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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. RoWok is a robotic restaurant. The cooked food is dropped into a bowl and delivered through side windows, see **Figure 1**.

Figure 1: RoWok robotic restaurant



Which percentile range should be used for the side windows of the RoWok?

- A. 5th
 - B. 50th
 - C. 95th
 - D. 5th–95th
-
2. The main purpose of a speedometer is to show how fast a vehicle is going at any given moment, typically in miles per hour (mph) or kilometres per hour (km/h).

The measurement on a speedometer is an example of:

- A. Nominal Scale
- B. Ordinal Scale
- C. Interval Scale
- D. Ratio Scale

3. Hasiru Dala Innovations' initiative aims to reduce plastic usage by promoting the refill of toiletries at a mobile station, see **Figure 2**.

Figure 2: Hasiru Dala Innovations' mobile van initiative



Which waste mitigation strategy is promoted by the Hasiru Dala Innovations' initiative mobile van?

- A. Recycle
 - B. Re-Engineer
 - C. Reuse
 - D. Recondition
4. What type of battery is commonly used in combustion engine cars?
- A. Li-Ion
 - B. Li-Po
 - C. Ni-Cd
 - D. Lead acid

5. What is the main benefit of dematerialization?
- A. The environmental impact of a product is reduced
 - B. The cost of a product is reduced
 - C. The weight of a product is reduced
 - D. The production time of a product is reduced
6. The quantification of carbon emissions created during the life of a product is also known as its carbon footprint.

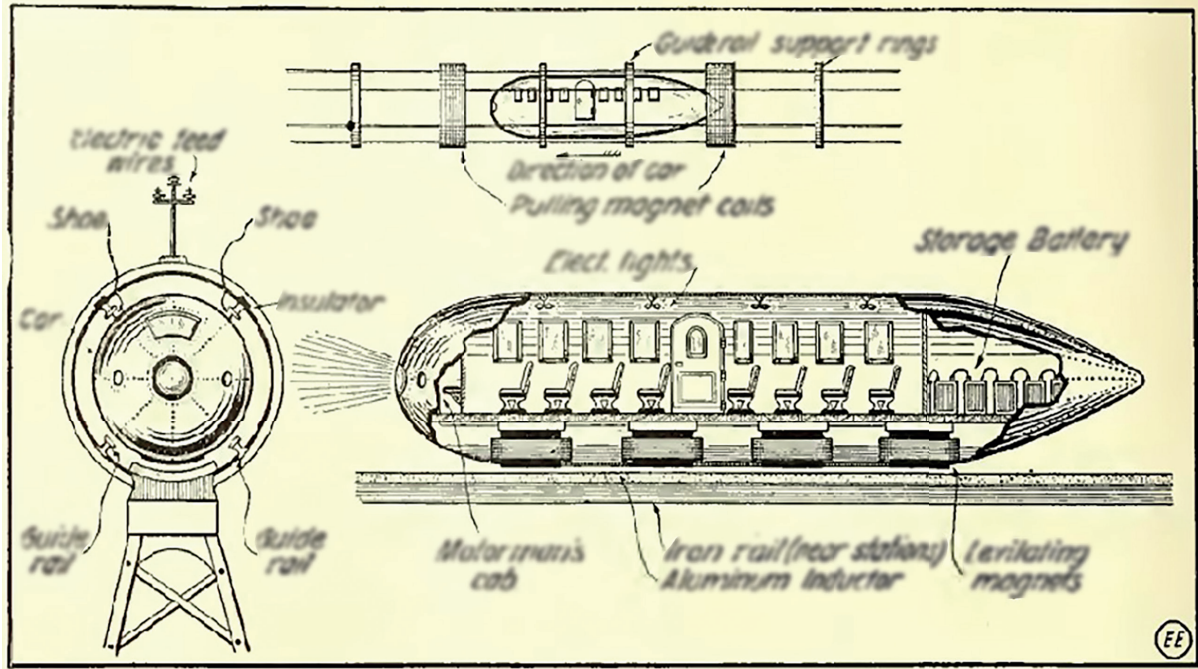
Which of the following aspects contribute to the carbon footprint of a product?

- I. Extraction of raw materials
 - II. Transport of raw materials to the factory
 - III. Waste created during the use of the product
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III
7. Which of the following is a characteristic of green design?
- A. Radical changes
 - B. Long timescale for implementation
 - C. Incremental changes
 - D. High risk of failure

8. The drawing in **Figure 3** presents the concept of a magnetic levitation carriage designed to achieve speeds of 500 miles per hour.

Figure 3: The magnetic levitation carriage

Image labels are for example use only



What type of drawing is this?

