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Design technology

Higher level

Paper 1

15 May 2026

Zone A afternoon | **Zone B** afternoon | **Zone C** afternoon

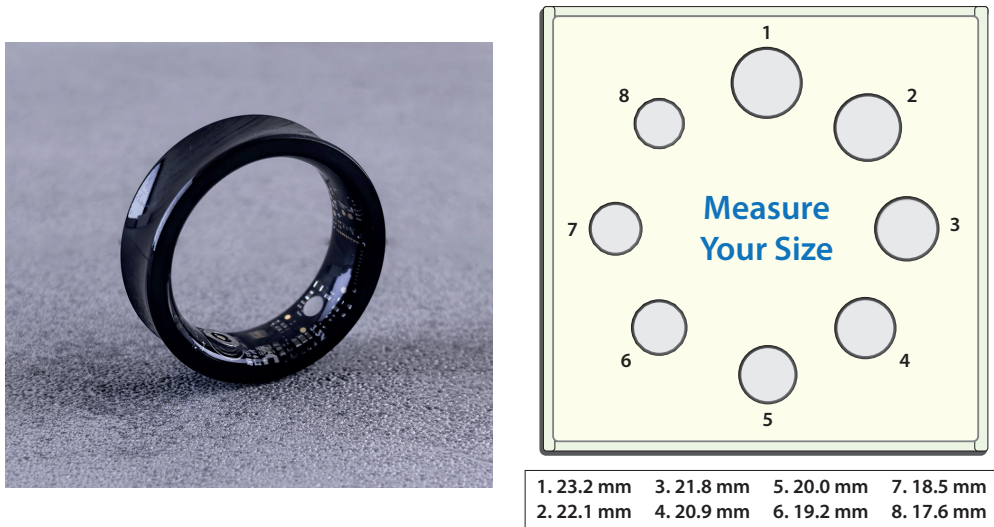
1 hour

Instructions to students

- 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. Smart rings are wearable devices that track health and activity. Before purchasing one, many companies send customers a sizing kit to help choose the correct ring size, see **Figure 1**.

Figure 1: Smart ring sizing kits



Which practice of measuring the human body does this sizing kit rely on to provide standardized size options?

- A. Ergonomics
 - B. Anthropometrics
 - C. Psychological factor data
 - D. Physiological factor data
2. Some customer satisfaction surveys allow customers to indicate their satisfaction levels using a range of smiley faces instead of traditional rating scales or text-based questions. What type of scale is this?
 - A. Nominal
 - B. Ratio
 - C. Increment
 - D. Ordinal

3. As part of the European Union’s Strategy for Plastics in a Circular Economy, aimed at reducing waste and promoting sustainable alternatives, new rules require beverage caps to remain attached to their cartons after opening. This feature, known as a “tethered cap,” helps prevent plastic litter. Packaging company Omnopack has responded by redesigning its cartons to keep the cap connected, see **Figure 2**.

Figure 2: Omnopack beverage packaging



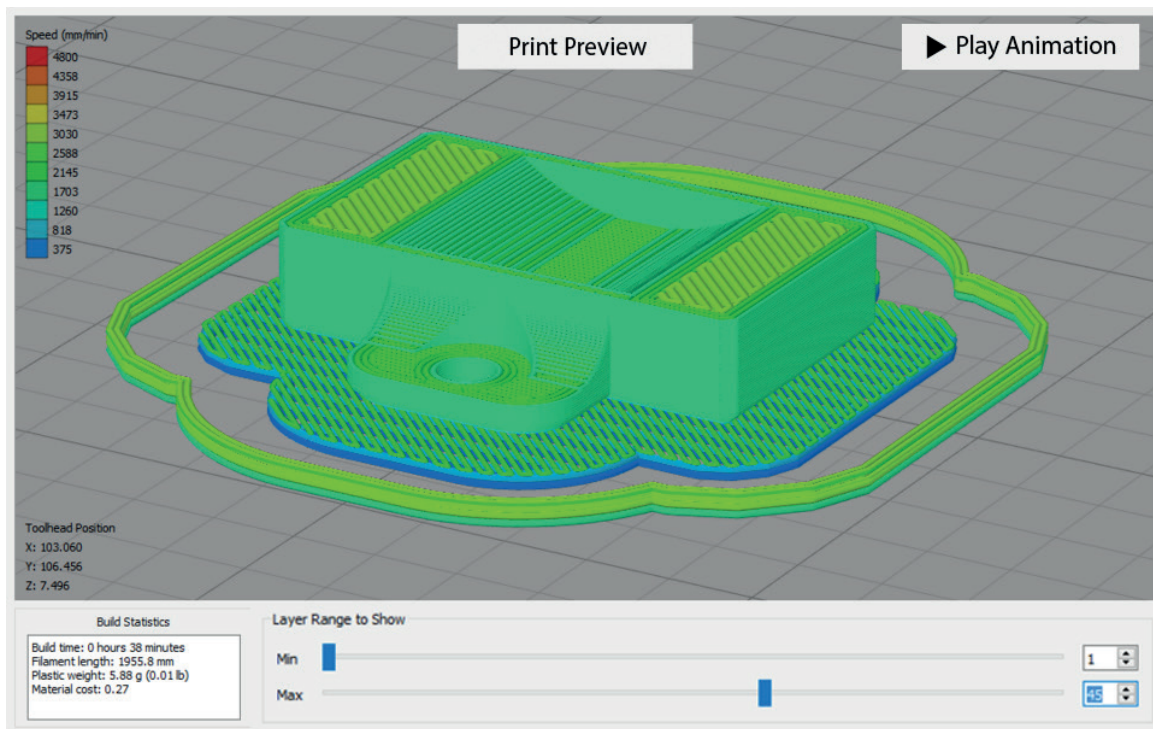
Which design objective for green products does the tethered cap address?

