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

N04/4/DESTE/SP2/ENG/TZ0/XX

88046205

DESIGN TECHNOLOGY
STANDARD LEVEL
PAPER 2

School code

Candidate code

Wednesday 17 November 2004 (afternoon)

1 hour

INSTRUCTIONS TO CANDIDATES

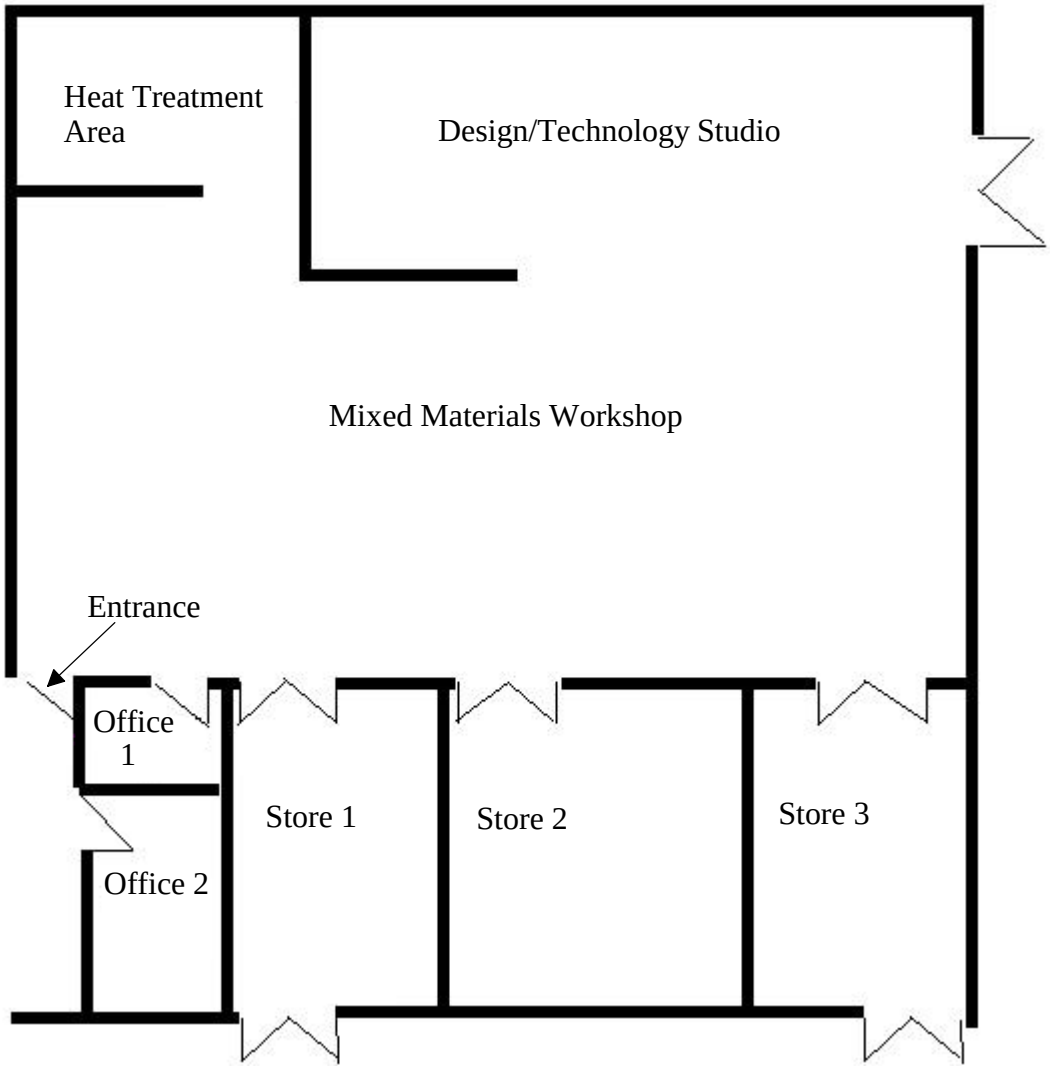
- Write your school code and candidate code in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all of Section A in the spaces provided.
- Section B: answer one question from Section B. Write your answers on answer sheets. Write your school code and 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 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. **Figure 1** shows the plan for a proposed new Design Technology Department in a college for students aged 16-18. The department comprises three areas. One area has kilns and ovens for heat treatment. One area has drawing equipment for design work. The third and largest area is for working with a range of materials, *e.g.* timber, metals and ceramics, and has dust extraction units fitted to machines. The department has one office next to the mixed materials workshop for the technician and one for teaching staff members. It has three storerooms. Two storerooms have two sets of double doors; one only has one set of double doors. The external dimensions of the department are 26 metres by 27 metres.

Figure 1: The plan of proposed new Design Technology Department



(This question continues on the following page)

(Question 1 continued)

(a) (i) Calculate the area of the Design Technology department. *[2]*

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(ii) Calculate the scale of the plan if the plan is 130 mm by 135 mm. *[2]*

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(b) (i) State **one** reason computers should be made available in the Design Technology area. *[1]*

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(ii) State **one** reason for allocating Office 1 next to the mixed materials workshop to the technician. *[1]*

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(iii) Outline **one** possible reason why Stores 1 and 3 have two sets of doors but Store 2 has only one set. *[2]*

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(c) (i) State **one** piece of power-driven equipment that would be likely to be available in the timber working area. *[1]*

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(ii) Explain why dust extraction units are fitted to machines in the mixed materials workshop. *[3]*

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2. (a) Define *density*. *[1]*