- A. Isometric
 - B. One-point perspective
 - C. Two-point perspective
 - D. Orthographic projection
9. Which of the following is an exclusive feature of bottom-up modelling when using computer aided design (CAD) for manufacturing?
- A. New features and parts are added as the design evolves
 - B. The dimensions of one component directly affects others
 - C. Components are created one by one before assembly
 - D. The design begins as a concept

10. Which rapid prototyping method involves hardening molecules of liquid polymer using a laser?
- A. Selective laser sintering (SLS)
 - B. Fused deposition modelling (FDM)
 - C. Stereolithography (SLA)
 - D. Laminated object manufacture (LOM)
11. Balsa wood is harvested from deciduous trees and is a popular material choice for building small models and prototypes, see **Figure 4**.

Figure 4: Airplane model made of balsa wood



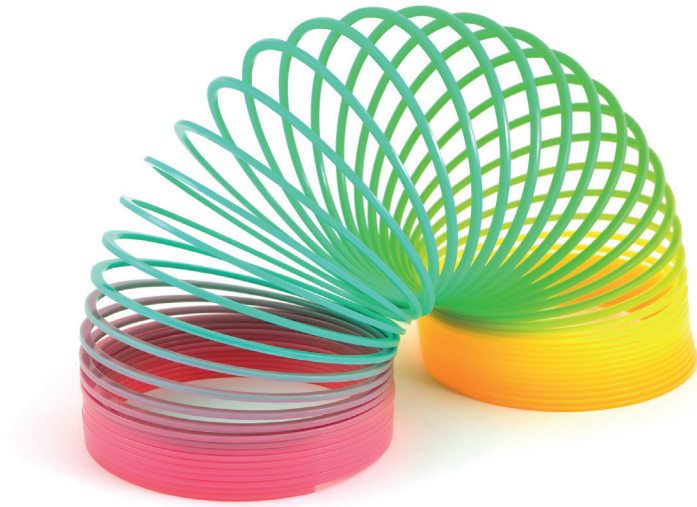
Which characteristic of balsa wood makes it suitable for modelling purposes?

- I. It is derived from softwood
 - II. It has low density
 - III. It is lightweight
- A. I and II only
 - B. II and III only
 - C. I and III only
 - D. I, II and III

- 12.** Which smart material exhibits a change in viscosity in response to an applied electric field?
- A. Piezoelectricity
 - B. Thermoelectricity
 - C. Photochromicity
 - D. Electro-rheostatic
- 13.** Which property of metals allows for effective recycling and disposal methods to enable softening and reuse?
- A. Electrical conductivity
 - B. Malleability
 - C. Ductility
 - D. Melting point
- 14.** What is the result of heating metals and allowing them to cool slowly?
- A. Large grain size and reduced strength
 - B. Large grain size and increased strength
 - C. Small grain size and reduced strength
 - D. Small grain size and increased strength
- 15.** What kind of manufacturing process is fusing?
- A. Shaping
 - B. Joining
 - C. Additive
 - D. Subtractive

16. In 1943, naval engineer Richard T. James accidentally knocked a spring off a shelf, and it began to “walk” across the floor. This led him to create the Slinky (**Figure 5**).

Figure 5: The Slinky



Which innovation strategy best describes this innovation?

- A. Act of insight
- B. Analogy
- C. Adaptation
- D. Chance

17. Incandescent lightbulbs have been superseded by more efficient LED lightbulbs. A 60-watt incandescent lightbulb produces 800 lumens, whereas an 8-watt LED lightbulb produces the same brightness.

What kind of obsolescence relates to the phasing out of incandescent lightbulbs?

- A. Technological obsolescence
 - B. Style (fashion) obsolescence
 - C. Planned obsolescence
 - D. Functional obsolescence
18. IKEA furniture products are designed to be self-assembled from a flat pack allowing consumers to easily transport them, reducing production costs for IKEA and the consumer.

Which classification best describes the IKEA flat pack furniture model?

- A. Sustaining innovation
- B. Process innovation
- C. Disruptive innovation
- D. Configurational innovation

19. Michael Thonet's Cafe Chair is a revolutionary icon of design and functionality, see **Figure 6**. Introduced in 1859, it was the first mass-produced bentwood chair.

Figure 6: Michael Thonet's Cafe Chair



Which of the following can be a psychological function of the Cafe Chair?