- A. Minimising the number of different materials used in a product
 - B. Increased efficiency in the use of materials and resources
 - C. Increasing efficiency in the use of energy
 - D. Reducing or negating environmental damage or pollution from the materials selected
4. Which of the following strategies is considered an end-of-pipe solution for reducing industrial air pollution?
- A. Installing scrubbers in factory chimneys
 - B. Switching to renewable energy sources
 - C. Designing products with fewer toxic materials
 - D. Using biodegradable packaging

5. What is true of hydrogen fuel cells?
- A. They produce water as a waste product
 - B. They are a type of battery
 - C. They are a low-cost power cell
 - D. They take a long time to recharge
6. Which of the following is a consideration of the UN Environmental Programme Manual on Eco-design?
- A. Utilise a cradle-to-grave philosophy
 - B. Increase product durability
 - C. Analyse all potential safety hazards
 - D. Sustain levels of manufacturing
7. Which of the following is a non-renewable energy source?
- A. Geothermal
 - B. Hydropower
 - C. Biomass
 - D. Nuclear

8. 3D printing companies allow designers to view an accelerated digital animation showing how their model will be built layer by layer (**Figure 3**).

Figure 3: 3D model print preview

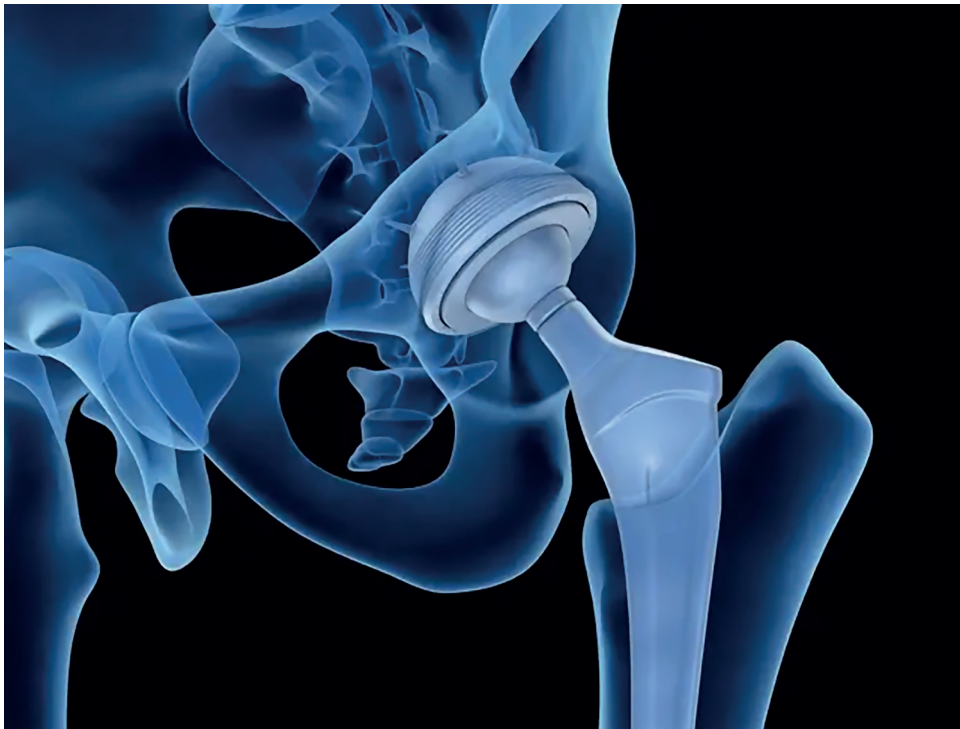


Why do designers preview the printing process before starting the actual build?