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(b) Explain **one** way in which density is important in the design specification of product packaging. *[3]*

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3. (a) Define *life cycle analysis.* *[1]*

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(b) Explain **one** way in which the pre-production stage can result in reduction of the environmental impact of a washing machine. *[3]*

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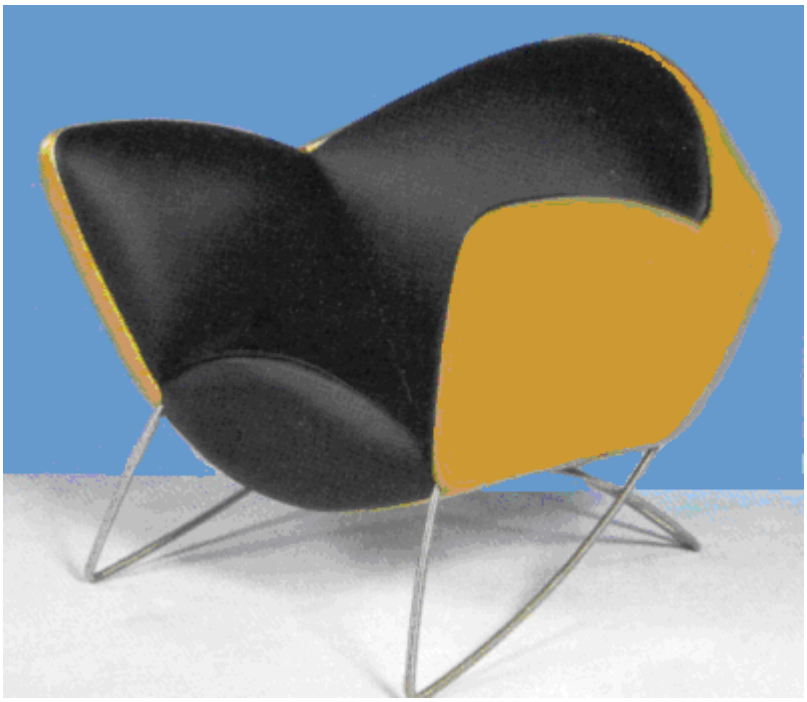
SECTION B

*Answer **one** question. Write your answers on the answer sheets provided. 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.*

4. **Figure 2** shows a chair designed in 1948, made by Knoll Associates, New York. The seat comprises a seat cover and a cushion made from a mixture of plastic materials and legs which are made from metal. The chair is batch produced.

Figure 2: Chair designed by Knoll Associates in 1948



(a) (i) State **one** physical property the designer should consider when choosing the plastic material for the seat cover. *[1]*

(ii) Outline **one** health and safety consideration the designer should take into account when choosing the plastic material for the seat cushion. *[2]*

(iii) Describe the relevance of ductility in choosing the metal material for the legs. *[2]*

(b) (i) List **two** variable costs involved in the batch production of the chair. *[2]*

(ii) Describe the contribution of variable costs to the final cost of the product. *[2]*

(iii) Describe the contribution of fixed costs to the final cost of the product. *[2]*

(c) Discuss how **three** different methods of joining could be used in the manufacture of the chair. *[9]*

5. **Figure 3** shows the CAD model of a new design of stethoscope (a device for listening to the heart beat and breathing of a patient). The stethoscope can be used by holding in the hand against a patient's chest or strapped onto a patient for continuous monitoring. The unit contains a transmitter and emits a signal which can be sent to a central control unit for display and recording. The stethoscope, which is shown actual size, is a self-contained unit with the outer casing made of a thermoplastic material.

Figure 3: CAD model of a new design of stethoscope

(a) (i) Outline **one** piece of anthropometric data required to design this product. *[2]*

(ii) Outline **one** physiological **or** psychological factor relevant to the ergonomics of the product. *[2]*

(iii) Outline **one** advantage of using a user trial, rather than using other methods of obtaining information, in the design development of the stethoscope. *[2]*

(b) (i) State the manufacturing technique for making the plastic outer casing. *[1]*

(ii) State **one** advantage and **one** disadvantage of using a CAD model rather than a physical model. *[2]*

(iii) List **two** mechanical properties required of the material used for manufacturing the product. *[2]*

(c) Explain the implications of the specialist nature and hence the limited market of this product for manufacturing costs, distribution costs and marketing costs and the impact on the final cost of the product. *[9]*

6. **Figure 4** shows one of the first portable transistor radios designed by Sony in 1955. The radio has an outer casing made from a thermoset, the radio does not have a handle. **Figure 5** shows a radio designed by Roberts (UK) and was made in 1996 and is an example of "retro" design, *i.e.* a design that invokes nostalgia for the past. The outer casing of the Roberts radio is made from plywood covered with a synthetic textile material.

Figure 4: Sony radio produced in 1955

Figure 5: Roberts radio produced in 1996

(a) (i) State the likely manufacturing technique used to make the handle of the Roberts radio shown in **Figure 5**. *[1]*

(ii) Describe the structure of plywood. *[2]*

(iii) Outline **one** advantage of using plywood for the manufacture of the Roberts radio. *[2]*

(b) (i) List **two** other professionals likely to be involved in the product design cycle in addition to the designer. *[2]*

(ii) List **two** contributions of life cycle analysis to the holistic evaluation of a product. *[2]*

(iii) Outline **one** ergonomic disadvantage of the Sony radio shown in **Figure 4**. *[2]*

(c) Explain why the choice of a thermoset for the outer casing of the Sony radio might lead to customer complaints. Explain the benefits of receiving complaints. Explain how the radio might be redesigned in response to the complaints. *[9]*