

Design technology
Standard level
Paper 1

Friday 4 May 2018 (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. What describes the collection of data that does not already exist?
 - A. Ordinal data
 - B. Secondary data
 - C. Primary anthropometric data
 - D. Categorical data

2. A designer wants to know how people really use an existing product.
Which of the following is the most appropriate data collection approach?
 - A. Questionnaires
 - B. Observation
 - C. Interviews
 - D. Standardized tests

3. A designer wants to reduce the strength it takes to use a tap.

Which of the following designs shown in **Figure 1** provides the best mechanical advantage?

Figure 1: A range of taps

A.



[Source: © International Baccalaureate Organization 2018]

B.



[Source: © International Baccalaureate Organization 2018]

C.



[Source: Screwfix]

D.

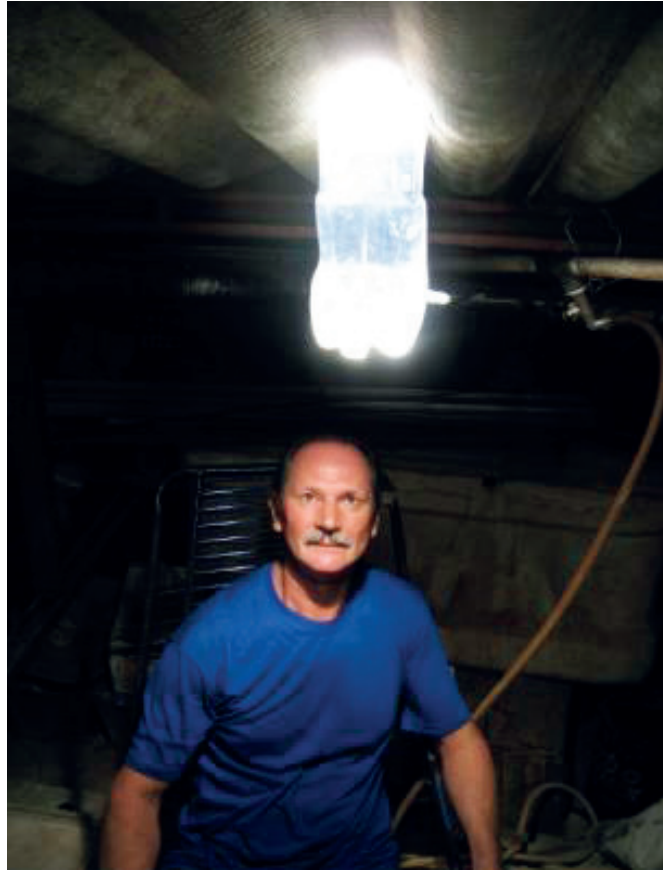


[Source: Heating and Plumbing Warehouse Ltd]

4. Which of the following is a non-renewable energy source?
- A. Solar
 - B. Natural gas
 - C. Hydro
 - D. Biomass
5. When can timber be defined as renewable?
- A. When a new tree is planted to replace used timber
 - B. When it is re-engineered
 - C. When it is sourced from a rainforest
 - D. When it has been recycled

6. Alfredo Moser invented a lamp, see **Figure 2**, to provide lighting to homes without access to electricity, using nothing more than a plastic bottle, water and bleach.

Figure 2: The Moser lamp



[Source: Image by Gibby Zobel]

What waste mitigation strategy describes the use of the bottle in this invention?

- A. Recondition
- B. Recycle
- C. Repair
- D. Reuse

7. Which of the following has the hierarchy of waste in the right order (from most to least desirable)?
- A. Landfill, incineration, resource recovery, recycling, reuse, source reduction
 - B. Source reduction, reuse, recycling, resource recovery, incineration, landfill
 - C. Landfill, resource recovery, recycling, reuse, source reduction, incineration
 - D. Source reduction, resource recovery, recycling, reuse, incineration, landfill