- A. To make the printing process faster
 - B. To save on material costs by avoiding errors
 - C. To ensure the final product is aesthetically pleasing
 - D. To reduce the environmental impact of printing
9. Which type of graphical model would be the most appropriate to show how components of a product fit together?
- A. 2D sketch
 - B. Projection
 - C. Part drawing
 - D. Assembly drawing

10. Which type of physical model is used to evaluate the performance of a product?
- A. Aesthetic model
 - B. Instrumented model
 - C. Mock-up
 - D. Scale model
11. Scientists at Japan's Tohoku university have made a breakthrough with metal implants, creating a material with flexibility and strain recovery to endure longer durations in the human body, **see Figure 4**. The implants are made of a combination of cobalt, chromium, aluminium and silicon.

Figure 4: A simulation of a metal hip joint implant



[Source: Alex Mit / Shutterstock.]

Which type of material is known for its excellent mechanical strength, resistance to thermal creep (a slow deformation under heat and stress), good surface stability, and resistance to corrosion?

- A. Alloy
- B. Smart material
- C. Super alloy
- D. Shape-memory metal

- 12.** Which of the following is an advantage of mass production?
- A. Increased customization options for individual products
 - B. Reduced unit costs due to economies of scale
 - C. Faster adaptation to market changes
 - D. Lower initial investment in machinery and equipment
- 13.** Which of the following is an important moral concern regarding the increased use of automation in industries?
- A. The potential for increased product quality
 - B. The reduction in production costs
 - C. The displacement of workers leading to unemployment
 - D. The improvement in manufacturing efficiency
- 14.** Which method of producing fabric can be described as “matting fibres together”?
- A. Weaving
 - B. Knitting
 - C. Lacemaking
 - D. Felting
- 15.** What is the main reason why hardwood timber is treated and/or finished when trying to increase the longevity of outdoor furniture?
- A. The treatment can protect the timber from environmental conditions
 - B. The treatment can change the appearance of the timber
 - C. The treatment can create a smooth and shiny surface
 - D. The treatment can make it easier for the timber to biodegrade

16. The Emira sports car (vehicle), see **Figure 5**, manufactured by the automotive company Lotus comes with two engine options: a 4 Cylinder AMG engine or a V6 Toyota engine.

Figure 5: The Lotus Emira sports car (vehicle)



Which type of innovation strategy is this an example of?

- A. Architectural innovation
- B. Modular innovation
- C. Configurational innovation
- D. Radical innovation

