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# Design technology

## Higher level

### Paper 1

11 May 2023

Zone A afternoon | Zone B morning | Zone C afternoon

1 hour

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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 **[37 marks]**.

1.

Question removed

2. **Figure 1** shows the Herman Miller Mirra 2 chair.

**Figure 1: The Herman Miller Mirra 2 chair**



What anthropometric data is most appropriate for the design of the Herman Miller Mirra 2 chair?

- A. 5th–95th percentile
  - B. 5th percentile
  - C. 50th percentile
  - D. 1st–99th percentile
3. Biomechanics is important for the design of different products.

Which aspect of biomechanics is important in the design of a can opener?

- A. Affordance
- B. Tension
- C. Torque
- D. Clearance

**Turn over**

4. Fashion designers can develop collections with the use of virtually simulated garments, see **Figure 2**. With this technology, they are able to significantly reduce the number of physical garments made while improving their range of designs.

**Figure 2: A range of virtually simulated garments**



What may be an eco-design reason to include these new innovations into the fashion cycle?

- A. Promotes circular economy
- B. Avoids overproduction and environmental footprint
- C. Avoids dematerialization
- D. Promotes a linear economy

5. Social and environmental factors need to be considered when obtaining renewable and non-renewable resources.

Which of the following economic factors also needs to be considered?

- I. Set-up cost
  - II. Dematerialization
  - III. Decommissioning
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III
6. To redesign components or products to improve their appearance or performance is known as...
- A. re-engineering.
- B. retro-styling.
- C. repairing.
- D. re-using.
7. Products, services or processes that reduce waste and require the minimum amount of non-renewable resources are known as...
- A. consequential technology.
- B. clean technology.
- C. clever technology.
- D. clear technology.
8. At what stage of the design cycle would system level solutions appear?
- A. After conceptual design but before detailed design
- B. After conceptual design and detailed design
- C. Before conceptual design and detailed design
- D. Before conceptual design and after detailed design

**Turn over**

9. The circular economy model considers which of the following issues?
- I. Waste
  - II. Economic
  - III. Social
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III
10. There are a wide range of technologies that can be used by designers to model their new ideas, see **Figure 3**.

**Figure 3: Technologies used to model new ideas**



Photorealistic CAD-based interactive models use surface and solid modelling. They can also be considered as mock-ups. Which of the following terms can they also be known as?

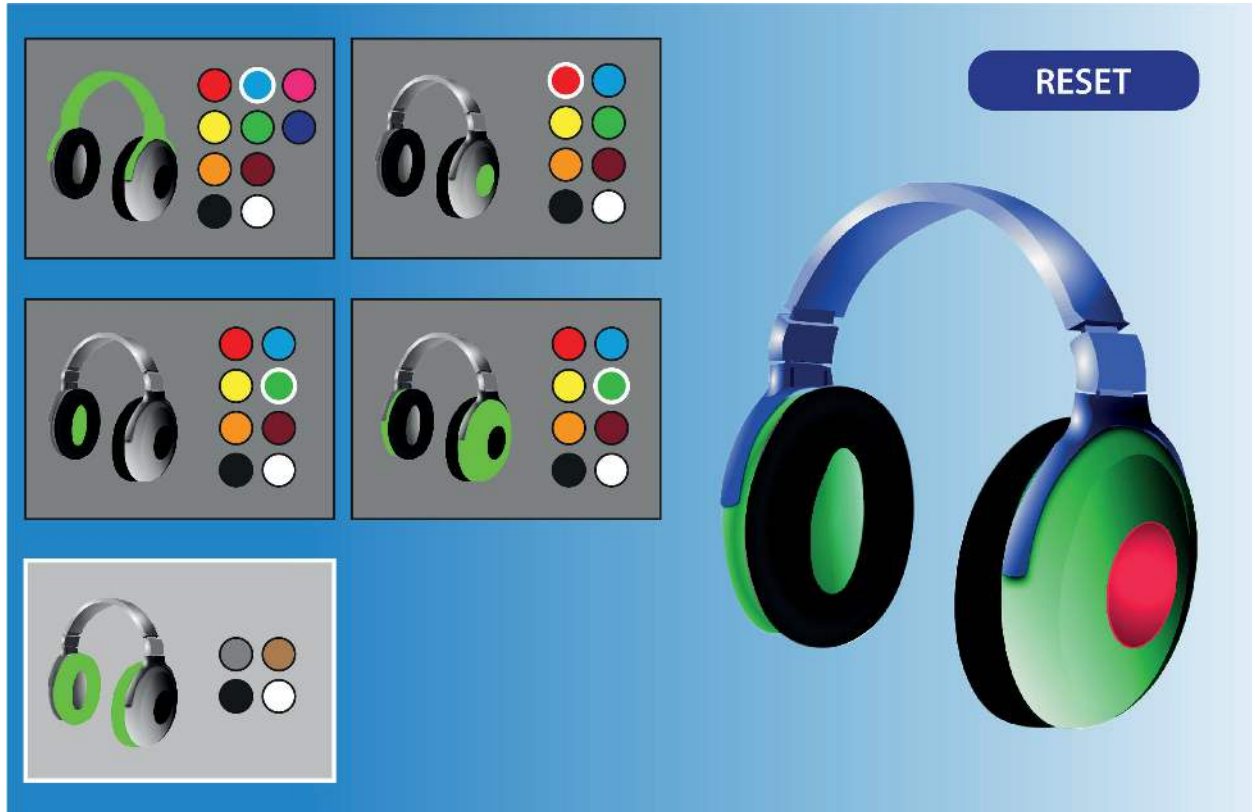
- A. Part drawings
- B. Virtual prototyping
- C. Instrumented models
- D. Motion capture

