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Design technology
Higher level
Paper 1

Monday 20 May 2019 (afternoon)

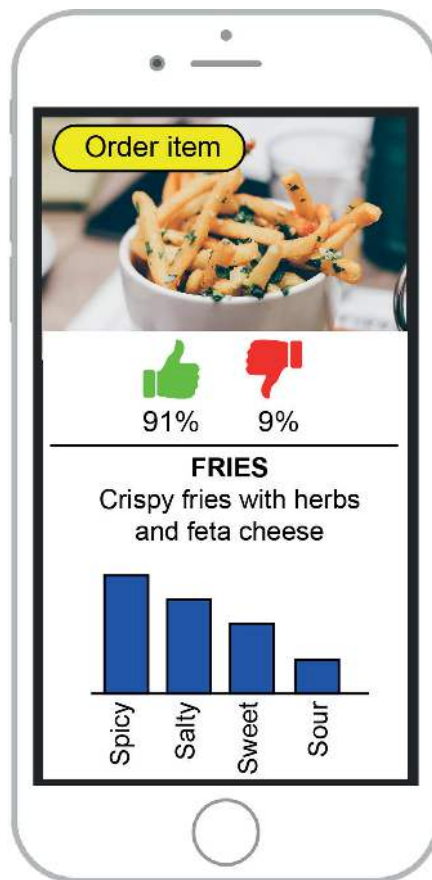
1 hour

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 **[40 marks]**.

1. The Tasty app gathers data from customers about the meals they have chosen, see **Figure 1**.

Figure 1: The Tasty app



[Source: © International Baccalaureate Organization 2019]

What type of human factors data is the app collecting?

- A. Quantitative primary data
 - B. Quantitative secondary data
 - C. Qualitative primary data
 - D. Qualitative secondary data
2. In which scale is the order of the values important, but the differences between the values unimportant?
- A. Ordinal
 - B. Nominal
 - C. Interval
 - D. Ratio

3. If you were designing a cell/mobile phone which of the following anthropometric data would be relevant?
- I. Width of hand
 - II. Stature
 - III. Grip diameter
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III

Turn over

4. The Eco-Flex straw by Aardvark Straws is biodegradable, compostable and 100% chlorine free, see **Figure 2**. Aardvark Straws claim that they are the only paper straws on the market made with FDA food grade-approved inks and paper.

Figure 2: The Eco-Flex straw



[Source: Images provided with kind permission from Hoffmaster/Aardvark Straws]

Many companies are now replacing plastic throwaway products with eco-friendly alternatives. What is the main driver for green design in products such as the Eco-Flex straw?

- A. Consumer pressure
- B. Technology push
- C. Technology pull
- D. Obsolescence

5. Which three categories are focussed on in eco-design?
- A. Materials, energy and pollution/waste
 - B. Production, utilization and distribution
 - C. Price, quality and service
 - D. Product, place and price
6. Embodied energy is the sum of all the energy required to produce any goods or services. Which of the following building materials would have the lowest levels of embodied energy?
- A. Steel
 - B. Stone
 - C. Concrete
 - D. Plastic
7. Cradle to grave is a linear economy based on the make, use, dispose model. What model is cradle to cradle based on?
- A. Reduce, re-use, recycle
 - B. Multidisciplinary approach
 - C. Made to be made again
 - D. Conflict and compromise
8. Dematerialization refers to the reduction of...
- I. Energy
 - II. Material
 - III. Design
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III

Turn over

9. The paper bone chair by Joris Laarman for Droog is an early study of the internationally acclaimed aluminum bone chair. The paper bone chair was made using an early rapid prototyping technique from layers of paper, see **Figure 3**.

Figure 3: The paper bone chair



[Source: image provided with permission from Joris Laarman]

What is the rapid prototyping technique called?

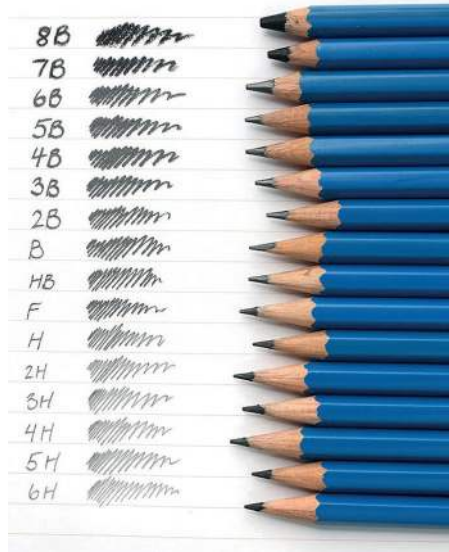
- A. Fused deposition modelling (FDM)
- B. Laminated object manufacturing (LOM)
- C. Stereo-lithography
- D. Selective laser sintering (SLS)

