



88146201



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**DESIGN TECHNOLOGY
HIGHER LEVEL
PAPER 1**

Tuesday 18 November 2014 (afternoon)

1 hour

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 *[40 marks]*.

1. **Figure 1** shows a freehand drawing developed during the early stages of the design development of a picnic basket which can be mounted on a bicycle as a pannier (**Figure 2**). The pannier can be unpacked and used as a picnic table (**Figure 3**).

Figure 1: Freehand drawing

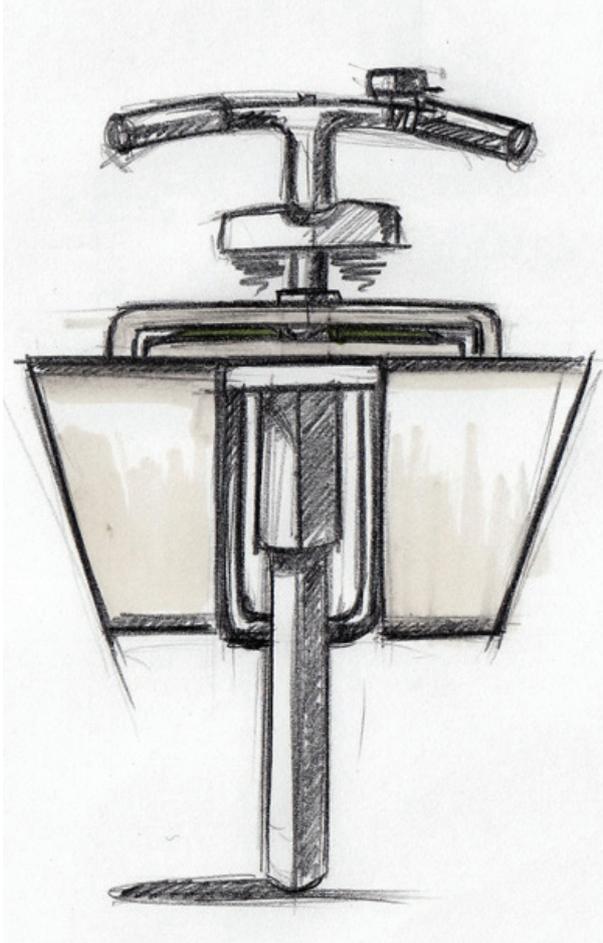


Figure 2: The bicycle-mounted picnic basket



Figure 3: The picnic basket unpacked into a picnic table



[Source: <http://www.bloondesign.com/>]

What is a major advantage of using freehand drawings, such as **Figure 1**, with non-designers in the early stages of design development?

- A. They can be used as production drawings.
- B. They show the proposed solution in shape and form.
- C. They show the sequence of assembly of a product.
- D. They are easily understood.

2. What is meant by the “goal” in a design brief?
 - A. The target market
 - B. The initial prototype
 - C. The final specification
 - D. The final outcome

3. What is defined as: analysing a situation that would benefit from redesign and working out a strategy for improving it?
 - A. Analogy
 - B. Adaptation
 - C. Attribute listing
 - D. Constructive discontent

4. What term describes a product accepted as the market standard?
 - A. Invention
 - B. Innovation
 - C. Dominant design
 - D. Robust design

5. Which is often true of both a lone inventor and a product champion?
 - A. They have strong corporate influence.
 - B. They are creative.
 - C. They have business acumen.
 - D. They are strongly committed to the product.

- 6. What is least likely to be the impetus for green design?
 - A. Consumer pressure
 - B. Profitability
 - C. Standards
 - D. Health and safety

- 7. What is true of an ecolabel?
 - A. It indicates that a product meets the most recent environmental standard for a particular product category.
 - B. It indicates that a product covers all aspects of green design.
 - C. It provides information to guide consumer decision-making.
 - D. It is a mandatory international standard.

- 8. Which combination of “high environmental impact” and in the “global marketplace” identifies the types of product targeted by life cycle analysis?

	High environmental impact	In the global marketplace
A.	No	No
B.	No	Yes
C.	Yes	No
D.	Yes	Yes

9. What is a major advantage of reconditioning a computer?
- A. It makes it more energy-efficient.
 - B. It is as reliable as a new product.
 - C. It is easy to undertake.
 - D. It extends the product life.
10. What is defined as a mixture that contains at least one metal?
- A. Atom
 - B. Molecule
 - C. Alloy
 - D. Composite
11. Which plastic would be suitable for use in the production of the electrical socket shown in **Figure 4**?