11.

Question removed

12. **Figure 4** shows custom coloured headphones from Custom Sounds.

**Figure 4: Custom coloured headphones**



This interactive website allows you to pick and choose colours for each part of your headphones. What type of process is this?

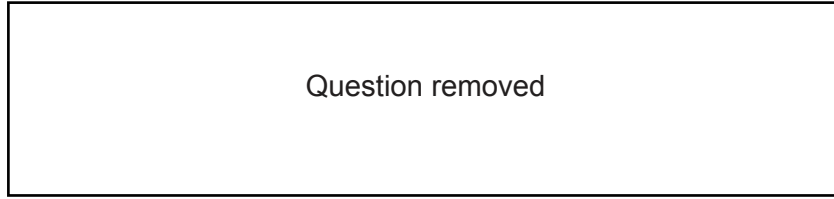
- A. Continuous flow
  - B. Mass customization
  - C. Just in case (JIC)
  - D. Feedback loop
13. Robots are classified in different generations.
- An autonomous networked robot is classified as...
- A. 1st generation.
  - B. 2nd generation.
  - C. 3rd generation.
  - D. 4th generation.

Turn over



- 14.** When selecting an appropriate scale of production, which of the following needs to be considered?
- I. Material selection
  - II. Manufacturing production processes
  - III. Size of the market
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III
- 15.** Which of the following could be characteristics of a composite?
- I. Made up entirely of non-metals
  - II. Are made from two or more constituent materials
  - III. Can have different characteristics than their original materials
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III
- 16.** Wood recycling is the process of turning waste timber into usable products. Recycling timber is a practice that was popularized in the early 1990s.
- Which of the following issues triggered this trend?
- A. Demand for MDF
  - B. Deforestation and climate change
  - C. Warping of existing wood
  - D. Oxidization resistance

17.



18. Apple has created multiple generations of their iPod®, iPhone® and iPad® products.

What is this strategy known as?

- A. Adaptation
- B. Product championing
- C. Chance
- D. Product versioning

Turn over

19. Which of the following are Rogers' five characteristics of innovation?
- A. Compatibility, complexity, observability, relative advantage, trialability
  - B. Compatibility, complexity, ideation, observability, relative advantage
  - C. Compatibility, complexity, ideation, observability, trialability
  - D. Compatibility, ideation, observability, relative advantage, trialability
20. The Dr. Martens 1460 boot, see **Figure 5**, is an iconic design first worn in its modern British-made form in 1960. The air cushion sole from which the boot gets its name was called “Dr. Maertens” and was a German invention from 1945. The German “Dr. Maertens” sole was originally incorporated in shoes in Germany and Austria and sold to women. In 1960, a British shoe making company bought the licence for the outsole and designed the boot which we now know as the iconic “Dr. Martens” boot. This included Anglicising “Dr. Maertens” to “Dr. Martens”. The British company made design innovations to the boot to emphasise that this was something new, including adding a distinctive yellow stitch, a two-toned grooved sole edge, a black and yellow heel loop and a unique sole pattern.

**Figure 5: The Dr. Martens boot**



The Dr. Martens boot is now worn by a diverse range of individuals all over the world. This constant presence in a changing context is known as...