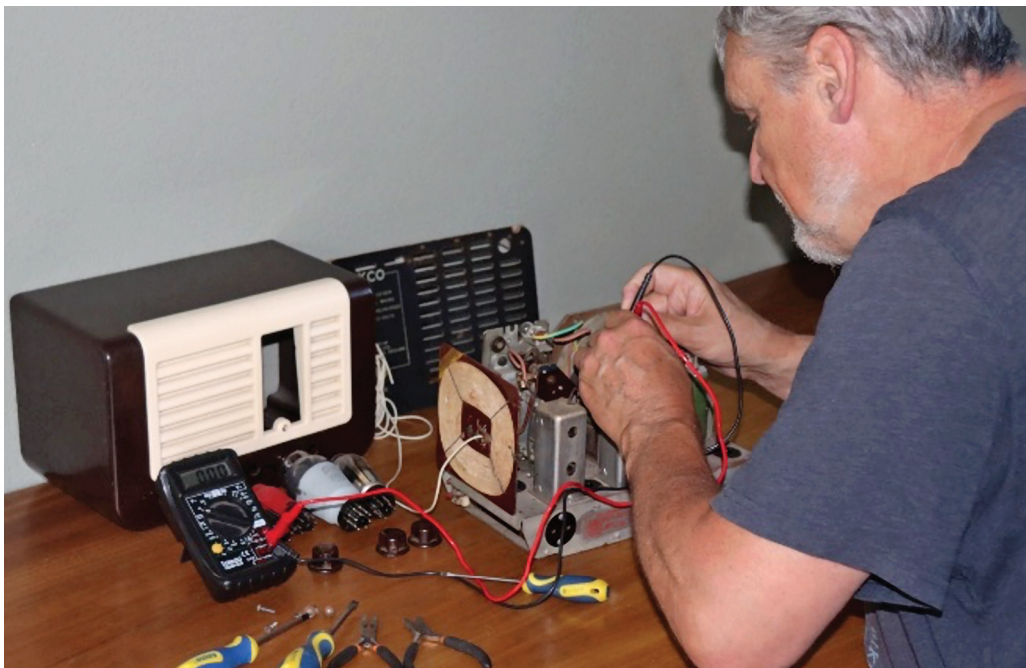
17. Which of Rogers' characteristics of innovation relates to the degree to which an innovation is considered better than the previous idea?
- A. Relative advantage
 - B. Complexity
 - C. Observability
 - D. Trialability
18. Who is an influential individual who can take an invention to market often by financing the development, production and diffusion of a product into the marketplace?
- A. Inventor
 - B. Champion
 - C. Entrepreneur
 - D. Innovator

19. Some designers, like Han Bex, repurpose vintage radios such as the 1936 Murphy Model A30C (**Figure 6**) by installing Bluetooth modules and converting them into functional speakers (**Figure 7**).

Figure 6: The 1936 Murphy Model A30C radio



Figure 7: Han Bex installing a Bluetooth module in an EKCO U29 1946 Bakelite radio



(This question continues on the following page)

(Question 19 continued)

Despite their technological obsolescence, what concept of classic design ensures that even the casings of these old radios remain popular?

- A. Omnipresence
- B. Mass production
- C. Status and culture
- D. Dominant design

20. Why might a classic design continue to be popular despite newer alternatives with better functions?

- A. Its emotional appeal
- B. It is cheaper to produce
- C. It offers superior technical performance
- D. It is more environmentally friendly

21. Mass production is a factor that contributes to a design being considered classic. Which of the following aspects of classic design does mass production facilitate?

- I. Status
 - II. Omnipresence
 - III. Ubiquity
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II, and III

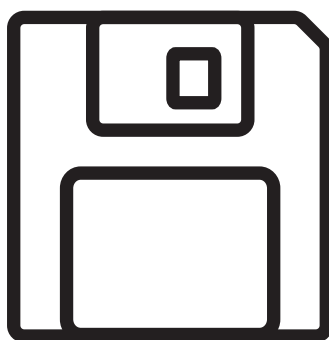
22. The floppy disk (**Figure 8**) was created by IBM in 1967 allowing users to store computer files in a portable, inexpensive, and reliable format, making it easy to transfer data between machines.

In 1984, designer Susan Kare created a save icon (**Figure 9**) inspired by the floppy disk for the Classic Apple Macintosh computer which was both innovative and widely adopted. This visual save icon metaphor quickly became the industry standard and remains a familiar symbol in many product–user interfaces.

Figure 8: Floppy disks



Figure 9: A save icon



(This question continues on the following page)

(Question 22 continued)

What characteristic of good user-product interface design led to the floppy disk icon (**Figure 9**) becoming the industry standard icon for saving files on a computer?

- A. Feedback
- B. Affordance
- C. Intuitive logic
- D. Visibility

23. How would a designer engaging with user-centred design (UCD) develop a detailed understanding of a products' function?

- A. By creating annotated photographs of the environment where the task will need to be completed
- B. By developing a storyboard that details the steps required to complete the task
- C. By interviewing potential users about their needs and wants for the product
- D. By conducting focus groups to discuss the advantages and disadvantages of a product

24. Which of the following would be one of the percentiles targeted when using the method of extremes as a strategy for user-centred design (UCD)?

- A. 2.5th percentile
- B. 5th percentile
- C. 50th percentile
- D. 70th percentile

25. Patagonia specialize in outdoor clothing and are widely recognized as a leader for sustainability within the fashion and textiles industry. To promote circularity, in addition to their use of “Repreve” recycled polyester fleece sourced from coastal communities at risk of plastic pollution, Patagonia’s “Worn Wear” initiative involves the reuse, repair and resale of their clothing, see **Figure 10**.

