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**DESIGN TECHNOLOGY  
STANDARD LEVEL  
PAPER 1**

Thursday 16 May 2013 (afternoon)

45 minutes

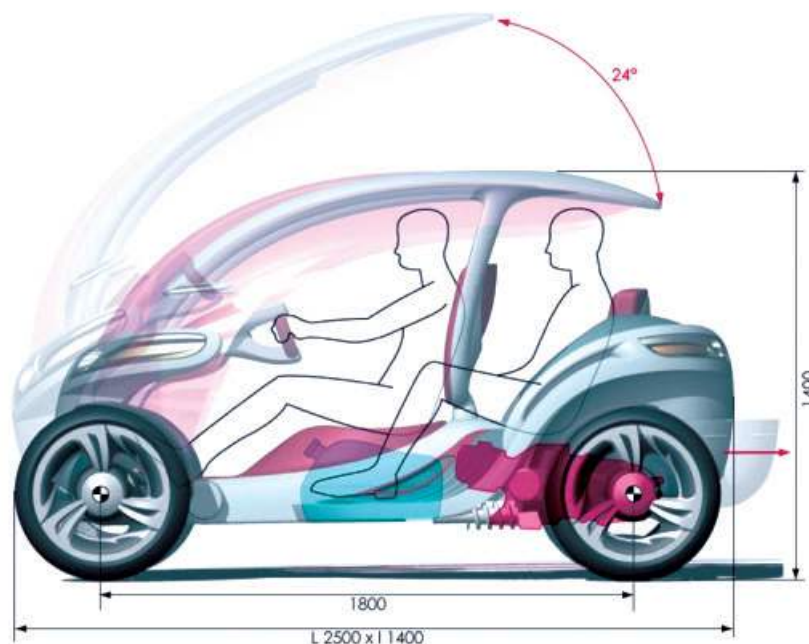
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**INSTRUCTIONS TO CANDIDATES**

- 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.
- The maximum mark for this examination paper is *[30 marks]*.

1. What is **not** identified in the design brief?
  - A. The target market
  - B. The design goal
  - C. The major constraints on the design
  - D. The detailed requirements for the design
  
2. **Figure 1** shows a concept vehicle – the Scooto – a cross between a scooter and a car designed to carry three people. It was designed by the French design and engineering studio ETUD Intégral. A prototype of the concept car was exhibited at the Paris Motor Show.

**Figure 1: Concept car designed by ETUD**



[Source: Designed by ETUD integral]

What is **not** likely to be true of a prototype of the concept vehicle?

- A. It communicates the concept to potential customers better than a drawing
- B. It will work like the final product
- C. It may never go into commercial production
- D. It models radical features of the design

3. Which stage of the IB design cycle results in a detailed design specification?
- A. Identifying or clarifying a need
  - B. Generating ideas and solutions
  - C. Analysing, research and specifying requirements
  - D. Developing the chosen solution

4. **Figure 2** shows a pair of safety scissors produced by Elephant Products company. They were produced to overcome injuries sustained by children in using scissors for art and craft activities.

**Figure 2: Safety scissors produced by Elephant Products**



[Source: [http://www.elephantproducts.com/pakidermsscissors.html?pab=1\\_6](http://www.elephantproducts.com/pakidermsscissors.html?pab=1_6)]

Which ideas-generating technique would have been used to identify the problems associated with earlier designs for children's scissors?

- A. Brainstorming
- B. Adaptation
- C. Constructive discontent
- D. Analogy

5. Which cycles focus on producing a suitable solution to a problem?

	<b>Design cycle</b>	<b>Product cycle</b>
A.	No	No
B.	No	Yes
C.	Yes	No
D.	Yes	Yes

6. What is more likely to be true of a lone inventor than a product champion?

- A. S/he is an entrepreneur
- B. S/he has influence in a company
- C. S/he is objective over the merits of an invention
- D. S/he has in-depth understanding of the scientific aspects of a design

7. What is **not** the result of recycling?

- A. A supply of virgin raw material
- B. Salvaging high-value materials
- C. Reducing the hazards associated with disposal
- D. Reducing landfill