- A. affordance.
- B. obsolescence.
- C. omnipresence.
- D. personae.

21. Art Deco is considered a classic design from the 1920s and 1930s. The style became popular decades later due to the mass production of products using different materials, such as metals, plastic and glass. Later products made in this style were classified as...
- A. image-styling.
  - B. Bauhaus.
  - C. retro-styling.
  - D. De Stijl (the style).

22. **Figure 6** shows Philippe Starck's iconic Hot Bertaa Kettle.

In 1997, production of the kettle was stopped because it was impossible to see the water level, and users were being burned by the hot body of the kettle.

**Figure 6: The Hot Bertaa Kettle**



Which user-centred design strategy may have identified the problem before production started?

- A. Acceptability
- B. Affordance
- C. Anti-personae
- D. Mapping

**Turn over**

- 23.** Which is the correct order of the five stages of the user-centred design process?
- A. Implementation, launch, design, research, concept.
  - B. Research, concept, implementation, design, launch.
  - C. Design, research, concept, implementation, launch.
  - D. Research, concept, design, implementation, launch.
- 24.** Which part of triple bottom line sustainability applies when dealing with financial viability?
- A. Business sustainability
  - B. Economic sustainability
  - C. Social sustainability
  - D. Investment sustainability
- 25.** Sustainable innovation focuses on how individuals decide what activities they should engage in, how to engage and where to allocate their resources.
- What is this type of sustainable innovation called?
- A. Micro energy sustainability
  - B. Macro energy sustainability
  - C. Minimal energy sustainability
  - D. Maximum energy sustainability
- 26.** The concept of decoupling refers to...
- A. deconstructing economic growth and environmental impact.
  - B. developing economic growth and environmental impact.
  - C. disconnecting economic growth and environmental impact.
  - D. dismantling economic growth and environmental impact.

27. Being an ethical consumer means...
- A. selling products which were ethically produced and/or which are not harmful to the environment and society.
  - B. buying products which were ethically produced and/or which are not harmful to the environment and society.
  - C. producing products which were ethically produced and/or which are not harmful to the environment and society.
  - D. manufacturing products which were ethically produced and/or which are not harmful to the environment and society.
28. The marketing mix is applied to product launches. The marketing mix is often crucial when determining a product launch such as the nappies (diapers) shown in **Figure 7**.

**Figure 7: A packet of nappies**



What are the 4Ps in the marketing mix?

- A. Product, place, price and promotion
- B. Place, price, promotion and production
- C. Price, promotion, place and process
- D. Promotion, place, process and production

**Turn over**

29. What does the term *target market* refer to?
- A. A product or the marketing message of a product
  - B. The market sectors and segments identified
  - C. The use of Internet marketing to identify the audience
  - D. A broad way of categorizing the company aims
30. Which of the following is used to classify market segments?
- A. Profession
  - B. Profile
  - C. Persona
  - D. Popularity
31. A type of product manufactured by a company under a particular name is a...
- A. Brand
  - B. Trademark
  - C. Logo
  - D. Copyright
32. Which of the following is a goal of lean production?
- A. Continual feedback and incremental improvement
  - B. The supply of raw material and electrical equipment
  - C. Shareholders maximizing profitability
  - D. Minimizing waste within production services

- 33.** What production management tool might a car manufacturer use to analyse current and future processes for the production of a product?
- A. Just in time (JIT) management
  - B. Computer integrated manufacturing (CIM) system
  - C. Cost-effectiveness
  - D. Value stream mapping
- 34.** Which of the following best describes kaizen?
- A. An approach that is based on the review of processes in a workflow in order to identify potential improvements
  - B. A culture of continuous improvement and considered an important aspect of a company's long-term planning
  - C. An organizational decision to standardize working practices
  - D. The implementation of strategies to optimize waste disposal
- 35.** Which of the following best describes lead time?
- A. The time needed for the research and development of a process
  - B. The time for the long-term production strategy
  - C. The time between the initiation and the execution of a process
  - D. The time for the short-term production strategy