Figure 4: An electrical socket



[Source: Australian dual switched power point” by Original uploader was Auspowerpoint at en.wikipedia - Transferred from en.wikipedia. Licensed under Public Domain via Wikimedia Commons—http://commons.wikimedia.org/wiki/File:Australian_dual_switched_power_point.jpg#mediaviewer/File:Australian_dual_switched_power_point.jpg]

- A. Urea-formaldehyde
- B. Polyethene
- C. Polyvinyl chloride
- D. Polyurethane

12. What is true of **both** composites **and** alloys?
- A. A wide variety of material groups can be combined.
 - B. The atomic structure is the same.
 - C. Materials are combined to improve selected material properties.
 - D. There is a fixed ratio of constituent materials.
13. Which material could be used to convert the force of an impact into an electrical charge for an airbag sensor in a car?
- A. Magneto-rheostatic
 - B. Electro-rheostatic
 - C. Piezoelectric
 - D. Shape memory alloy
14. Which property is consistent with free electrons flowing through a metal?
- A. High electrical conductivity.
 - B. High thermal expansivity.
 - C. High tensile strength.
 - D. High density.
15. Which material cannot be shaped by casting?
- A. Metal
 - B. Plastic
 - C. Timber
 - D. Ceramic

16. The Terracotta Army is a collection of over 8000 terracotta sculptures. Careful studies have shown that they would probably have been produced using just 8 different head moulds and clay would then have been added to produce individual facial features. **Figure 5** shows the faces of some of the soldiers.

Figure 5: Faces of the terracotta soldiers



[Source: www.chinatourguide.com]

What scales of production would have been used for the head shapes and the facial features of the terracotta soldiers?

	Head shapes	Facial features
A.	Craft	Craft
B.	Batch	Craft
C.	Craft	Batch
D.	Batch	Batch

17. What is true of just-in-case (JIC) production but **not** just-in-time (JIT) production?
- A. Increased pressure on the workforce
 - B. Increased flexibility of the workforce
 - C. Reduced storage requirements
 - D. Reduced set-up costs
18. Which percentile range would be used for the commercial production of an adjustable ironing board?
- A. 5th–50th
 - B. 50th–95th
 - C. 5th–95th
 - D. 1st–99th
19. What is an impetus for planned obsolescence?
- A. Market pull
 - B. Technology push
 - C. Product reconditioning
 - D. Restyling
20. Which evaluation strategy is most likely to be carried out in a laboratory?
- A. Field trial
 - B. Performance test
 - C. User research
 - D. Expert appraisal

21. What will determine the minimum price for a cost-effective product?
- A. Demand for the product
 - B. Production costs
 - C. Competition
 - D. Perceived value
22. Which evaluation strategy would generate a “problem list” relating to product usability issues that would inform the redesign of a product?
- A. Literature search
 - B. Performance test
 - C. User trial
 - D. User research
23. Which of the following would be advantages for a government commissioning a nuclear power station?
- I. Low CO₂ emissions
 - II. Low capital costs
 - III. High efficiency energy production
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

24. **Figure 6** shows an off-shore wind energy generating system.

Figure 6: An off-shore wind energy generating system



[Source: http://en.wikipedia.org/wiki/Offshore_wind_power#mediaviewer/File:DanishWindTurbines.jpg]

What is not an issue for an off-shore wind energy generating system?

- A. Capital costs
 - B. Maintenance costs
 - C. Visual pollution
 - D. Noise pollution
25. Which combination of force applied and extension characterizes a brittle material?

	Force applied	Extension
A.	Small	Small
B.	Small	Large
C.	Large	Small
D.	Large	Large

26. Which formula would be used to calculate the stress acting on a body?
- A. $\frac{\text{Force}}{\text{area}}$
 - B. $\frac{\text{Change in length}}{\text{original length}}$
 - C. $\frac{\text{Load}}{\text{deflection}}$
 - D. $\frac{\text{Design load}}{\text{normal maximum load}}$
27. Which consideration may **not** be carefully controlled as part of the factor of safety considerations on aeroplanes?
- A. Weight of luggage
 - B. Weight of cargo
 - C. Weight of passengers
 - D. Weight of the plane
28. What type of conversion of motion does a cam mechanism achieve?
- A. Converts rotary motion to linear motion
 - B. Converts vertical motion to horizontal motion
 - C. Converts rotary motion to reciprocating motion
 - D. Converts linear motion in one direction to linear motion in the opposite direction

29. **Figure 7** shows the Alessi Socrates corkscrew designed by Jasper Morrison.