8. Which process will contribute most to reducing capital costs for manufacturing a new product?

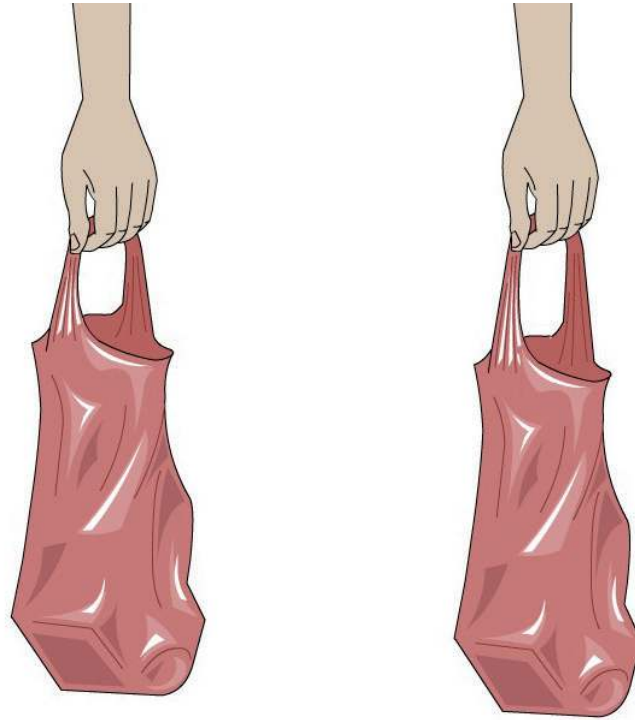
- A. Design for materials
- B. Design for process
- C. Design for assembly
- D. Design for disassembly

9. What benefits are achieved by addressing issues identified in the life cycle analysis of a product?
- I. Saving natural resources
  - II. Reducing energy consumption
  - III. Minimizing waste
- A. I and II
  - B. I and III
  - C. II and III
  - D. I, II and III
10. Which strategy is **not** facilitated by manufacturing washing machines from standard components?
- A. Repair
  - B. Reconditioning
  - C. Reuse
  - D. Recycling
11. What is defined as the smallest part of an element that can exist chemically?
- A. Alloy
  - B. Atom
  - C. Composite
  - D. Molecule

12. What is the ability of a material to withstand pulling forces?
- A. Ductility
  - B. Hardness
  - C. Tensile strength
  - D. Toughness
13. What are the advantages of a hardwood over a softwood for making furniture?
- I. Durability
  - II. Cost
  - III. Aesthetics
- A. I and II
  - B. I and III
  - C. II and III
  - D. I, II and III

14. **Figure 3** shows what happens when a plastic bag is overloaded.

**Figure 3: The effect of a heavy load on a plastic bag**



[Source: Source: www.absorblearning.com. Used with permission.]

What explains the effect of a heavy load on a plastic bag as shown in Figure 3?

- A. Plastic deformation
- B. Stiffness
- C. Ductility
- D. Tensile strength



15. **Figure 4** shows a wood burning stove.

**Figure 4: A wood burning stove**



[Source: [http://en.wikipedia.org/wiki/File:Sauna\\_stove\\_narvi\\_02.JPG](http://en.wikipedia.org/wiki/File:Sauna_stove_narvi_02.JPG)]

Which physical property needs careful consideration in the selection of the different materials for the structure of the door of a wood burning stove?

- A. Density
  - B. Electrical conductivity
  - C. Thermal conductivity
  - D. Thermal expansivity
16. Why are thermosets unsuitable for use as adhesives in products designed for disassembly by application of heat?
- A. Thermosets have extensive bonding between the linear chains
  - B. The effect of temperature on a thermoset is irreversible
  - C. Thermosets have a rigid 3D structure
  - D. Thermosets are made of linear chain molecules

17. **Figure 5** shows the view through the glass floor in the viewing platform of the CN Tower in Toronto (**Figure 6**).

**Figure 5: The glass floor in the CN Tower**



[Source: [http://upload.wikimedia.org/wikipedia/commons/e/e9/Glass\\_Floor\\_of\\_the\\_CN\\_Tower.JPG](http://upload.wikimedia.org/wikipedia/commons/e/e9/Glass_Floor_of_the_CN_Tower.JPG)]

**Figure 6: The CN Tower**



[Source: [http://en.wikipedia.org/wiki/File:Toronto\\_-\\_ON\\_-\\_Toronto\\_Harbourfront7.jpg](http://en.wikipedia.org/wiki/File:Toronto_-_ON_-_Toronto_Harbourfront7.jpg)]

Which combination of properties makes glass a suitable material for the floor of the viewing platform in the CN Tower?