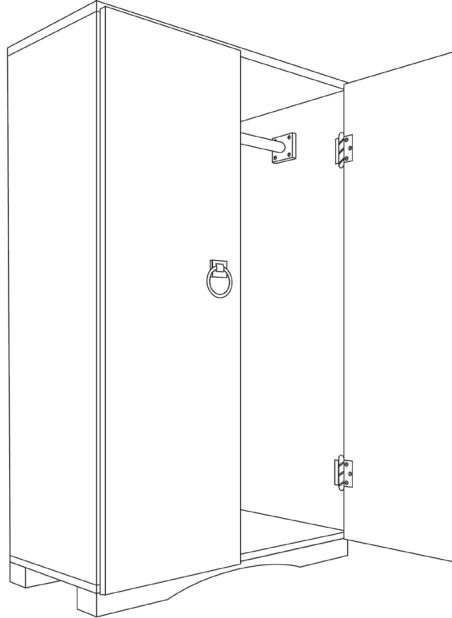
8. Climate change mitigation is the actions designed to limit long-term climate change. It usually involves reducing greenhouse gases or increasing carbon sinks.

Which of the following is an example of increasing carbon sinks?

- A. Reforestation
 - B. Sustainable forestry
 - C. Source reduction
 - D. Recycling and reuse
9. What best describes a combined heat and power approach?
- A. A national energy distribution system
 - B. A macro energy policy
 - C. A sustainable energy strategy
 - D. An efficient way of generating electrical and thermal energy from a single source
10. Which of the following is an advantage of radical solutions to clean energy development?
- A. Benefits from patenting new solutions
 - B. Quick response to legislation
 - C. Low levels of uncertainty
 - D. Limited investment required

11. Many furniture manufacturers provide graphical models to help customers assemble their products, see **Figure 3**.

Figure 3: An example of a graphical model



[Source: Image designed by Mike Oliver]

What perspective style is used in the image?

- A. Linear perspective
- B. Two-point perspective
- C. One-point perspective
- D. Three-point perspective

12. James Dyson reportedly made over 5000 prototypes before he was happy with the design of his vacuum cleaner, see **Figure 4**.

Figure 4: A Dyson vacuum cleaner



[Source: The image of the Dyson prototype reproduced at page 8 is reproduced with the permission of Dyson Technology Limited]

What could be a disadvantage of a detailed working prototype?

- A. Looks different to the final product
 - B. Encourages inaccurate feedback
 - C. Does not give an accurate idea of the final product
 - D. Expensive to produce
13. Virtual reality is increasingly being used in design and development to simulate product interaction. Sometimes this is used in relation to tools that allow designers and testers to “feel” the virtual environment.

Which of the following best describes a technology that simulates the sense of touch?

- A. Accelerometer
- B. Movement sensor
- C. Haptic
- D. Vibration motors

14. The joints along railway tracks have noticeable gaps. This is not a design flaw as these gaps serve a purpose, see **Figure 5**.

Figure 5: The gaps along railway tracks



[Source: https://commons.wikimedia.org/wiki/File:Track_joint.jpg]

What purpose do the gaps along railway tracks serve?

- A. Easy access for maintenance
 - B. Allow for thermal expansion
 - C. Ease of transportation
 - D. To adjust the distance between the wooden sleepers
15. Man-made timbers can be convenient for industrial use.
- Which of the following man-made timbers is created from thin layers glued together?
- A. Chipboard
 - B. MDF
 - C. Particle board
 - D. Plywood

16. Glass can be processed in many ways to achieve different properties.

Which of the following processes describe tempering?

- A. Heat treating
- B. Laminating
- C. Moulding
- D. Etching

17. Which of the following is an advantage of thermoset plastics?

- A. Retain their strength and shape when heated
- B. Returns to original form on heating
- C. Re-mouldable when heated
- D. Increases hardness when heated

18. Modern sportswear often advertises its technical capabilities, such as wicking properties, see **Figure 6**.

Figure 6: Modern sportswear



[Source: Todor Tsvetkov / iStockphoto]

What material is best suited for this application?

- A. Silk
- B. Cotton
- C. Polyester
- D. Wool

19. The 2016 BMW 7 series may be considered a breakthrough in the use of carbon-fibre reinforced plastic in a mainstream car, see **Figure 7**.

Figure 7: The 2016 BMW 7 series



[Source: Image by Kevauto, [https://commons.wikimedia.org/wiki/File:2017_BMW_750i_\(G12\)_front_3.23.18.jpg](https://commons.wikimedia.org/wiki/File:2017_BMW_750i_(G12)_front_3.23.18.jpg)]

What advantage is BMW seeking in using this composite material?

