IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

M06/4/DESTE/SP3/ENG/TZ0/XX

22066206

DESIGN TECHNOLOGY
STANDARD LEVEL
PAPER 3

Friday 19 May 2006 (morning)

1 hour

Candidate session number

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INSTRUCTIONS TO CANDIDATES

- Write your session number 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 session 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 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.

0119

Option A — Raw material to final product

A1. Backpacks, similar to those shown in **Figure A1** and **Figure A2** are often used as a means of carrying everyday items. The sections in the bag are usually closed with zippers. The light coloured backpack shown in **Figure A1** is made from 100 % canvas cotton, and the other, in black, shown in **Figure A2**, is made from nylon.

Figure A1

Figure A2

Product shown in Natural version
is also available in colours

[Source: http://store.officialsoutfitters.com]

(a) List **two** materials that are mixed to form nylon to make the backpack in Figure A2. *[2]*

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(b) Explain how cotton bolls are converted into thread for the production of the cotton in the backpack in Figure A1. *[3]*

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A2. List **two** reasons why the zipper in the bag is made from stainless steel. *[2]*

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A3. Compare the effect of an impact on toughened and laminated glass. *[2]*

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A4. Explain **two** reasons why cotton would need to be finished for it to be useful outdoors. *[6]*

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Option B — Microstructures and macrostructures

B1. **Figure B1** is an example of a stress-strain curve which could have been used in the design of the suspension bridge in **Figure B2.**

Figure B1: Stress-strain curve

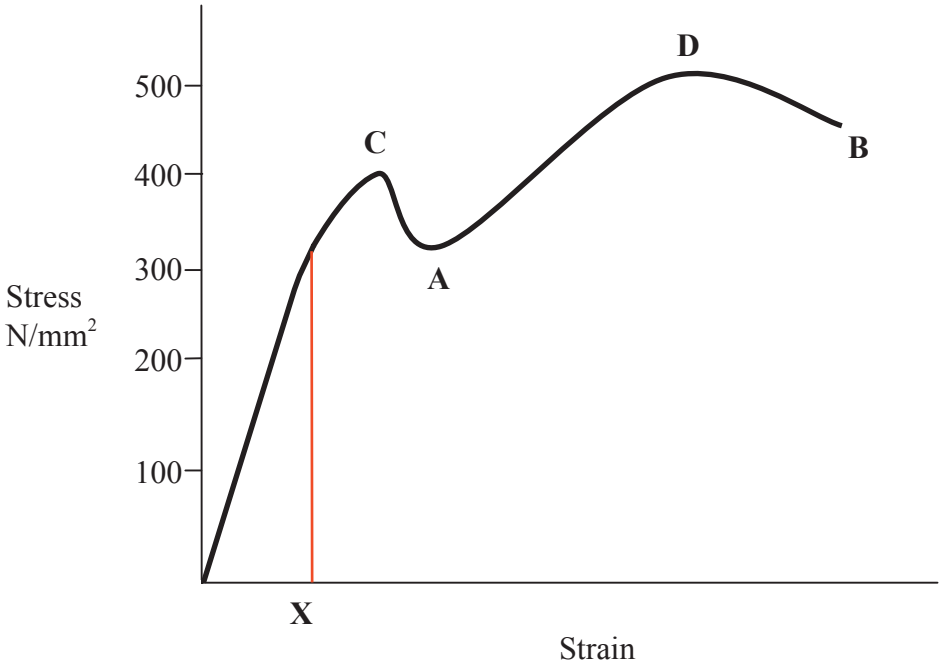

Figure B2: Suspension Bridge in England

(This question continues on the following page)

(Question B1 continued)

(a) From the stress-strain graph in Figure B1, determine the value of the yield stress and identify the letter which is nearest the point of ultimate stress. *[2]*

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(b) Annotate by using shading, the area under the curve in Figure B1 which represents the elastic region of the material. *[2]*

B2. Evaluate the importance of strain in the design of a suspension bridge. *[3]*

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B3. Describe, at the atomic level, how the tensile strength of metal is increased by alloying. *[2]*

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B4. Explain why metals harden when deformed beyond their yield stress. *[6]*

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Option C — Appropriate technologies

C1. **Figure C1** is a picture of a large scale pig and hen farm in Slovakia. In response to an initial problem of manure disposal, a biogas plant was built which now uses the energy generated from the waste manure to produce electric power, heat and fertilizer.

Figure C1: Slovakian Farm

(a) Describe **one** advantage of the energy system of the farm described in Figure C1. *[2]*

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(b) Explain **one** way energy considerations influenced the design of the pig and hen farm described in Figure C1. *[3]*

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C2. Outline how the farm represents sustainable development. *[2]*

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C3. Outline **one** way in which the biogas farm is an example of an alternative technology. *[2]*

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C4. Discuss **two** ethical issues involved when a country develops a natural resource conservation policy. *[6]*

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Option D — Food technology

D1. An example of a food label for a low fat milk product is shown in **Figure D1**.

