



**DESIGN TECHNOLOGY
STANDARD LEVEL
PAPER 1**

Thursday 10 May 2007 (afternoon)

45 minutes

INSTRUCTIONS TO CANDIDATES

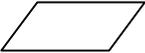
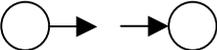
- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

1. What is included in the product design specification (PDS) but not in the design brief?
 - A. Evaluation criteria for a good design proposal.
 - B. The major constraints which the design must achieve.
 - C. Identification of the target market.
 - D. Precise limits for all performance requirements.

2. Which stage of the IB elaborated design cycle relates to the development of a design brief?
 - A. Identifying or clarifying a need or opportunity.
 - B. Analysing, researching and specifying requirements.
 - C. Realizing the chosen solution.
 - D. Testing and evaluating the chosen solution.

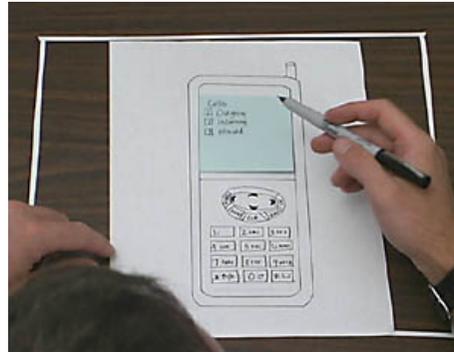
3. Which is **most** likely to result in changes to the design of an existing product?
 - A. Adaptation
 - B. Brainstorming
 - C. Analogy
 - D. Constructive discontent

4. Which stage of the IB simple design cycle model is most likely to involve mathematical models?
 - A. Identifying the problem and the brief.
 - B. Researching and specifications.
 - C. Developing the chosen solution.
 - D. Planning and realizing the chosen solution.

5. In which technique for solving problems are solutions to a problem in one field used to provide a new idea for a solution in another?
- A. Adaptation
 - B. Animation
 - C. Analogy
 - D. Brainstorming
6. Which model type is a designer most likely to use in discussions with a manufacturer?
- A. Algorithm
 - B. Perspective drawing
 - C. Orthographic drawing
 - D. Mathematical model
7. Which flow chart symbol is used to represent a decision?
- A. 
 - B. 
 - C. 
 - D. 

- 8. Paper prototyping is widely used to collect data for developing computer interfaces, e.g. for mobile phone displays (see Figure 1). This approach has a number of advantages as it is an extremely fast and cheap way of collecting data. It can be used very early in the development of a design.

Figure 1: Paper prototyping in the development of a mobile phone display



For which combination of user research and user trial is paper prototyping appropriate for data collection?

	User research	User trial
A.	Yes	No
B.	Yes	Yes
C.	No	No
D.	No	Yes

- 9. Applying scientific information about the relationship of humans to their working environment in order to improve working conditions and increase efficiency is called
 - A. percentile range.
 - B. ergonomics.
 - C. anthropometrics.
 - D. bodily tolerances.

10. The relationship between what a product is worth to a consumer and what it costs is known as
- A. cost-effectiveness.
 - B. value for money.
 - C. aesthetics.
 - D. manufacturing costs.
11. A “reach envelope” is the volume in 3-D space that a person can reach. Reach envelopes are used by designers, *e.g.* for the design of a cockpit-style workspace (see Figure 2a and 2b below). Data for which percentile range would ensure that the maximum numbers of users would be able to reach items within the workspace?

Figure 2a: Reach envelope

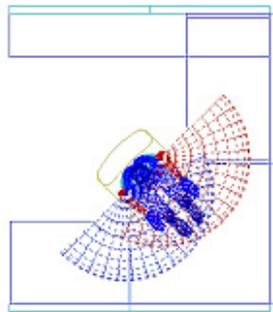


Figure 2b: Cockpit style workspace



- A. 99th
- B. 95th
- C. 50th
- D. 5th

12. Which combination of “**focus on aesthetics**” and “**predictability of product cycle**” characterises fashion?

	Focus on aesthetics	Predictability of product cycle
A.	High	Predictable
B.	High	Unpredictable
C.	Lower	Predictable
D.	Lower	Unpredictable

13. Which property is **most** important in the selection of a material for the cable of a lift (elevator) which is designed to take people quickly up a high-rise building?

