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Design technology
Standard level
Paper 1

15 May 2026

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

45 minutes

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 **[30 marks]**.

1. Passengers use overhead handles to steady themselves on moving trains.

Figure 1: Train traveller using an overhead handle



What percentile is used to determine the grip height of handles used in public transport, **see Figure 1**?

- A. 5th
 - B. 50th
 - C. 95th
 - D. 5th–95th
-
2. Which research method is most suitable for collecting psychological factor data to be used in airport lounge design?
 - A. Expert appraisal
 - B. User trial
 - C. Literature search
 - D. Performance testing

3. Which environmental factors influence the alertness of a person within a crowded group setting, such as when travelling on public transport?
- I. Temperature
 - II. Lighting conditions
 - III. Noise levels
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III
4. The design of which item of sports equipment is more significantly influenced by biomechanics?
- A. A tennis racket
- B. A pair of swimming goggles
- C. A tennis ball
- D. A cycling helmet
5. Which renewable energy resource harnesses energy from the sun?
- A. Nuclear energy
- B. Biomass energy
- C. Tidal energy
- D. Geothermal energy

6. Much of India's rural population relies on smallholder farming where about 30 % of agricultural produce is being wasted. An initiative from Science for Society helps farmers by providing them with solar-powered food drying systems, such as the one shown in **Figure 2**, to convert food waste from farming into ingredients for the food industry.

Figure 2: Solar-powered food dehydrator



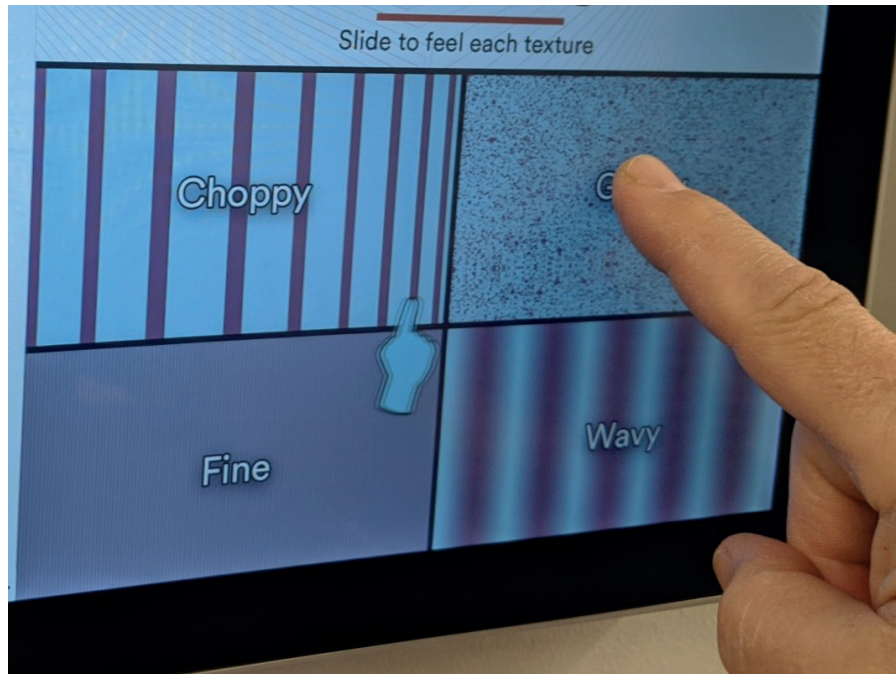
Which green design objectives are addressed by this initiative?

- A. Materials and Energy
 - B. Waste and Energy
 - C. Pollution and Materials
 - D. Waste and Materials
7. Why are capacitors more efficient than batteries for storing energy?
- A. Capacitors store electrical energy directly without converting it into chemical energy
 - B. Capacitors can store energy for a longer duration than batteries
 - C. Capacitors convert chemical energy into electrical energy more efficiently than batteries
 - D. Capacitors convert solar energy into electrical energy more efficiently than batteries