Figure D1: Low fat milk product label

Low-Fat Milk

Nutrition Facts
Serving Size 8 fl. oz. (236g)
Servings Per Container 8

Amount Per Serving	
Calories 100	**Calories from Fat** 20
	% Daily Value
Total Fat 2.5g	4%
Saturated Fat 1.5g	8%
Cholesterol 10g	3%
Sodium 130mg	5%
Total Carbohydrate 12g	4%
Dietary Fibre 0g	0%
Sugars 11g	
Protein 8g	

Vitamin A	10%	* Vitamin C	4%
Calcium	30%	* Vitamin D	25%

* Percent Daily Values are based on a 2,000 calorie diet

(a) List **two** types of information, other than that shown in Figure D1, that could be communicated to consumers on a food label. *[2]*

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(b) Explain how increasing health consciousness has resulted in the development of a modified food product. *[3]*

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D2. Describe how the pasteurization of milk increases its shelf life. *[2]*

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D3. List **two** examples of macronutrients listed on the label in Figure D1. *[2]*

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D4. Explain **one** advantage and **one** disadvantage of packaging milk. *[6]*

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Option E — Computer-aided design, manufacture and production

E1. The perspective CAD image in **Figure E1** was produced by the designers during the preliminary design phase of a condominium project in Abu Dhabi.

Figure E1

(a) List **two** ways in which the relationship between the designer and consumers can be enhanced through using CAD images such as the one in Figure E1. *[2]*

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(b) Discuss **one** criterion an interior designer would use in selecting a CAD software package. *[3]*

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E2. Outline **one** way in which virtual reality could be used by an interior designer to conserve resources. *[2]*

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E3. List **two** possible impacts that might arise for some of the workforce within a company from the introduction of CAD-CAM. *[2]*

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E4. Explain **two** reasons why JIT would be used in preference to JIC when manufacturing from CAD generated images *[6]*

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Option F — Invention, innovation and design

F1. The Zorin bicycle pump is a new design where the pump is hidden within the frame of the seat post **(Figure F2)**. When the seat post is removed the flexible valve connector is pulled out of the tube **(Figure F1)** to connect to the tyre.

Figure F1

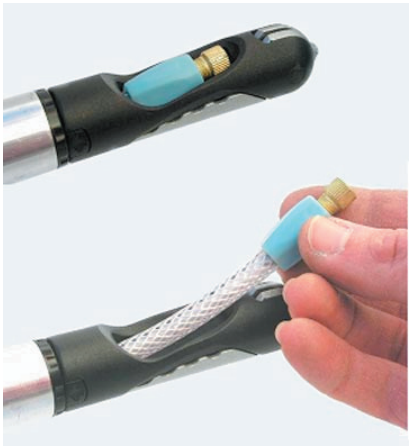
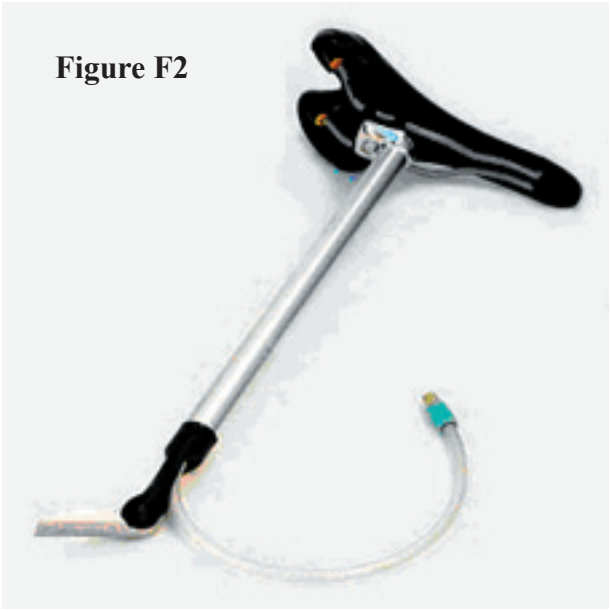


Figure F2



(a) Describe how the seat post bicycle pump in Figure F2 is an example of incremental design. *[2]*

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(b) Explain **one** invention that was important in the development of inflatable tyres for bicycles. *[3]*

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F2. List **two** reasons why market pull may have resulted in the seat post pump. *[2]*

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F3. Compare the lone inventor with the product champion. *[2]*

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F4. Explain **two** consumer demands that continue to be important in the ongoing development of the bicycle. *[6]*