Figure 7: The Alessi Socrates corkscrew designed by Jasper Morrison



[Source: <http://www.alessi.com>]

Which type of mechanism is used in the Alessi Socrates corkscrew?

- A. Toggle clamp
- B. Linkage
- C. Lever
- D. Bell crank

30. **Figure 8** shows shoes designed by Dutch designer Eric Hulleigie. The uppers of the shoes are produced using vacuum forming (**Figure 9**).

Figure 8: The finished shoes



Figure 9: Vacuum forming the uppers of the shoes



[Source: www.designboom.com]

What is a limitation of the vacuum forming process for producing the shoes shown in **Figure 9**?

- A. The amount of waste
- B. The expense of the process
- C. The complexity of the process
- D. The suitability of the process for volume production

31. Plastic bottles are generally made using a two-stage process. The first stage involves the production of a pre-form (**Figure 10**); the second stage shapes the pre-form into the final bottle.

Figure 10: Plastic bottle pre-forms



[Source: www.cherryplastics.co.uk]

Which moulding processes would be used for the production of the pre-forms and the final bottles?

	Injection moulding	Blow moulding
A.	Pre-form	Pre-form
B.	Pre-form	Final bottle
C.	Final bottle	Pre-form
D.	Final bottle	Final bottle

32. Which is a temporary joining technique?
- A. Use of screws
 - B. Use of pop rivets
 - C. Welding
 - D. Brazing
33. Which aspect of sustainability is most important to manufacturers?
- A. Economic
 - B. Social
 - C. Environmental
 - D. Triple bottom line

Please **do not** write on this page.

Answers written on this page
will not be marked.

34. The frames of BLACKSTAR® bicycles (**Figure 11**) are made in Ghana from bamboo and sisal. The bicycles are sold in major cities around the world.

Figure 11: Bamboo bike by BLACKSTAR®



[Source: <http://blackstarbikes.nl>]

Why might the BLACKSTAR® bamboo bicycle be considered an appropriate technology in cities outside of Ghana?

- A. It creates jobs using local skills and labour.
 - B. Its use is not detrimental to the environment.
 - C. It uses local materials.
 - D. It has a long product life.
35. What is part of an active solar hot water system but **not** a passive solar hot water system?
- A. A solar collector
 - B. A storage tank
 - C. A back-up heating system
 - D. A pump

Questions 36–40 relate to the following case study. Please read the case study carefully and answer the questions.

Design student, Quentin Debaene, won the James Dyson Design Award for creating “a product which solves a problem of everyday life”. Quentin’s design was for the “Airblow 2050” – an invisible umbrella – which seeks to overcome the problems associated with the use of traditional umbrellas (**Figure 12**) – most of which relate to the use of the fabric. Through a process that Quentin referred to as ideation (**Figure 13**) he developed the design for the “Airblow 2050” (**Figure 14**) which uses a small motor in its handle to blow out air from the top of the tube and push the rain away, keeping its user dry.

Figure 12: The problems with traditional umbrellas

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Figure 12 is available on <http://www.coroflot.com/quentindebaene/DYSON-AIRBLOW-2050>
(see “Are umbrella reall practical” drawing)

Figure 13: Ideas for the Airblow 2050

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Figure 13 is available on <http://www.coroflot.com/quentindebaene/DYSON-AIRBLOW-2050>
(see “Ideation” sketch)

Figure 14: The Airblow 2050

Removed for copyright reasons

Figure 14 is available on <http://www.coroflot.com/quentindebaene/DYSON-AIRBLOW-2050>
(see “Daily Life/While it is a very technological umbrella...” picture)

36. Which strategy would have provided the impetus for the design of the Airblow 2050?
- A. Constructive discontent
 - B. Analogy
 - C. Morphological synthesis
 - D. Attribute listing
37. Which stage of the IB design cycle corresponds to the process called “ideation” by Quentin Debaene in **Figure 13**?
- A. Identifying a need or opportunity
 - B. Analysing, researching and specifying requirements
 - C. Generating ideas and solutions
 - D. Testing and evaluating the chosen solution

- 38.** What was Quentin’s role in the development of the Airblow 2050?
- A. Lone inventor
 - B. Innovator
 - C. Product champion
 - D. Entrepreneur
- 39.** Which strategy would be most appropriate for the evaluation of the Airblow 2050?
- A. User trial
 - B. User research
 - C. Literature review
 - D. Performance testing
- 40.** What is the primary strategy adopted by Quentin for the Airblow 2050?
- A. Market penetration
 - B. Product development
 - C. Market development
 - D. Diversification
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