10. Graphical models are useful for engineers, manufacturers, designers and clients, and vary depending on the context. Which of the following graphical models is most appropriate in the context of an architectural design to present to a client?
- A. Assembly drawing
 - B. Perspective drawing
 - C. Isometric drawing
 - D. Orthographic projection
11. Which type of analysis would you use to simulate unknown factors, such as stresses within a joint, in products?
- A. Market analysis
 - B. Finite element analysis (FEA)
 - C. Life cycle analysis (LCA)
 - D. Work flow analysis

Turn over

12. The Staedtler 100 Mars Lumograph pencil is a premium quality drawing pencil for writing, drawing and sketching, see **Figure 4**.

Figure 4: The Staedtler 100 Mars Lumograph pencil



[Source: image provided with permission from STAEDTLER]

A common wood used to make a pencil is cedar. Which type of wood is cedar?

- A. Composite wood
 - B. Soft wood
 - C. Plywood
 - D. Hardwood
13. Robots can be used to replace humans in a number of production areas. Which of the following is a potential disadvantage of using robots in production?
- A. Perform repetitive tasks
 - B. Work in confined spaces
 - C. Loss of jobs
 - D. Highly accurate

14. Which of the following best describes the term *brittle*?
- A. Returns to its original shape after being deformed
 - B. Can be drawn or extruded into an extended shape
 - C. Slow and permanent deformation under the influence of mechanical stress
 - D. Breaks into numerous sharp shards
15. Timber often needs to be treated and finished. Which of the following is a reason for treating and finishing woods with creosote?
- A. Improves chemical resistance
 - B. Reduces attack from borers, wood lice and fungal attack
 - C. Protects from the weather
 - D. Improves humidity
16. The grain size in a metal can affect the properties. Which of the following statements are true?
- I. The larger the grains, the more brittle the metal
 - II. The smaller the grains, the more brittle the metal
 - III. The larger the grains, the more ductile the metal
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III

17. In 1826, John Walker noticed a dried lump on the end of a stick while he was stirring a mix of chemicals. When he tried to scrape it off it created sparks and a flame. Following on from this discovery, Walker marketed the first friction matches as “Friction Lights” and sold them at his pharmacy, see **Figure 5**.

Figure 5: The “Friction Lights” match



[Source: image provided with permission from Preston Park Museum & Grounds]

Which of the following innovation strategies applies to John Walker’s invention?

- A. Adaptation
 - B. Constructive discontent
 - C. Chance
 - D. Technology transfer
18. Which of the following are innovation strategies?
- I. Market pull and technology push
 - II. Property recovery and waste mitigation
 - III. Act of insight and analogy
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III

19. According to Rogers there are five categories of consumer. Which of the following best describes an Innovator?
- A. Minimal exposure to media
 - B. Risk taker
 - C. Resistant to change
 - D. Resistant to peer pressure
20. Product life cycle is a tool for mapping out the four stages of a product's commercial life. The four stages are launch, growth, maturity and decline. Which of the following occurs in the decline stage?
- A. Obsolescence
 - B. Design development
 - C. Continuous flow
 - D. Prototypes

Turn over

21. The 501 shrink-to-fit denim jeans is an iconic design, see **Figure 6**. In 2016, Levi's decided to update the 501 and introduce stretch denim. This change was not popular with customers who had purchased shrink-to-fit denim.

Figure 6: The Levi's 501

Removed for copyright reasons

Which of the following characteristics of classic design is shrink-to-fit denim most likely to apply to?

- A. Timeless
 - B. Mass production
 - C. Image
 - D. Dominant design
22. A user-centred approach to design puts the design team in direct contact with the people they are designing for and is also referred to as...
- A. Aesthetic design
 - B. Empathetic design
 - C. Apathetic design
 - D. Creative design

23. The Kohler Real Rain shower uses the same amount of water as a traditional shower but mimics actual rain with droplets and irregular spacing between bursts of water, see **Figure 7**.

Studying all the elements of a natural rain shower, from the varying sizes of the raindrops to the angles at which they fall, Kohler has created Real Rain, a showering experience that transports the user beyond the everyday home event. The shower is often a conversation starter.