- A. Tensile strength
- B. Stiffness
- C. Toughness
- D. Hardness

14. Which physical property is important in selecting a material as a thermal insulator in the wall of a domestic oven?

- A. Thermal expansivity
- B. Thermal conductivity
- C. Electrical resistivity
- D. Hardness

15. Which material group is subdivided into “natural” and “synthetic”?
- A. Timber
 - B. Plastics
 - C. Textile fibres
 - D. Metals
16. What property determines a material’s suitability for sintering?
- A. Tensile strength
 - B. Thermal conductivity
 - C. Durability
 - D. Ductility
17. Of the following manufacturing processes used at different stages in the production of a cotton shirt, which is an example of a shaping process?
- A. Stitching
 - B. Using fasteners
 - C. Weaving
 - D. Cutting
18. What is a **disadvantage** of lamination?
- A. No finishing is required.
 - B. Complex shapes can be produced.
 - C. May need the production of a mould.
 - D. Different materials can be combined.

19. How would the plastic pipes shown in Figure 3 have been produced?

Figure 3: Plastic pipes



- A. Lamination
 - B. Injection moulding
 - C. Sintering
 - D. Extrusion
20. Laser guidance systems use laser beams to guide automated guided vehicles (AGVs). They are the latest innovation in AGV technology and are controlled by computers. What advantage do laser guidance systems offer over underfloor cable guidance systems?
- A. Labour requirements for material delivery are reduced.
 - B. The path for the vehicle is not fixed and can be easily changed.
 - C. Damage to the transported materials is reduced.
 - D. Materials can be delivered to where they are needed on time.
21. What is **not** necessarily true of automating a mechanised production process?
- A. Product quality increases.
 - B. Training requirements are different.
 - C. Capital costs increase.
 - D. Variable costs increase.

22. How is the final cost of manufacturing a product calculated?

- A. Fixed costs plus raw material costs plus labour costs.
- B. Fixed costs plus a proportion of the variable costs.
- C. Variable costs plus a proportion of the fixed costs.
- D. Variable costs plus fixed costs.

23. Which combination of “changes to the product” and “diffusion into the marketplace” characterises the mature stage of the product life cycle?

	Changes to the product	Diffusion into the marketplace
A.	Many	High
B.	Many	Low
C.	Few	High
D.	Few	Low

24. Which aspect of a washing machine design is not included in an Ecolabel?

- A. Energy consumption.
- B. Water consumption.
- C. That the design is easily disassembled and recycled.
- D. Maintenance considerations.

25. What is most likely to be the initial response of a manufacturer to new legislation relating to cleaning up the manufacturing process?

- A. Significant product modification.
- B. Significant process modification.
- C. Collection of quantitative data relating to pollution and waste.
- D. Addition of end-of-pipe technologies to the manufacturing process.

Questions 26 to 30 relate to the following case study. Please read the case study and then answer the questions.

CASE STUDY

Polyethylene terephthalate (PET), commonly known as polyester, is a clear plastic used for beverage containers. It is cheap, lightweight, shatter-resistant and recyclable. Recycled PET can be used for producing carpet yarns and polyester fibrefill for sleeping bags and winter coats. However, in 1999 in the United States of America (USA), data showed that only 41% of beverage containers were recycled, and about 114.4 billion beverage containers (7.7 million tons of PET) were disposed of - many into landfill sites (see **Figure 3**).

Figure 3: Beverage containers in a landfill site



Refundable bottle deposits have been found to be an extremely effective method for ensuring bottles are returned for recycling. In 2002 in the USA, legislation (called the National Beverage Producer Responsibility Act) was introduced to force the industry to design the most efficient deposit-return systems.

26. Which design objective for green products is **not** achieved by the National Beverage Producer Responsibility Act?
- A. Increased efficiency in the use of materials, energy and other resources.
 - B. Taking full account of the end disposal of the product.
 - C. Analysing and minimizing potential safety hazards.
 - D. Reducing to a minimum any long-term harm caused by the use of the product.
27. What does the symbol shown in Figure 4 indicate?

Figure 4: Symbol marked on PET products



	The bottle is made of recycled material	The bottle can be recycled
A.	Yes	No
B.	Yes	Yes
C.	No	No
D.	No	Yes

28. Which characteristic of PET is **least** likely to ensure that it is recycled?
- A. It is cheap.
 - B. It can easily be converted into a form for use in other products.
 - C. It is shatter-resistant.
 - D. It is a lightweight material.
29. Why can PET recycling be regarded as a clean technology?
- I. It reduces the exploitation of natural resources.
 - II. It does not produce toxic emissions.
 - III. It minimizes waste.
- A. I, II and III
 - B. I and II
 - C. II and III
 - D. I and III
30. At what stage in the life cycle of a beverage container will the National Beverage Producer Responsibility Act help to reduce its environmental impact?
- A. Production
 - B. Distribution
 - C. Utilization
 - D. Disposal
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