- A. Flexibility
 - B. Increased rigidity
 - C. Light and strong
 - D. Lower costs
20. Which of the following is most suited to the manufacture of a high-value niche product?
- A. Continuous flow
 - B. One-off
 - C. Mass production
 - D. Batch manufacture

21. Gillette has been operating since 1901 and has consistently stayed ahead of its competition through advancements in its shaving products, see **Figure 8**.

Figure 8: An example of a Gillette product



[Source: © Gillette and Procter and Procter & Gamble]

What type of innovation is utilized by Gillette?

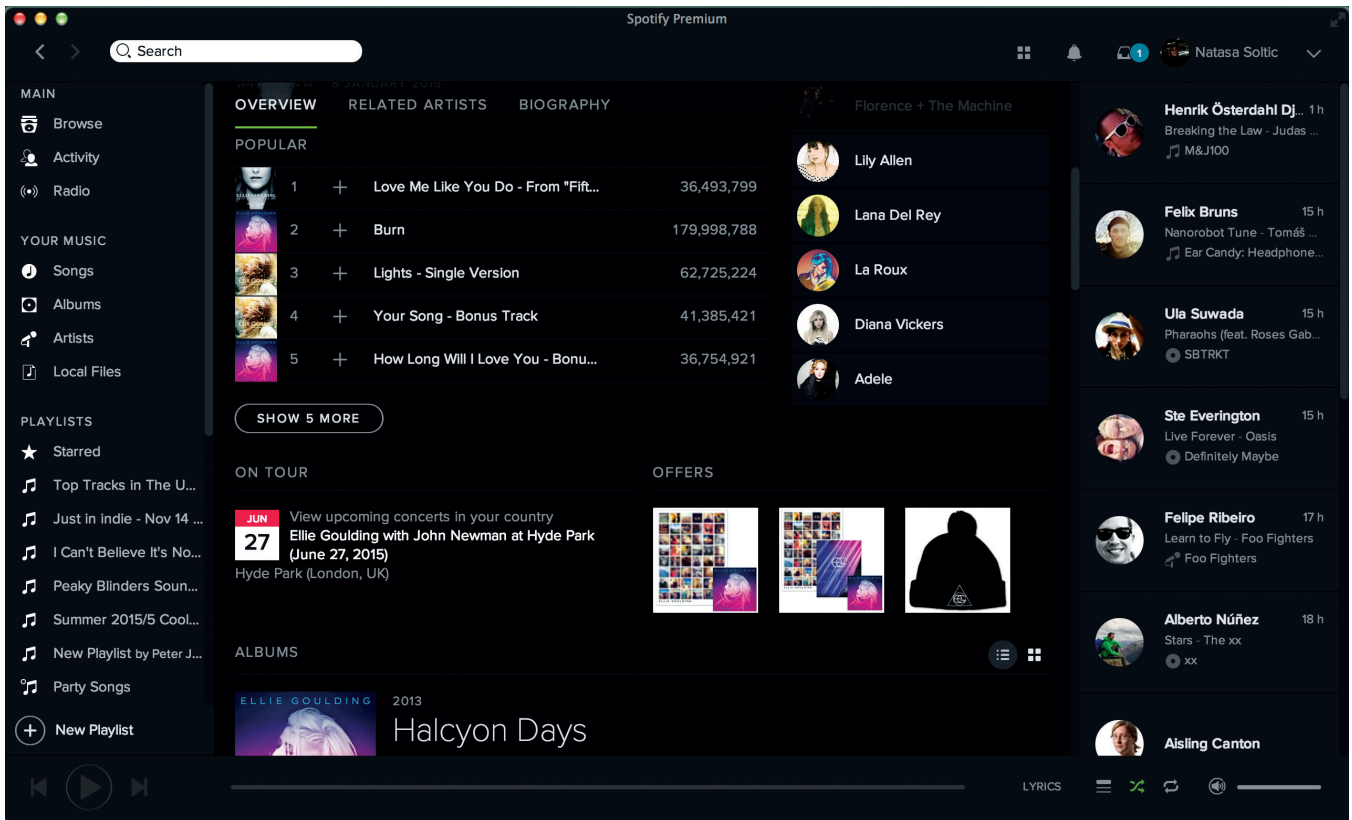
- A. Modular
 - B. Radical
 - C. Incremental
 - D. Technology transfer
22. Modern products are often very complex, containing digital and physical elements.

What approach do many companies employ to deal with this complexity?