8. Which of the following factors has a direct effect on the reliability of individual energy generation systems?
- A. Installation cost
 - B. Renewable energy source availability
 - C. Maintenance requirements
 - D. Electricity consumption patterns
9. How can legislation encourage manufacturers to clean up their production processes?
- A. Encouraging the use of non-renewable energy sources
 - B. Mandating the use of renewable resources
 - C. Providing tax incentives for eco-friendly practices
 - D. Altering focus and priorities
10. How do converging technologies in a smartphone benefit the environment?
- A. Reducing the smartphone's battery life
 - B. Increasing the production cost of smartphones
 - C. Increasing social interaction between smartphone users
 - D. Reducing the need for multiple devices

11. Tanvas technology creates the sensation of different surface textures on a flat touchscreen as a user slides a finger across a digital illustration (see **Figure 3**). Developed in the Neuroscience and Robotics Laboratory at Northwestern University, it allows users to engage their sense of touch.

Figure 3: Tanvas flat touchscreen



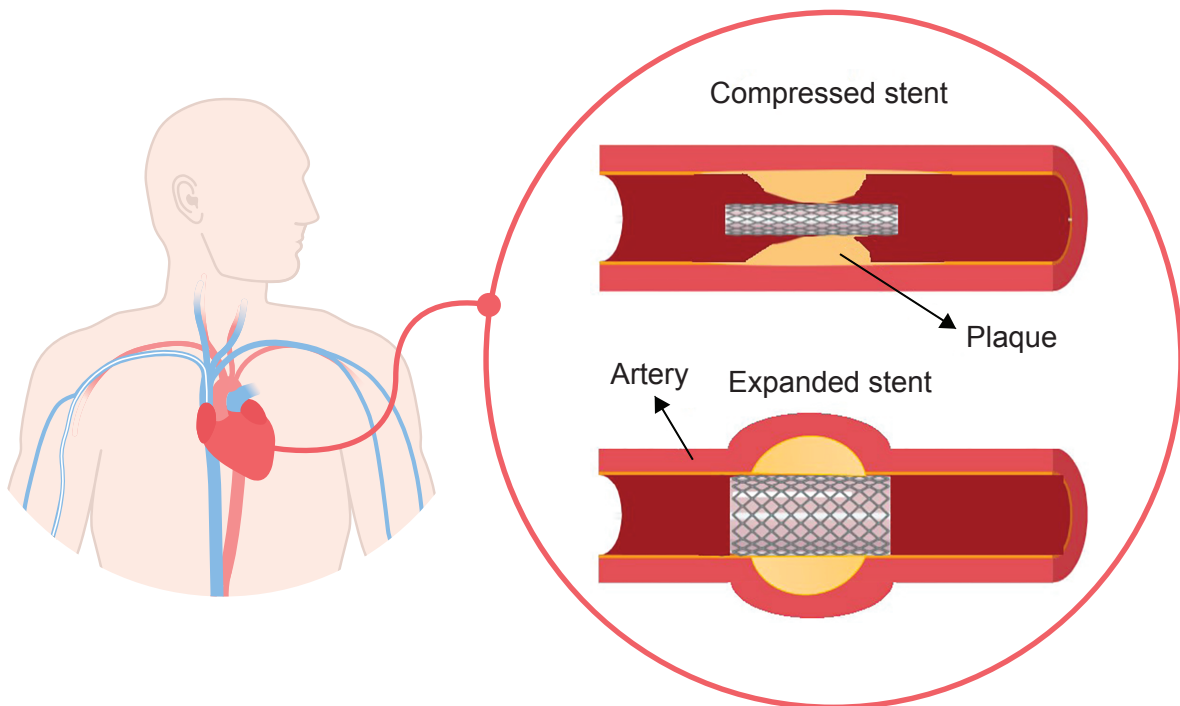
Which technology enables interaction with digital content through touch?

- A. Virtual modelling
 - B. Finite element analysis (FEA)
 - C. Motion capture
 - D. Haptic technology
12. How do perspective drawings contribute to the design of buildings?
- A. Providing projections showing accurately
 - B. Predicting future building trends
 - C. Visualizing conceptual models
 - D. Reducing construction time

13. Which prototyping technique is more suitable for creating large scale structures?
- A. Fused deposition modelling (FDM)
 - B. Stereolithography (SLA)
 - C. Selective laser sintering (SLS)
 - D. Laminated object manufacturing (LOM)
14. An arterial stent is a wire mesh tube that holds an artery open to restore normal blood flow where plaque has built up.