Figure 10: Patagonia Classic Retro X-fleece jacket



What aspect of sustainable development does Patagonia demonstrate through their initiatives?

- A. Decoupling
- B. Sustainability reporting
- C. Lifestyle consumerism
- D. Product stewardship

- 26.** Which of the following is a technological barrier to sustainable innovation?
- A. Rapid advancements in eco-friendly technologies
 - B. High consumer demand for sustainable products
 - C. Insufficient infrastructure for recycling and waste management
 - D. Abundant resources for sustainable production
- 27.** Which class of consumer would most likely be in favour of continuing the use of fossil fuels as an energy source?
- A. Eco-champions
 - B. Eco-fans
 - C. Eco-phobes
 - D. Eco-warriors

28. Farmers in communities around Hwange National Park in Zimbabwe build “Bomas” using acacia branches to enclose their animals. However, the gaps between the branches allow predators to see inside, making livestock more vulnerable to attacks.

The Wildlife Conservation Research Unit, known as WildCRU who are affiliated with Oxford University have introduced a new design that uses thick opaque plastic sheeting to block the predators’ view, (**Figure 11**). WildCRU identified that lions rely heavily on sight, typically fixing their gaze on a single animal before attacking. The opaque sheet blocks the view, significantly reducing livestock losses.

Figure 11: A WildCRU Boma



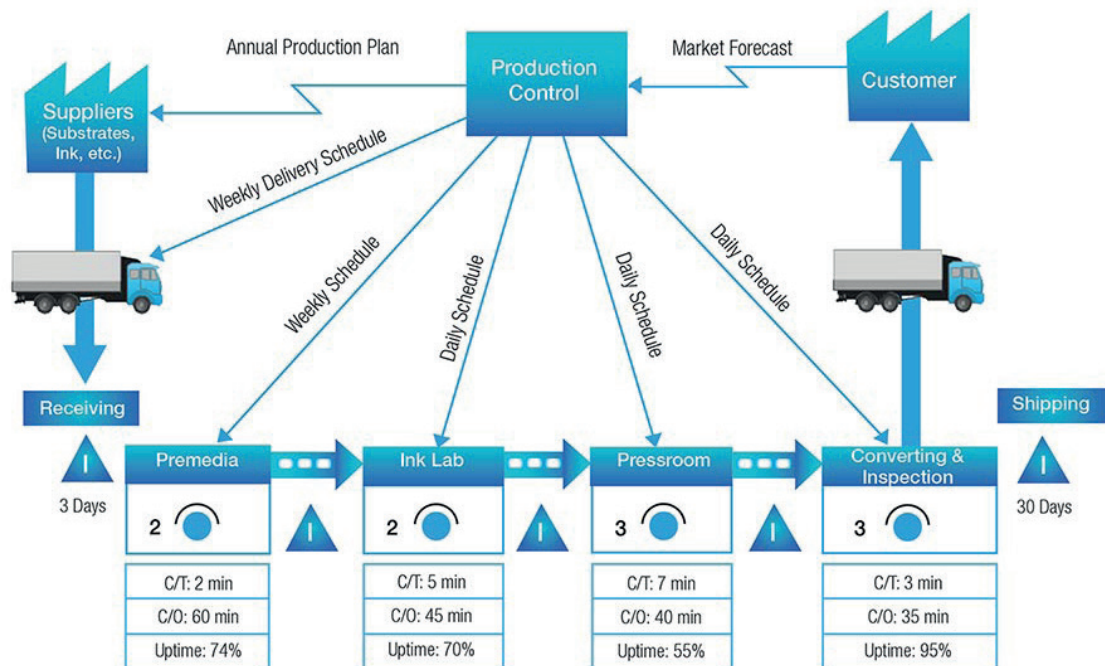
What kind of market research strategy would have been employed by WildCRU to identify the opportunity/need/requirement for a completely opaque screen for the boma?

- A. Expert appraisal
- B. User research
- C. Perceptual mapping
- D. Product analysis

- 29.** What strategic advantage can a company gain through celebrity collaboration as part of its product launch and promotional strategy in competitive markets?
- A. It guarantees the product will be successful without any marketing effort
 - B. It allows the company to avoid investing in other marketing channels
 - C. It provides access to the celebrity's fan base and increases brand visibility
 - D. It ensures the product will have the lowest price on the market
- 30.** Which pricing strategy would become important for a novel, highly desirable product?
- A. Cost-plus pricing
 - B. Demand pricing
 - C. Product line pricing
 - D. Competitor-based pricing
- 31.** How is a product family best described?
- A. A group of products targeted at different members of a family across generations
 - B. A group of products made by a range of companies that have the same function
 - C. A group of products made by the same company and launched into the market at the same time
 - D. A group of products having common classification criteria and sharing many common parts and assemblies

32. Value stream mapping (**Figure 12**) is a lean production management tool that visually depicts the production of a product through to delivery to the customer.