- A. Focus on a core technology
- B. Employ a product champion
- C. Multidisciplinary approach
- D. Monodisciplinary approach

- 23. Spotify, see **Figure 9**, is an example of an online music streaming service which is changing the way many people access music. This has had an impact on the sale of music CDs.

Figure 9: An example of the way people access music on Spotify



[Source: Spotify]

What best describes the impact of music streaming services such as Spotify on CD sales?

- A. Functional obsolescence
- B. Planned obsolescence
- C. Style obsolescence
- D. Technological obsolescence

24. The Jerrycan, see **Figure 10**, was developed in Germany in the 1930s for military use. It became a much sought-after item because it was engineered to a much higher standard than the competition and contained many innovative features, including indentations in the walls that allowed for expansion and increased strength, and a handle design that allowed it to be carried by one or two people. Its iconic status is demonstrated by continued availability of and the use of the term “Jerrycan” in reference to all fuel containers.

Figure 10: The Jerrycan



[Source: <https://commons.wikimedia.org/wiki/File:Jerrycan.JPG>]

What term best describes the Jerrycan?

- A. Imitative design
- B. Dominant design
- C. Obsolescent design
- D. Aesthetic design

25. **Figure 11** below shows the 2015 Leica X digital camera.

Figure 11: The Leica X digital camera



[Source: With permission from Leica Camera]

Which best describes the designer's approach?

- A. Retro-styling
- B. Psychological function
- C. Compromise
- D. Innovation

26. **Figure 12** below shows a room with Utility Furniture. This was a scheme created by the British government during World War II to ensure efficient use of scarce resources for the creation of furniture.

Figure 12: A room with Utility Furniture



[Source: https://commons.wikimedia.org/wiki/File:Utility_Furniture_Exhibition_at_the_Building_Centre,London,_1942D11053.jpg]

What design principle guided the development of Utility Furniture?

- A. Iconic design
- B. Aesthetic design
- C. Functional design
- D. Cultural design

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

The Leatherman Tread is a multipurpose tool that can be worn around the wrist, see **Figure 13**. The Leatherman Tread has 32 functions that include screwdrivers, bottle openers and cutting hooks, see **Figures 14 and 15**. It can be purchased for US\$220. The bracelet is made from tempered metal.

Figure 13: The Leatherman Tread



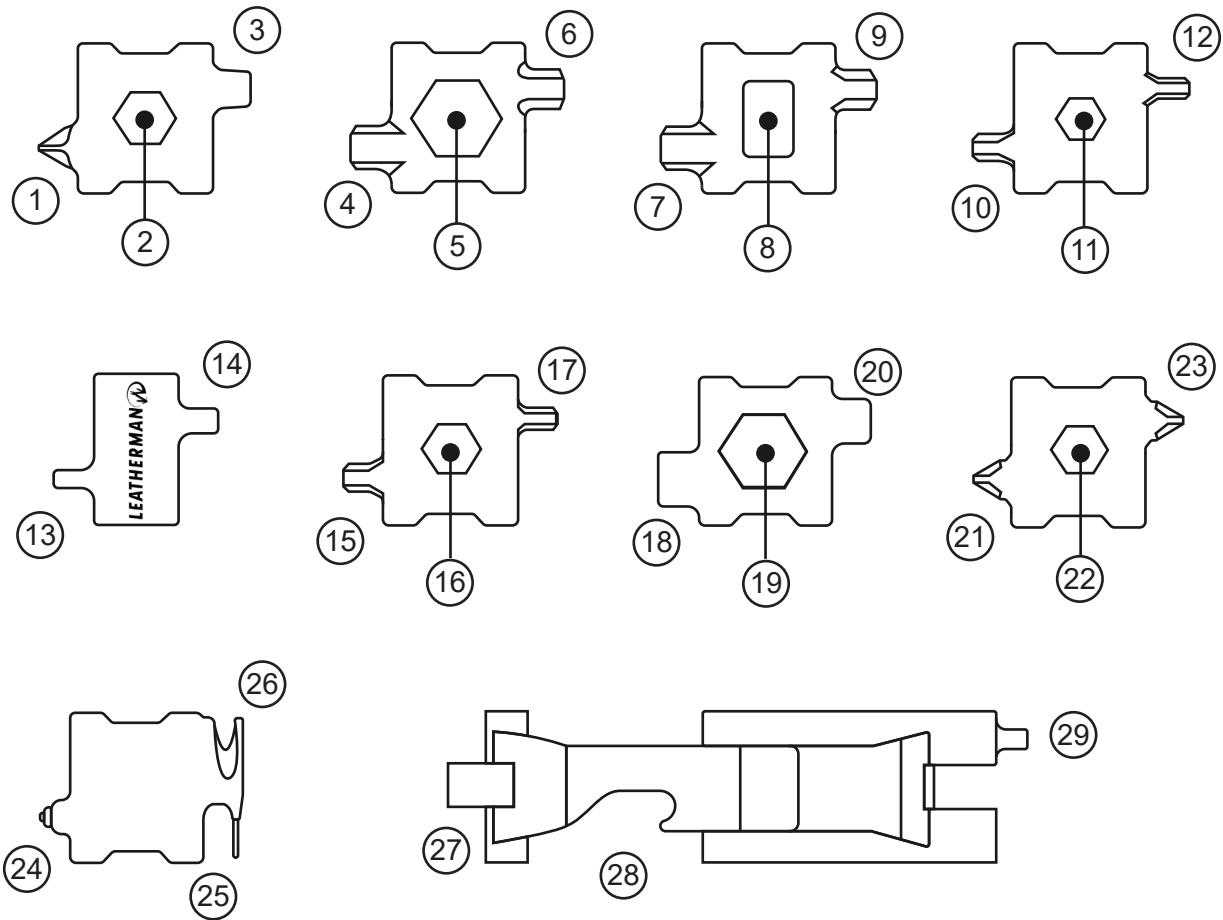
[Source: Copyright 2015, Leatherman Tool Group, Inc.]

