

Design technology
Standard level
Paper 1

Wednesday 8 November 2017 (afternoon)

45 minutes

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 **[30 marks]**.

1. **Figure 1** shows information gathered from an athlete in a sports laboratory.

Figure 1: Athlete in sports laboratory



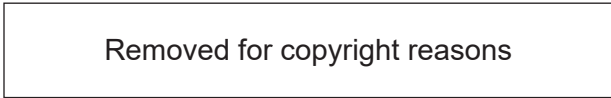
[Source: Getty Images/OptiTrack]

Muscle strength, age and coordination are examples of which type of factors considered by designers?

- A. Psychological factors
 - B. Biomechanical factors
 - C. Static factors
 - D. Primary factors
2. Which term describes anthropometric data taken while someone is at rest?
- A. Static data
 - B. Dynamic data
 - C. Functional data
 - D. Secondary data

3. Designers use an understanding of human factors to...
- I. Increase safety
 - II. Increase ease of use
 - III. Reduce stress and fatigue
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III
4. **Figure 2** shows packaging used by McDonald’s fast food restaurants. The company changed to card and paper packaging in 2008, (shown on the left). They had previously used Styrofoam plastic, (shown on the right). This change reduced the weight and amount of materials used.

Figure 2: McDonald’s packaging



What waste mitigation strategy is this an example of?

- A. Re-engineering
- B. Re-use
- C. Reconditioning
- D. Dematerialization

5. Which of these is a non-renewable resource?
- A. Geothermal
 - B. Biomass
 - C. Wind
 - D. Coal
6. What is a major disadvantage of lead acid batteries?
- A. They are inefficient
 - B. They are expensive
 - C. They contain hazardous chemicals which are harmful to the environment
 - D. They are unreliable
7. What is an advantage of developing radical solutions for clean technology?
- A. Manufacturers can benefit from patenting new solutions
 - B. Manufacturers do not need to invest large sums of money into the solution
 - C. Manufacturers can make small changes over time
 - D. Manufacturers can respond to legislation quickly
8. Which of these contributes to a product's embodied energy?
- A. Initial use
 - B. Disposal
 - C. Assembly
 - D. Disassembly

9. At what stage in the life cycle of a product will a manufacturer have the least influence?
- A. Pre-production
 - B. Production
 - C. Distribution
 - D. Disposal
10. What do end-of-pipe technologies achieve?
- A. Reduced use of finite resources
 - B. Reduction of emissions after production
 - C. Reduction of harmful chemicals before production
 - D. Improved efficiency of resources being used

11. **Figure 3** shows a car design modelled from clay.

Figure 3: A clay model of a car



[Source: [https://commons.wikimedia.org/wiki/File:Opel_50_Jahre_Design_\(14541643013\).jpg](https://commons.wikimedia.org/wiki/File:Opel_50_Jahre_Design_(14541643013).jpg), by Robert Basic]

Which of the following best describes a model that shows exactly how a product could look but not function?

- A. Mock-up model
 - B. Prototype model
 - C. Realistic model
 - D. Aesthetic model
12. Clay models, scale models and prototypes are all examples of which type of modelling?
- A. Physical modelling
 - B. Graphical modelling
 - C. Functional modelling
 - D. Conceptual modelling

13. Designing parts of a product individually then assembling them together later is known as...
- A. Top-down modelling
 - B. Join together later modelling
 - C. Bottom-up modelling
 - D. Assembly modelling
14. **Figure 4** shows a textile process. The process uses a machine containing needles that penetrate the material and tangle upper fibres to inner fibres.

Figure 4: A textile process



[Source: Christine Forrest/Farm Credit Bank of Texas]

What is the name of this process?