The material properties of the stent in **Figure 4** allows it to be compressed and placed into the artery, where it will expand to its full diameter returning to its original shape.

Figure 4: Compressed and expanded views of an arterial stent



Which material is used to manufacture stents due to its ability to self-expand after implantation?

- A. Super alloy
- B. Shape memory alloy
- C. Piezoelectric
- D. Magneto-rheostatic

- 15.** Which material property makes glass a popular choice in the design of modern office buildings?
- A. High thermal conductivity
 - B. High tensile strength
 - C. Low density
 - D. Transparency
- 16.** Which of the following methods are used to modify the mechanical properties of metals?
- I. Work hardening
 - II. Tempering
 - III. Alloying
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III
- 17.** In which design context is high absorbency of textiles an important consideration?
- A. Outer shells of winter jackets
 - B. Upholstery fabric for furniture
 - C. Athletic wear and sports uniforms
 - D. Insulation material for buildings

18. Why are composites increasingly replacing traditional materials in vehicle design?
- A. Lower manufacturing costs
 - B. Superior strength-to-weight ratio
 - C. Ease of recycling
 - D. Readily available
19. Which of the following strategies is referred to as *design for manufacture* (DFM)?
- A. Design for comfort
 - B. Design for assembly
 - C. Design for aesthetics
 - D. Design for markets
20. What is an advantage of introducing multi-tasking robots in manufacturing?
- A. Higher initial investment
 - B. Increased maintenance cost
 - C. Increased unemployment
 - D. Increased production flexibility

21. Swoppit is a startup connecting Gen Z*'s consumption needs with climate action through a clothes-swapping marketplace.

The clothing exchange app, see **Figure 5**, offers an eco-friendly and enjoyable fashion experience for those who love fashion but also care about the environment.

Self-expression through fashion becomes possible without a guilty conscience with this alternative to traditional shopping.

Figure 5: An outline of how to use Swoppit



Which role would best describe the founder of Swoppit?

- A. Innovator
- B. Entrepreneur
- C. Product champion
- D. Inventor

* Gen Z (Generation Z): Those born between the mid-1990s and early 2010s, characterized by their comfort with technology and concern for social issues.

- 22.** Which of the following exemplifies modular innovation in the development of an electric car?
- A. Incorporating sustainable materials in manufacturing
 - B. Using assembly line techniques
 - C. Implementing customizable battery configurations
 - D. Minimizing product features for cost reduction
- 23.** Scientific research that leads to advances in technology that underpin new ideas is referred to as:
- A. Technology push
 - B. Market innovation
 - C. Technology diffusion
 - D. Consumer adoption

24. The centuries-old Hinoki wooden bathtub, see **Figure 6**, is an example of traditional Japanese craftsmanship reflecting the harmony between nature and daily life as a Japanese design philosophy.

A standard size Hinoki wooden bathtub can cost as much as USD 8230 and can be found in residential homes, traditional Japanese hotel rooms or inn's known as Ryokan.

Figure 6: Hinoki wooden bathtub



What distinguishes the Hinoki wooden bathtub as a classic design?

- A. Material
- B. Manufacturing process
- C. Omnipresence
- D. Retail cost

- 25.** Which of the following is a fundamental principle of classic design?
- A. Ornate decoration over utility
 - B. Form follows function
 - C. Innovation above tradition
 - D. Aesthetic appeal over innovation
- 26.** What factors contribute to an emotional connection evoked by classic designs?
- A. Reliance on cutting-edge technology
 - B. Tendency to prioritize complex features
 - C. Timeless appeal and enduring qualities
 - D. Frequent updates and redesigns