- I. It is strong in compression
  - II. It is strong in tension
  - III. It is transparent
- A. I and II
  - B. I and III
  - C. II and III
  - D. I, II and III

18. Which aspect of assembly-line production is **not** a benefit for the workforce?
- A. No bending over required
  - B. Job standardization
  - C. Limited training required
  - D. No heavy lifting
19. What is true of mass customization?
- I. Mass-produced products can be customized to meet the needs of individuals
  - II. Customized products can be produced at competitive prices
  - III. The product should be customized as early as possible in the manufacturing process
- A. I and II
  - B. I and III
  - C. II and III
  - D. I, II and III

20. Which manufacturing technique would have been used to produce the basket shown in **Figure 7**?

**Figure 7: A basket**



[Source: [http://commons.wikimedia.org/wiki/File:Cistell\\_002.jpg](http://commons.wikimedia.org/wiki/File:Cistell_002.jpg)]

- A. Moulding
  - B. Casting
  - C. Weaving
  - D. Stitching
21. What would be improved by adding an “end-of-pipe” solution to clean up a manufacturing process?
- A. Process efficiency
  - B. Cost-effectiveness
  - C. Emission of toxic materials
  - D. Waste minimisation
22. What is a disadvantage of planned obsolescence for manufacturers?
- A. They must carefully monitor market trends
  - B. The product life cycle is predictable
  - C. Products are designed so they are easy to maintain
  - D. Products must last at least as long as their guaranteed product life

23. In which design context would the 5th–95th percentile be used?
- A. The length of a bed
  - B. The range of adjustment for the driver’s seat in a car
  - C. The reach envelope for a work station
  - D. The height of a wash hand basin
24. Which evaluation technique would be used by a manufacturer to test the performance of a new product under the conditions in which it is used?
- A. User trial
  - B. User research
  - C. Performance test
  - D. Field trial
25. What is a major advantage of user research?
- A. It is cost-effective
  - B. It provides mainly quantitative data
  - C. It is time-consuming
  - D. It does not require a prototype
26. Which criterion could be assessed by a consumer before purchase?
- A. Aesthetics
  - B. Ease of maintenance
  - C. Reliability
  - D. Actual performance

Questions 27–30 relate to the following case study. Please read the case study carefully and answer the questions.

The Barrow Boat Company manufactures small sailing and rowing boats. They have a fixed wheel at the front and holes through the transom through which the oars fit. This allows the boats to be wheeled like a wheelbarrow and removes the need for a trolley (Figure 8). Following their success The Barrow Boat Company has diversified its range and now has a product family with a range of traditional style boats (Figure 9). Customers can purchase a kit and assemble a boat themselves, they can buy a boat built but not finished or they can buy a completed boat. The boats use composite materials, for example, marine ply (plywood which has been specially treated to resist rotting in a high-moisture environment), rather than natural timber to make them lighter and easier to maintain.

Figure 8: A Barrow Boat

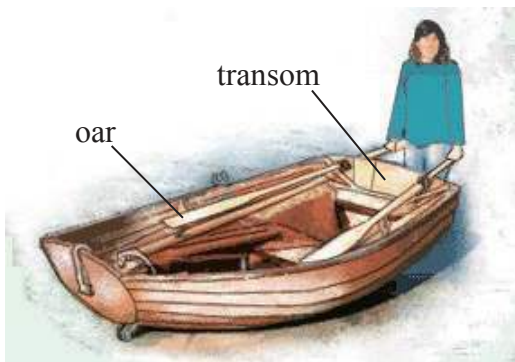


Figure 9: The Barrow Boat product family



[Source: <http://www.barrowboats.co.uk>. Used with permission.]

27. Which ideas-generating technique would have informed the design and naming of the Barrow Boat?
- A. Constructive discontent
  - B. Morphological synthesis
  - C. Analogy
  - D. Adaptation

28. What advantage does developing a product family give to the Barrow Boat Company?
- I. Faster time to market
  - II. Cost-effectiveness
  - III. Increased productivity
- A. I and II
  - B. I and III
  - C. II and III
  - D. I, II and III
29. What would be an advantage of using a clear varnish rather than paint to finish the boat?
- A. Enhancing the aesthetic properties of the plywood
  - B. Resistance to damp environments
  - C. Reducing warping
  - D. Increasing its resistance to cracking
30. Apart from painting or varnishing, what other manufacturing technique is likely to be required to finish the boat?
- A. Casting
  - B. Weaving
  - C. Abrading
  - D. Cutting
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