dates and consume-by dates of each item.

Figure F1: Refrigerator-computer

(a) Outline **one** reason why the refrigerator-computer in **Figure F1** is likely to have been developed by a team of designers rather than a lone inventor. *[2]*

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(b) List **two** factors that might result in the refrigerator-computer in **Figure F1** failing to reach the market place. *[2]*

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(Question F1 continued)

(c) Explain why it would be difficult to determine whether market pull or technology push was the impetus for the design of the refrigerator-computer in **Figure F1**. *[3]*

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F2. Outline **one** benefit of adopting a pioneering corporate strategy for the company introducing the refrigerator-computer. *[2]*

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F3. Outline **one** criterion relevant to a proactive environmental policy for the refrigerator-computer manufacturing company. *[2]*

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(Option F continued)

F4. Explain **three** reasons for conducting market research before starting the design of the new refrigerator-computer in **Figure F1** for sale in the global market place. *[9]*

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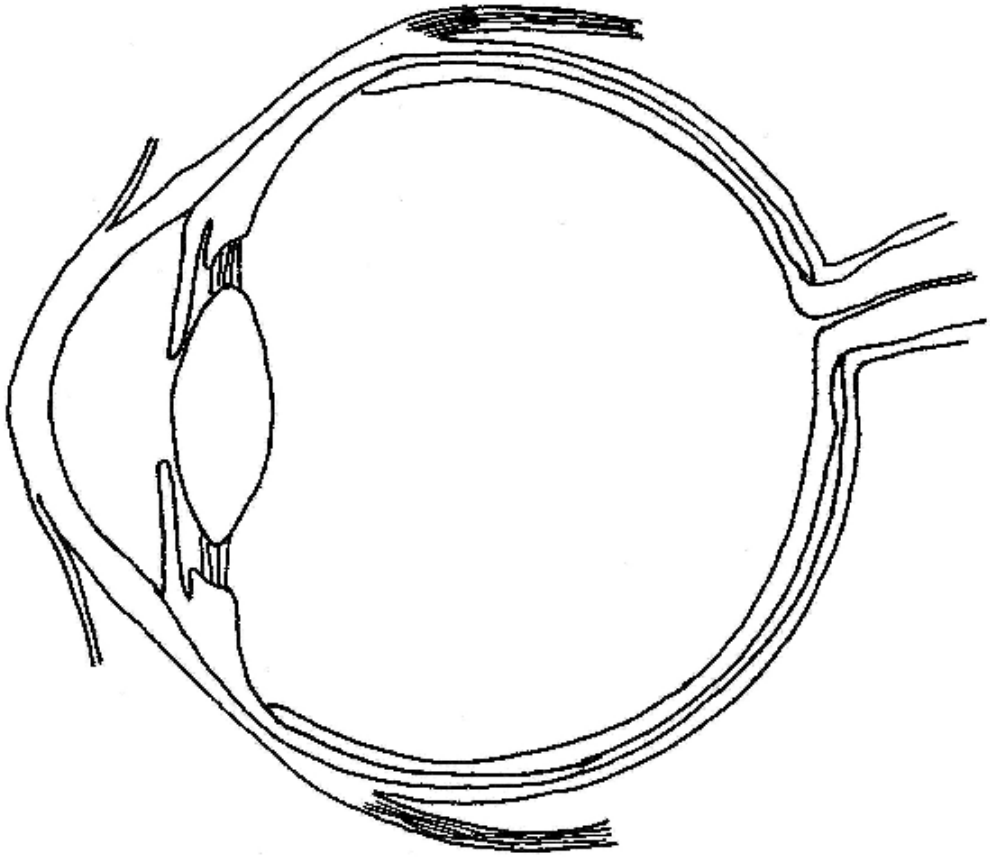
Option G – Health by Design

G1. **Figure G1** shows a cross-section of the human eye receiving light from a distant object.