- A. Knitting
- B. Weaving
- C. Lacemaking
- D. Felting

15. Photochromic materials change in response to what stimulus?
- A. Heat
 - B. Light
 - C. Electric current
 - D. Pressure
16. What type of tree is considered “leaf losing”?
- A. Coniferous
 - B. Softwood
 - C. Deciduous
 - D. Spruce
17. What is true of timber finishing and treatment?
- I. It protects against insects and fungi
 - II. It protects against moisture
 - III. It allows the material to be recycled easier when no longer needed
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III
18. What manufacturing process uses a laser to harden liquid resin?
- A. Fused deposition modelling (FDM)
 - B. Laminated object manufacture (LOM)
 - C. Paper-based rapid prototyping
 - D. Stereolithography

19. Which combination of cooling type and grain structure is correct?

	Cooling type	Grain structure
A.	Rapid	Large
B.	Slow	Small
C.	Rapid	Small
D.	Slow	None

20. What process will increase the toughness of a metal?

- A. Normalizing
- B. Annealing
- C. Tempering
- D. Hardening

21. **Figure 5** shows a concept design for Phonebloks.

Figure 5: Phonebloks



[Source: <https://phonebloks.com/assets/images/touch-icon.png>, by Dave Hakkens]

Phonebloks is a concept aimed at allowing users to customize and upgrade their mobile phones. This strategy of innovation, where the architecture of a product is maintained and components are modified, is known as...

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

- 22.** Who is best suited to help an invention to market, often by financing development and production?
- A. Lone inventor
 - B. Product champion
 - C. Entrepreneur
 - D. Early adopters
- 23.** Which of the following terms best describes the process of using a solution in one field to solve a problem in another field?
- A. Analogy
 - B. Transfer
 - C. Technology push
 - D. Adaptation

24. **Figure 6** shows a coffee maker design from the 1930s. It is widely considered a design classic and is still used today.

Figure 6: A coffee maker



[Source: <https://commons.wikimedia.org/wiki/File:Moka2.jpg>
Imm808 – Wikimedia Commons]

Which of these factors may have contributed to its status as a classic design?

- I. It could be mass produced easily
 - II. It was the dominant design for coffee makers for many years
 - III. It transcended its function by being used as decoration in many kitchens
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

- 25.** Which of the following applies to retro styling?
- A. A product that uses elements of previous designs updated with new technologies
 - B. A product that uses the principles of form follows function
 - C. A product that uses the principles of conflict and compromise
 - D. A product with timeless appeal
- 26.** Which of these statements best describes practical function?
- I. A product that focuses on reliability
 - II. A product that focuses on functionality
 - III. A product that focuses on desirability
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

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

In 2015, Oakley Europe, along with www.designboom.com, launched a European-wide competition where entrants were challenged to create an innovative design that would enhance elite sports performance.

The winning design by Nacho Fernandez Bellette and Luis Enrique Muñoz Vargas was the Konk. This product brings together in a single object the functionality of a dozen pieces of outdoor equipment.

Figure 7 below shows the Konk in a number of applications.

Figure 8 shows where the Konk attaches to backpacks for easy carrying when not in use.

Figure 7: Fire insulator, stove/wok/grill, shovel, bucket sledge, hammock

Removed for copyright reasons

Figure 8: How the Konk attaches to a backpack

Removed for copyright reasons

27. According to the designers, their “first source of inspiration were turtle shells, as a result of this, we designed a rigid and strong structure with a concave shape which allows many different uses”.

Which strategy for innovation is this an example of?

- A. Adaptation
 - B. Analogy
 - C. Act of insight
 - D. Technology push
28. The Konk is made of an alloy. What most accurately describes an alloy?
- A. A material comprised of two or more materials that have different properties
 - B. A material that consists of particles and a matrix
 - C. A mixture of two or more non-metals
 - D. A mixture that contains two or more metals

29. What percentile range should the Konk be designed for?
- A. 50th percentile
 - B. 5th percentile
 - C. 5th – 95th percentile
 - D. 95th percentile
30. What name would be given to a physical model of the Konk that was able to carry out all of the tasks shown in **Figure 7**?
- A. Scale model
 - B. Prototype
 - C. Mock-up
 - D. Instrumented model
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