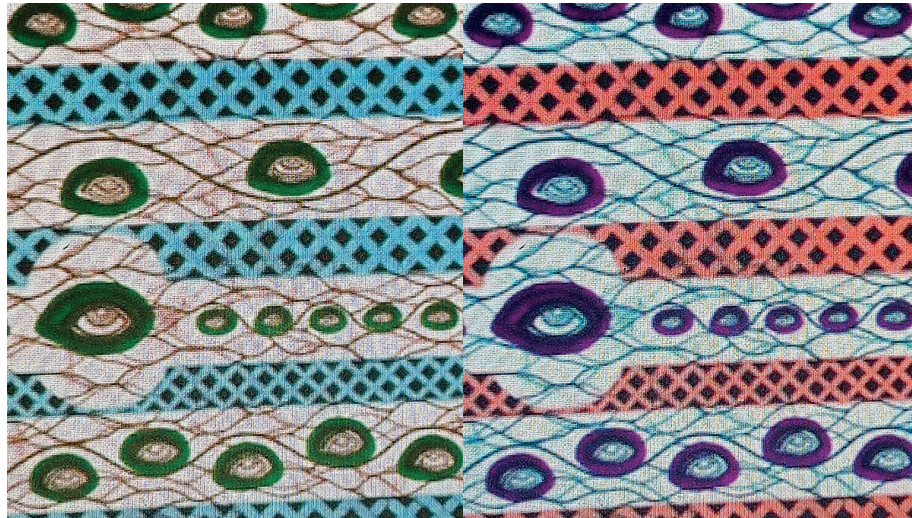
- A. Durability and strength
- B. Lightweight
- C. Comfort and relaxation
- D. Versatile design

- 20.** Which of the following is a characteristic of a classic design?
- A. Emphasis on technological innovations
 - B. Utilization of precious materials
 - C. Timeless with enduring aesthetic appeal
 - D. Innovative and experimental designs
- 21.** What is best described as “a modern product that uses the form and decoration from a particular period of time or style”?
- A. Retro-styling
 - B. Classic design
 - C. Iconic design
 - D. Dominant design

22. The National Institute of Fashion Technology Gandhinagar, India, is developing baby clothes and mattresses with thermochromic (heat reactive) properties. This can help parents identify if the baby has a fever or gets too hot, see **Figure 7**.

When developing ideas for the clothes and mattress, the designers imagined several step-by-step sequences of events where the thermochromic material could benefit parents and babies.

Figure 7: Example of a thermochromic material when cold (left) and when warm (right)



What is the term used to describe an imagined sequence of events used as a strategy for user research?

- A. Mind map
- B. Affinity diagramming
- C. Task analysis
- D. Scenario

23. Video games become more complex and challenging when users advance through the levels.

Which four-pleasure framework does the increased cognitive demand engage with?

- A. Ideo-pleasure
- B. Physio-pleasure
- C. Psycho-pleasure
- D. Socio-pleasure

24. Which design strategy attempts to include all stakeholders in the design process?

- A. Participatory design
- B. Sustainable design
- C. Design for emotion
- D. Design for process

25. Robotic advances have led to a wider range of jobs being filled by robots across a wider breadth of industries (**Figure 8**).

Figure 8: Robotic waiter serving food



Which aspect of triple bottom line would be most affected by replacing workers with robots?

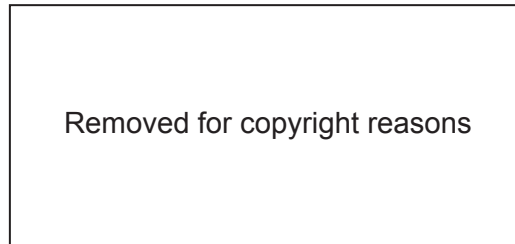
- A. Social
- B. Economic
- C. Environmental
- D. Manufacture

- 26.** What is a disadvantage of pressure groups?
- A. They lobby governments to develop approaches that align with their needs
 - B. They may not represent the whole community and could have a biased view
 - C. They promote a culture of lifestyle consumerism
 - D. They leverage social media to gain support at a local and global level
- 27.** What kind of strategy would best fit a person who wants to take their home off the grid, generate power for themselves, and utilize renewable energies to generate power?
- A. Macro energy sustainability
 - B. Micro energy sustainability
 - C. Energy security
 - D. Combined heat and power

28. With growing trends that combine both business and leisure travel, known as “Bleisure” or “Workcation” trips, Bugatti has responded to “work on the go” needs by designing a range of affordable luxury luggage and travel bags that target business travellers and executives, see **Figure 9**.

The Bugatti Travel Desk is a carry-on suitcase with an integrated, pop-out laptop stand allowing travellers to maximise their productivity during “down-time” in airports, freeing up more time when they reach their destination.

Figure 9: The Bugatti Travel Desk



Which innovation strategy most likely led to the design of the Bugatti Travel Desk?