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

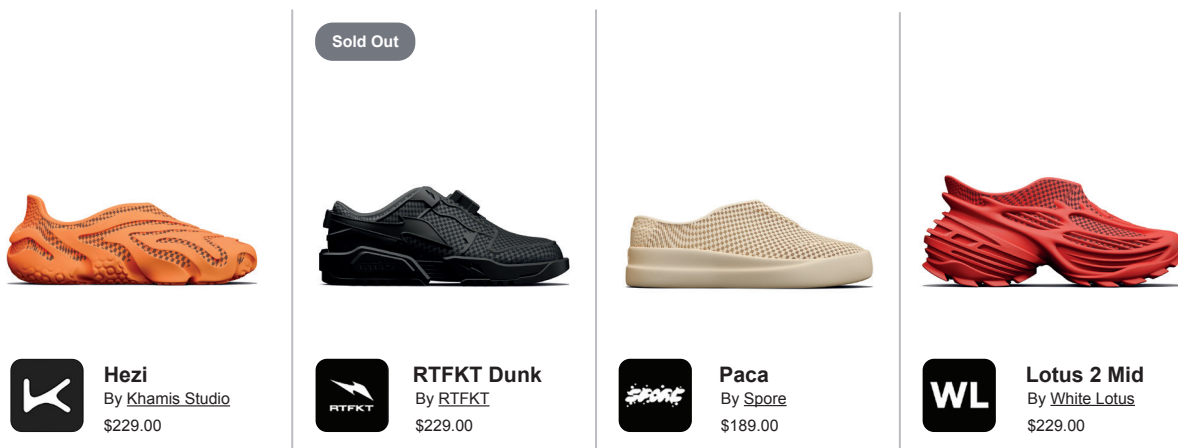
Cornelius Schmitt, CEO of Zellerfeld, has a goal to put fully recyclable 3D-printed shoes “on every foot in the world”.

The Zellerfeld shoe, see **Figure 7**, is made to order. Since startup, Zellerfeld have designed and developed their own range of MONO1 through to GEN3 3D printers to create custom-designed shoes. Customers scan their feet with a smartphone which is used as a base for their shoe design and can even launch their own brands through Zellerfeld’s website.

Computer-aided design (CAD) software is used to adapt the shoe to fit the exact shape of the user’s feet. Recent collaborations with brands such as Louis Vuitton highlight how Zellerfeld’s technology is being applied across fashion and luxury markets.

The Zellerfeld shoes are made out of a single material, thermoplastic polyurethane (TPU), and can be returned to the company at disposal for them to make new shoes out of the old ones.

Figure 7: Zellerfeld 3D printed shoes



27. Why does Zellerfeld design the shoes to fit the user’s feet exactly?
- 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

- 28.** Zellerfeld has implemented a program where consumers can return their shoes at the end of the product's life.

Which of the following waste mitigation strategies applies to the Zellerfeld shoes?

- A. Recondition
- B. Re-engineer
- C. Repair
- D. Recycle

- 29.** Which of the following properties makes thermoplastic polyurethane (TPU) ideal for a 3D printing process?

- A. High toughness
- B. Softens when heated above 250 °C
- C. High durability
- D. Resistance to cutting

- 30.** Zellerfeld have designed their own 3D printers to manufacture the shoes.

Which aspects of a design specification would specify additive manufacturing as a production 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
-

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References:

- Figure 1** boana, 2018. *Woman using phone in the subway train – stock photo*. [image online] Available at: <https://www.gettyimages.in/detail/photo/woman-using-phone-in-the-subway-train-royalty-free-image/961748002> [Accessed 28 June 2024].
- Figure 2:** With permission from S4S Technologies.
- Figure 3:** Photo credit Michael Peshkin.
- Figure 4:** S. Omid et al., 2020. Self-expanding stents based on shape memory alloys and shape memory polymers. [pdf] *Journal of Composites and Compounds*. Available at: <https://jourcc.com/index.php/jourcc/article/view/jcc225/55> [Accessed 01 July 2024]. Open access article, licensed under CC BY 4.0 <https://creativecommons.org/licenses/by/4.0/>. Source adapted.
- art4stock, 2022. *Peripherally inserted central catheter PICC on male body – stock image*. [image online] Available at: <https://www.gettyimages.co.uk/detail/illustration/peripherally-inserted-central-catheter-picc-royalty-free-illustration/1410816460> [Accessed 30 October 2025]. Source adapted.
- Figure 6:** With permission from Hinokisoken Co., Ltd.
- Figure 7:** With permission from Zellerfeld Shoe Company Inc.