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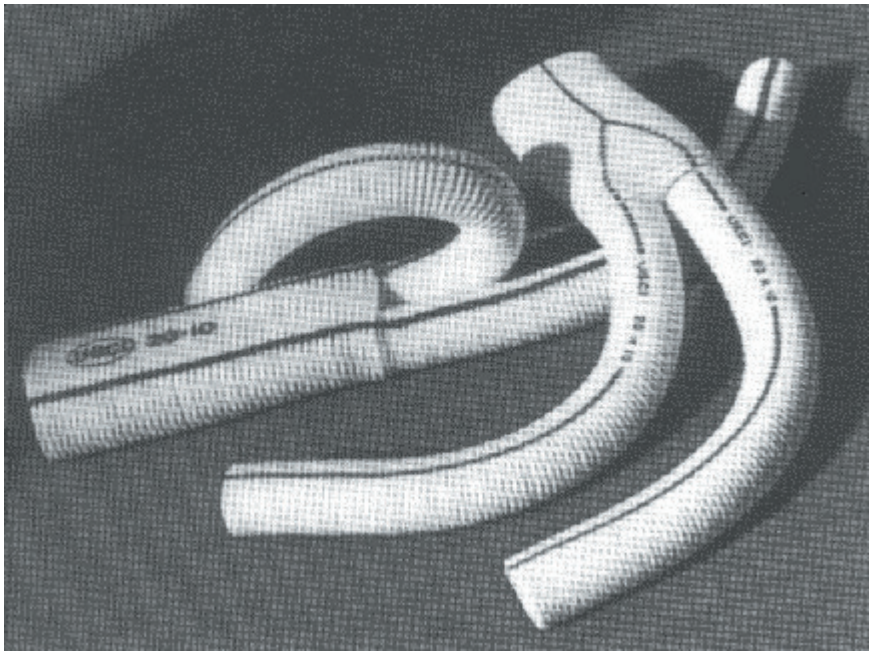
Option G — Health by design

G1. An example of a textile vascular graft, or prosthesis, is shown in **Figure G1**.

Figure G1: Textile Vascular Graft



(a) List **two** criteria for the design of a textile vascular graft such as that in Figure G1. *[2]*

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. (b) Discuss **one** difference between vascular prostheses produced by weaving and those produced by knitting. *[3]*

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G2. Describe **one** recent development in the design of textile vascular prostheses. *[2]*

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G3. Outline **one** reason why some metals are commonly used as implant materials. *[2]*

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G4. Explain how Pro Osteon can act as a temporary framework for bone regrowth. *[6]*

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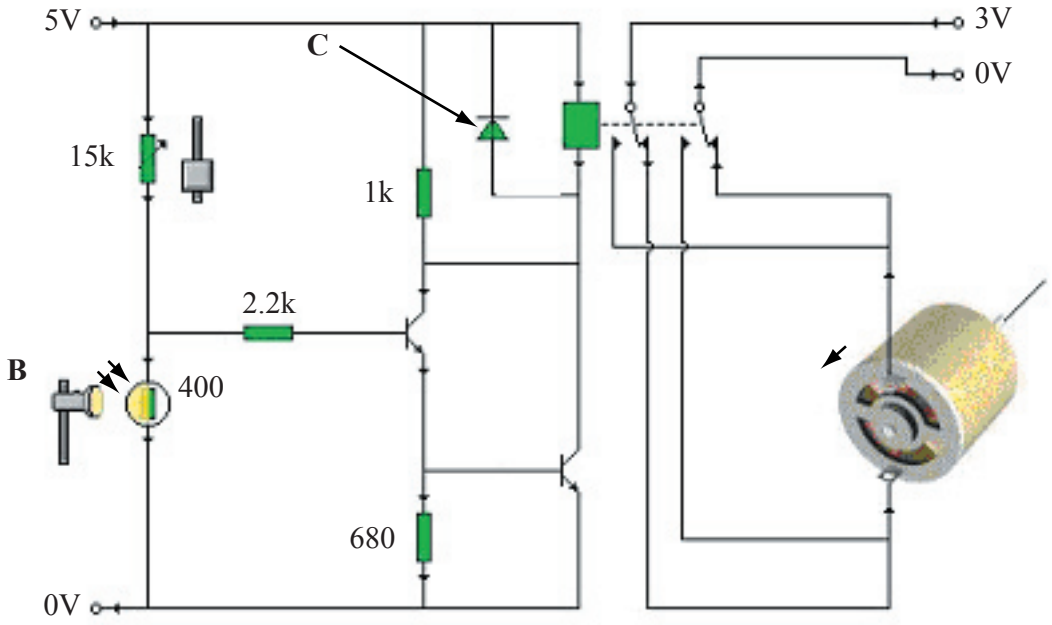
Option H — Electronic products

H1. The electronic circuit for a control system is shown in **Figure H1**. It has been generated from an electronic CAD package.

Figure H1: Circuit Diagram



(a) Outline a possible use for the circuit in Figure H1. *[2]*

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(b) Explain the function of the component at C in Figure H1. *[3]*

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H2. Describe the function of an Op-amp. *[2]*

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H3. Draw **one** diagram which illustrates the difference between a closed loop and an open loop electronic system. *[2]*

H4. Discuss **two** impacts on society of the minaturization of electronic products. *[6]*

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