- A. Imitative strategy
- B. Act of insight
- C. Market development
- D. Product development

- 29.** Which of the 4Ps requires a deep understanding of national and international standards when considering the marketing mix?
- A. Production
 - B. Place
 - C. Price
 - D. Promotion
- 30.** Why is market research important to inform the marketing of a product?
- A. It can be used to identify new ways to manufacture the product
 - B. It can be used to identify potential design ideas
 - C. It can be used to identify appropriate promotional strategies
 - D. It can be used to identify appropriate scientific advances
- 31.** Which market segment would primarily be used to determine the target audience for a high quality chew toy for a dog?
- A. Profession
 - B. Age
 - C. Lifestyle
 - D. Income

32. Birdfy make a range of products for birds including feeders, birdboxes, and poles. The Birdfy Nest (**Figure 10**) is a nesting box that includes two HD cameras with artificial intelligence (AI) recognition that is powered by an integrated solar panel.

The Birdfy Nest is manufactured using computer integrated manufacture (CIM) and each is made to order.

Figure 10: The Birdfy Nest



Which manufacturing strategy would be most suited for the Birdfy Nest?

- A. Just in time
 - B. Just in case
 - C. Mass production
 - D. Mass customization
33. Which of the following tends to be the highest?
- A. Wholesale price
 - B. Retail price
 - C. Manufacturing cost
 - D. Material cost

34. What is the most accurate description of kaizen in terms of its implementation?

- A. It is an incremental solution
- B. It is a radical solution
- C. It is a system level solution
- D. It is an innovative solution

35. What best describes quality control?

- A. Using statistics to ensure a process is operating efficiently
- B. Purchasing the best quality raw materials available
- C. Planning when a product will be inspected through its manufacture
- D. Checking a component is within tolerance for a specified size

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

The FUSED Kodo is a 3D printed shoe, made as one piece, see **Figure 11**. They can be ordered in all white, all black, or as a mixed pair with each shoe a different colour. The left upper features a coral pattern, while the right shoe has a scales pattern, a reference to water and fire.

The FUSED Kodo is made to order. The shoes are 3D printed in one piece and feature a large shoestring (shoelace) that wraps around the shoe and between the outsole pods. The outsole pods are filled with shock-absorbing lattice structures. The shoes are designed to fit the individual customer's feet.

FUSED shoes are made out of a single material – thermoplastic elastomer (TPE) – and can be returned to the company at disposal for them to make new shoes out of the old ones.

Figure 11: FUSED Kodo 3D printed footwear



36. The FUSED Kodo shoe is made to order. It is designed and developed using computer aided design software. As the base model of the shoe is adapted to the required size, the design of the shoes can be easily adjusted to allow for customization and personal fit.

Why do FUSED design the Kodo shoes to match the user's feet?

- A. To ensure maximum comfort for the user when using the shoes
- B. To reduce the risk of foot injuries during athletic activities
- C. To reduce the environmental impact during the initial production phase
- D. To create a highly fashionable product users will pay more for

- 37.** The FUSED Kodo 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 FUSED Kodo shoes?

- A. Recondition
 - B. Re-engineer
 - C. Repair
 - D. Recycle
- 38.** Which properties of thermoplastic elastomer (TPE) makes it ideal for a 3D printing process?
- A. High toughness
 - B. Softens when heated above 210 °C
 - C. High durability
 - D. Resistance to cutting
- 39.** Which of the following aspects of a design specification would need to address the use of 3D printing as a manufacturing process for the shoes?
- 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 Datchefski’s five principles of sustainable design apply to the FUSED Kodo shoe?
- A. Safe
 - B. Social
 - C. Cyclic
 - D. Solar
-

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References:

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- Figure 2:** With permission from Hasiru Dala Innovations Private Limited.
- Figure 3:** [Future Electric Railway] 1917. [image online] Available at: <https://www.maglevboard.net/en/about/in-memori-370-boris-petrovich-weinberg> [Accessed 17 July 2025]. Source adapted.
- Figure 4:** capecodphoto, 2010. *Plane in flight – stock photo*. [image online] Available at: <https://www.gettyimages.co.uk/detail/photo/plane-in-flight-royalty-free-image/157694480?adppopup=true> [Accessed 24 September 2025]. Source adapted.
- Figure 5:** Lucielang, 2012. *Slinky toy over white – stock photo* [image online] Available at: <https://www.gettyimages.co.uk/detail/photo/slinky-toy-over-white-royalty-free-image/150683973> [Accessed 30 May 2025]. Source adapted.
- Figure 6:** With permission from Thonet GmbH.
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- Figure 8:** Julia Garan, 2019. *A humanoid robot waiter...* [image online] Available at: <https://www.gettyimages.co.uk/detail/photo/humanoid-robot-waiter-carries-a-tray-of-food-and-royalty-free-image/1195237857> [Accessed 17 July 2025]. Source adapted.
- Figure 10:** With permission from Birdfy.
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