Figure 14: The functions of the Leatherman Tread



[Source: Copyright 2015, Leatherman Tool Group, Inc.]

Figure 15: An illustration of the functions of the Leatherman Tread



- | | | |
|----------------------|-------------------------|-------------------------|
| ① #1-2 Phillips | ⑪ 3/16" Box Wrench | ⑳ #1 Phillips |
| ② 1/4" Box Wrench | ⑫ 3/32" Hex Drive | ㉑ 6mm Box Wrench |
| ③ 3/16" Screwdriver | ⑬ 3/32" Screwdriver | ㉒ #2 Phillips |
| ④ 6mm Hex Drive | ⑭ 1/8" Flat Screwdriver | ㉓ Carbide Glass Breaker |
| ⑤ 10mm Box Wrench | ⑮ 4mm Hex Drive | ㉔ Pick/Sim Card Tool |
| ⑥ 5mm Hex Drive | ⑯ 8mm Box Wrench | ㉕ Cutting Hook |
| ⑦ 1/4" Hex Drive | ⑰ 3mm Hex Drive | ㉖ 1/4" Socket Drive |
| ⑧ Oxygen Tank Wrench | ⑱ 5/16" Screwdriver | ㉗ Bottle Opener |
| ⑨ 3/16" Hex Drive | ㉀ 3/8" Box Wrench | ㉘ #2 Scare Drive |
| ⑩ 1/8" Hex Drive | ㉁ 1/4" Flat Screwdriver | |

[Source: Copyright 2015, Leatherman Tool Group, Inc.]

"Take the functionality of a Leatherman tool with you everywhere. Our engineers designed multiple tools in each stainless steel bracelet link, making usable tools like Allen wrenches, screwdrivers and box wrenches available at a moment's notice. Adjustable to 1/4 inch to accommodate any wrist size and fully customizable with the links you need most, the Leatherman Tread is as stylish as it is functional."

[Source: Copyright 2015, Leatherman Tool Group, Inc.]

27. How does the Leatherman Tread incorporate different percentile ranges for the user population?
- A. Adjustability
 - B. Range of sizes
 - C. Universal fit
 - D. Flexibility
28. Which of the following best describes the ability to adapt a product to the needs of an individual?
- A. Batch production
 - B. Mass customization
 - C. One-off production
 - D. Mass production
29. Which of the following best describes what happens in the tempering of metal?
- A. Decreases ductility
 - B. Increases brittleness
 - C. Increases resistivity
 - D. Decreases hardness
30. Compared to other Leatherman products, what strategy for innovation has the company used?
- A. Analogy
 - B. Adaptation
 - C. Act of insight
 - D. Technology push
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