**Turn over**

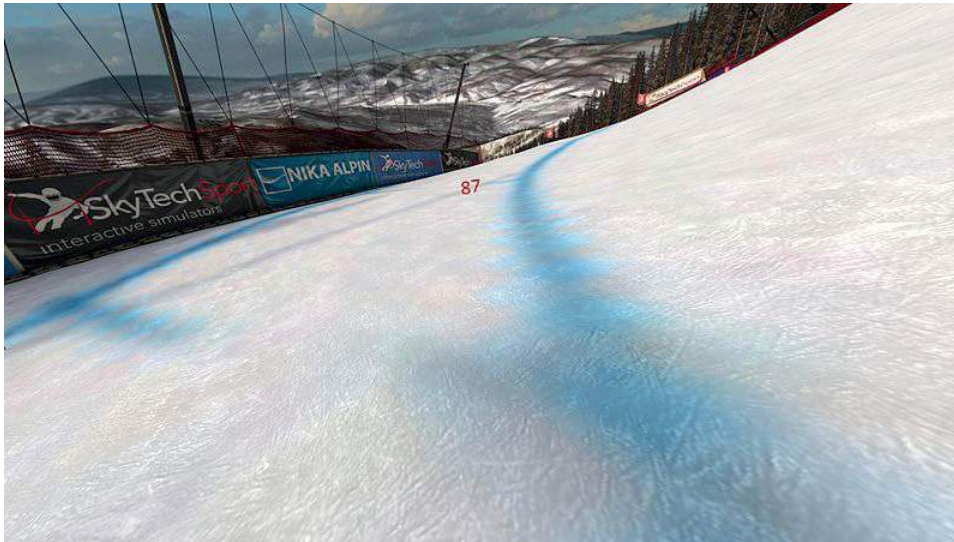


Questions 36–40 relate to the following case study. Please read the case study carefully and answer the questions.

Travel goggles, see **Figure 8**, are used for advertising and promoting popular travel destinations. Recent developments in digital technologies have made it possible for users to experience potential travel destinations from around the world without leaving their own home.

John is 21 years old. He wants to holiday in France and discover its food, landscapes and culture. The app “Setting Thematic Holidays” allows him to experience being in France on a skiing holiday.

**Figure 8: A simulation using travel goggles**



36. Which form of data might be used to determine the size of travel goggles around the head?
- A. Anthropometric
  - B. Dynamic
  - C. Biomechanical
  - D. Stress and comfort
37. Travel goggles are an example of which type of digital technology?
- A. Virtual reality (VR)
  - B. Motion capture
  - C. Animation
  - D. Data modelling

- 38.** Only 100 pairs of the travel goggles will be manufactured.

Which scale of production is most appropriate for the manufacture of the 100 pairs of travel goggles?

- A. Mass production
  - B. Craft production
  - C. Batch production
  - D. Customized production
- 39.** The travel goggles were produced in response to customer demand. Which of the following is this an example of?
- A. Driven innovation
  - B. Market Pull
  - C. First to market
  - D. Technology push
- 40.** The production of the travel goggles will require a system of checks designed to ensure that the product is free from faults. This will involve regular inspections that test and monitor the product from the design stage through to its manufacture.
- What is the process that will be used?
- A. Quality assurance
  - B. Quality control
  - C. Statistical process control
  - D. Cost-effectiveness management
-

## References:

- Figure 1** Mirra 2 chair images provided by Herman Miller.
- Figure 2** "Stop Looking! Fashion Runway 2011" by henryjose is licensed under CC BY 2.0. To view a copy of this license, visit <https://creativecommons.org/licenses/by/2.0/?ref=openverse>. Source adapted.
- Figure 5** Images with permission from Dr. Martens.
- Figure 6** Metalware in the Indianapolis Museum of Art. Image by Sailko. [https://commons.wikimedia.org/wiki/File:Philippe\\_starck\\_per\\_alessi\\_spa.,\\_bollitore\\_hot\\_bertaa,\\_1990.jpg](https://commons.wikimedia.org/wiki/File:Philippe_starck_per_alessi_spa.,_bollitore_hot_bertaa,_1990.jpg). This file is licensed under the Creative Commons Attribution 3.0 Unported license <https://creativecommons.org/licenses/by/3.0/deed.en>.
- Figure 7** Photo by jobertic per Open Products Facts. <https://creativecommons.org/licenses/by-sa/3.0/deed.en>.
- Figure 8** SkyTechSport. [https://commons.wikimedia.org/wiki/File:Virtual\\_Birds\\_of\\_Prey\\_Ski\\_Course\\_Screenshot\\_for\\_SkyTechSport\\_Ski\\_Simulator.jpg](https://commons.wikimedia.org/wiki/File:Virtual_Birds_of_Prey_Ski_Course_Screenshot_for_SkyTechSport_Ski_Simulator.jpg). <https://creativecommons.org/licenses/by-sa/4.0/deed.en>.

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