(a) Define *hypermetropia*. *[1]*

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(b) Annotate **Figure G1** to show what happens to the light from a distant object in hypermetropia. *[1]*

(c) Describe how hypermetropia can be corrected with a spectacle lens. *[2]*

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(Question G1 continued)

(d) Explain how spectacle wearers have benefited from the development of high refractive index glasses. *[3]*

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G2. List **two** materials commonly used for implants in the human body. *[2]*

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G3. Outline **one** situation in which designers can benefit from adopting a user-centred design strategy. *[2]*

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(Option G continued)

G4. Explain why indoor air pollution is a critical environmental issue in many developing countries and discuss the role of clean fuels and improved stove design in reducing indoor air pollution. *[9]*

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Option H – Electronic Products

H1. **Figure H1** shows the performance characteristics of a thermistor.

Figure H2 is the incomplete circuit for a fish tank heater. The heater which is required to turn on to heat the water when the temperature falls below 25 °C.

Figure H1: Performance characteristics of a thermistor

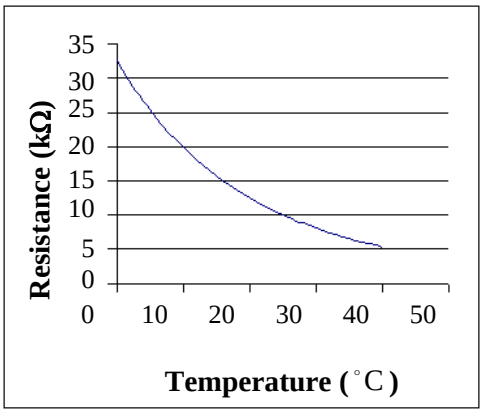
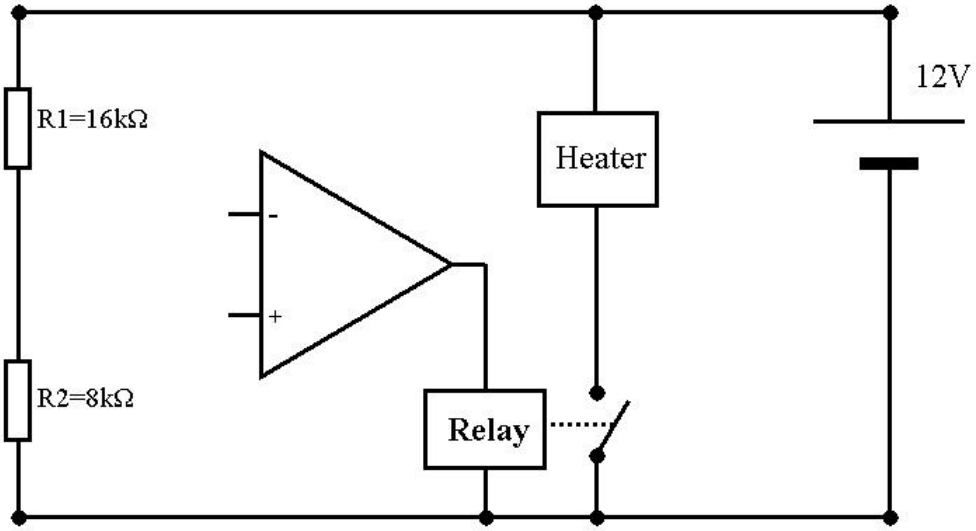


Figure H2: Incomplete circuit for a fish tank heater



(a) Annotate **Figure H2** to explain how you would complete the circuit using a thermistor and a fixed value resistor (do not select a value for the resistor at this point) so that it operates as a comparator circuit and the fish tank heater would turn on when the temperature of the water is less than 25 °C. *[3]*

(b) Identify a value for the fixed value resistor so that the circuit operates to turn the fish tank heater on at temperatures below 25 °C. *[2]*

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(Question H1 continued)

(c) Outline **one** advantage of using a variable resistor in place of a fixed value resistor in the development of the comparator circuit. *[2]*

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H2. List **two** semiconductor materials. *[2]*

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H3. Outline the importance of critical damping in the fish tank heater. *[2]*

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(Option H continued)

H4. Explain the benefits of using standards for mobile phones. *[9]*