Figure 12: Value stream mapping infographic



What is an advantage of value stream mapping to a manufacturer?

- A. It can identify the most expensive aspects of a production process
 - B. It can help the manufacturer analyse current and future manufacturing processes
 - C. It can identify specific dates a customer will receive their products
 - D. It can focus on a linear workflow for the production of a product
33. Which stakeholder is best positioned to identify if a product is considered value for money?
- A. The manufacturer
 - B. The consumer
 - C. The designer
 - D. The product champion

- 34.** For which of the following scales of manufacturing is computer integrated manufacturing (CIM) considered appropriate?
- I. One-off production
 - II. Batch production
 - III. Mass production
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II, and III
- 35.** What is the most likely cause of waste in a just in time (JIT) production system?
- A. Overproduction
 - B. Defects
 - C. Unnecessary inventory
 - D. Inappropriate processing

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

Homa has created a new performance running shoe called the CIRC360, see **Figure 13**. This shoe features a 3D-printed sole, which is designed specifically for an individual user. The sole provides tailored cushioning and support based on scans of the user’s foot combined with anthropometric data.

The midsole lattice structure enhances movement and forward propulsion. The upper part of the shoe is made using Primegreen, a recycled polyester material developed by Homa. At the end of its life, the shoe can be returned to Homa for recycling. The company repurposes materials from old shoes to manufacture new ones, supporting more sustainable product cycles.

Figure 13: Homa CIRC360 3D-printed shoe



[Source: © Yan Zabolotnyi | Dreamstime.com.]

- 36.** The Homa CIRC360 shoe is custom-designed using 3D scans of the user’s feet. Computer-aided design (CAD) software is used to adapt a base model of the shoe, allowing the sole to be tailored for individualized support and cushioning.

Why does Homa design the CIRC360 shoes to match the user’s feet?

- A. To ensure maximum comfort for the user when using the shoes
- B. To create a unique product for the user that no one else can use
- C. To create a fully recyclable product
- D. To create a highly fashionable product users will pay more for

- 37.** The Homa CIRC360 meets the requirements of take-back legislation, which means they take back the shoes at the end of their life.

Which of the following waste mitigation strategies applies to the Homa CIRC360 shoes?

- A. Recondition
 - B. Re-engineer
 - C. Repair
 - D. Recycle
- 38.** Which of the following properties of polyester (PET) makes it ideal for a 3D printing process?
- A. High toughness
 - B. Softens when heated above 220°C
 - C. High durability
 - D. Resistance to cutting

- 39.** Which aspects of a design specification must be considered to ensure compatibility with 3D printing as a manufacturing method?
- I. Price constraints
 - II. Manufacturing requirements
 - III. Materials requirements
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III
- 40.** Which of Datschefski's five principles of sustainable design applies to the Homa CIRC360 shoe?
- A. Safe
 - B. Social
 - C. Cyclic
 - D. Solar
-

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References:

Figure 1: Andrey Matveev / Pexels.

Figure 2: Tony Webster. https://commons.wikimedia.org/wiki/File:Plastic_Water_Bottle_with_Attached_Cap_in_Europe_%2853926999150%29.jpg. Licensed under CC BY 2.0 <https://creativecommons.org/licenses/by/2.0/deed.en>. Source adapted.

Figure 3: Weppigu. <https://commons.wikimedia.org/wiki/File:SlicerView.png>. Licensed under CC BY-SA 4.0 <https://creativecommons.org/licenses/by-sa/4.0/deed.en>. Source adapted.

Figure 4: Alex Mit / Shutterstock.

Figure 5: With permission from Lotus Cars Limited.

Figure 6: Han Bex, 2024. 1936 Murphy Model A30C.

Figure 7: Han Bex, 2024. Installing a Bluetooth module in an EKCO U29 1946 Bakelite radio.

Figure 8: George Chernilevsky. https://commons.wikimedia.org/wiki/File:Floppy_disk_2009_G1.jpg. Public domain image.

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