Figure 7: The Kohler Real Rain shower



[Source: Courtesy of Kohler Co]

In terms of Tiger’s four-pleasure framework, which of the following areas would be addressed by the Kohler Real Rain shower?

- I. Socio-pleasure
 - II. Physio-pleasure
 - III. Psycho-pleasure
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III
24. What do the letters ACT stand for in Van Gorp and Adams’ framework for creating designs that intentionally trigger emotional responses with the use of a product?
- A. Aesthetic, Converse, Transact
 - B. Attract, Converse, Transact
 - C. Attract, Create, Transact
 - D. Attract, Create, Transfer

Turn over

25. The graphic in **Figure 8** is linked to good environmental practices.

Figure 8: A label indicating good environmental practices



[Source: Image provided with permission from Good Environmental Choice Australia, <http://www.geca.eco>]

Which of the following is this graphic an example of?

- A. Corporate label
 - B. Energy label
 - C. Eco label
 - D. Country label
26. A person that enthusiastically adopts environmentally friendly practices as a consumer is known as...
- A. An eco-warrior
 - B. An eco-champion
 - C. An eco-fan
 - D. An eco-phobe

27. Which of the following principles are true of sustainable design?

- I. Environmental
- II. Economic
- III. Social

- A. I and II
- B. I and III
- C. II and III
- D. I, II and III

28. Which of the following strategies involves stakeholders at a local level?

	Top down	Bottom up
A.	Yes	Yes
B.	Yes	No
C.	No	Yes
D.	No	No

Turn over

29. Converse Chuck Taylor All-Stars are the best selling sneaker of all time and its design has remained largely unchanged.

In the 1960s, over 90% of basketball players were wearing Converse Chuck Taylor All-Stars and in more recent times the shoe has gained popularity in pop culture and fashion through their portrayal in film, art and music culture.

Which aspects of the Converse Chuck Taylor brand has ensured its ongoing success?

- I. A strong user-centred design (UCD)
 - II. Appeal to different market segments
 - III. Brand loyalty
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III

30. Which of the following are in the 4 Ps marketing mix?
- I. Product
 - II. Packaging
 - III. Place
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III
31. The use of newspapers, magazines, encyclopaedias and annual reports to conduct research is known as...
- A. A literature search
 - B. An expert appraisal
 - C. A user trial
 - D. Focus groups
32. What is true of just-in-case (JIC) inventory management?
- A. Guarantees that products will be available
 - B. Reduces inventory costs
 - C. Enables lean production
 - D. Efficient use of materials
33. Which of the following is a pricing strategy where a company will add a percentage to the total cost of a product?
- A. Demand pricing
 - B. Competitor-based pricing
 - C. Cost-plus pricing
 - D. Psychological pricing

Turn over

- 34.** The regulation of the quality of raw materials, assemblies, products and components is referred to as...
- A. Quality control (QC)
 - B. Quality assurance (QA)
 - C. Statistical process control (SPC)
 - D. Standardization
- 35.** Which of the following is true of break-even?
- A. It is based on qualitative analysis
 - B. It is based on all products that a company sells
 - C. It is based on fixed and variable costs
 - D. It is based on trends of consumer behaviour

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



Figure 9: 3D printed headphone cup before the gloss paint finish is applied



Figure 10: A close-up of the partially printed headphone cup showing the internal fine lattice profile and the finished headphone



Turn over

36. Which of the following is a reason why Alpha Dog headphones are manufactured using 3D printing techniques?
- A. Speed of manufacture
 - B. Ergonomics of the headphones
 - C. Complex shape of the headphones
 - D. Minimize costs
37. Which of the following scales of production would be most appropriate for the Alpha Dog headphones?
- A. Craft production
 - B. Mass production
 - C. Mass customization
 - D. Batch production
38. Which of the following is the designer Dan Clark an example of?
- I. Lone inventor
 - II. Product champion
 - III. Entrepreneur
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II and III
39. Which of the following plastics would be most appropriate for 3D printing the headphone cup?
- A. Melamine resin
 - B. Poly-vinyl chloride (PVC)
 - C. Polypropylene (PP)
 - D. Acrylonitrile-Butadiene-Styrene (ABS)

40. Dan Clark has created his own start-up company to make the Alpha Dog headphones that are based on previous models of the headphone. Which of the following corporate strategies is being used?
- A. Market penetration
 - B. Market development
 - C. Product development
 - D. Product diversification
-