Diploma Programme
Programme du diplôme
Programa del Diploma

Design technology
Higher level
Paper 1

Wednesday 7 November 2018 (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]**.

8818 – 6201

1. **Figure 1** shows a woman on an exercise machine.

Figure 1: A woman on an exercise machine

[Source: Photo credit by KETTLER GmbH]

While the woman is using the exercise machine data is being collected. Which type of data is being collected?

A. Dynamic data

B. Static data

C. Structural data

D. Psychological data

2. What is the final stage of the human information processing system, which results in a physiological response?

A. Sensory process

B. Input

C. Central process

D. Motor process

3. What percentile range for thumb length would be used in the design of a smartphone screen?

A. 50th percentile

B. 95th percentile

C. 5th–95th percentile

D. 5th percentile

4. Which of the following is considered a renewable energy source?

A. Nuclear

B. Coal

C. Oil

D. Hydro

5. What are the disadvantages of carrying out a life cycle analysis (LCA)?

I. Time consuming

II. Expensive

III. Legally binding

A. I and II

B. I and III

C. II and III

D. I, II and III

6. How is the embodied energy of a product best described?

A. The energy consumed by just the extraction of raw materials

B. The energy consumed by the manufacturing processes and the product in use

C. The energy consumed by the extraction of raw materials, manufacturing processes and the product in use

D. The energy consumed by the extraction of raw materials, manufacturing processes and recovery

7. Used smartphones are sometimes made to look new by replacing the casing and screen as well as installing a new battery.

Which waste mitigation strategy does this best describe?

A. Reconditioning

B. Re-engineering

C. Reuse

D. Recovery

8. Designers need to know which materials for a particular product would be most sustainable. Which of the following would help a designer achieve this task?

A. UNEP eco design manual

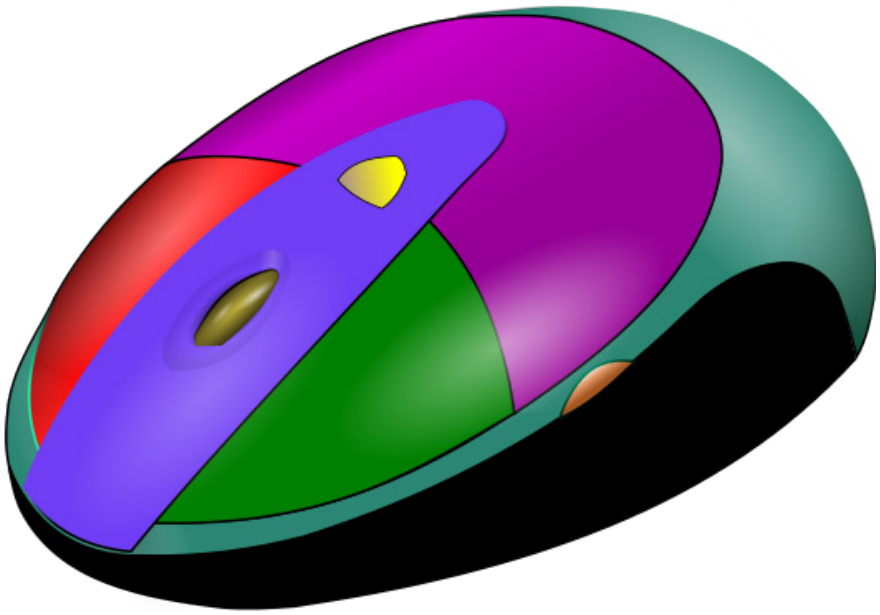
B. Design for environment software

C. Environmental impact assessment matrix

D. Finite element analysis (FEA)

9. **Figure 2** shows a photorealistic model of a computer mouse. The model gives no internal data for manufacture using computer-aided manufacturing (CAM).

Figure 2: A photorealistic model of a computer mouse



[Source: Image by Eduemoni www.wikipedia.com]

What type of model is shown in **Figure 2**?

A. Solid model

B. Graphic model

C. Surface model

D. Physical model

10. Which of the following describes a conceptual model?

I. A model that is used to help us develop and understand ideas

II. A scale or full-size representation of a product used to gain feedback from users

III. Photorealistic computer-aided design (CAD)-based interactive models

A. I and II

B. I and III

C. II and III

D. I, II and III

11. **Figure 3** shows someone wearing cycling shorts. The shorts mould to the user's body and stretch with movement due to their elasticity.

Figure 3: Cycling shorts

State the type of textile used in these cycling shorts.

A. Cotton

B. Silk

C. Lycra

D. Wool

12. A table leg, under normal load conditions, would be under which force?

A. Shear

B. Torsion

C. Compression

D. Tension

13. Which best describes the properties required of copper when being drawn into wire?

A. Plasticity

B. Ductility

C. Malleability

D. Elasticity

14. Which of the following production systems gives consumers flexibility of choice with the advantages of economies of scale?

A. Mass production

B. Craft production

C. Mass customization

D. Automated production

15. Which types of robot are capable of operating for long periods without human intervention?

I. First Generation

II. Second Generation

III. Third Generation

A. I and II

B. I and III

C. II and III

D. I, II and III

16. Kevlar® is a well-known high performing composite. What best describes its form?

A. Fibres

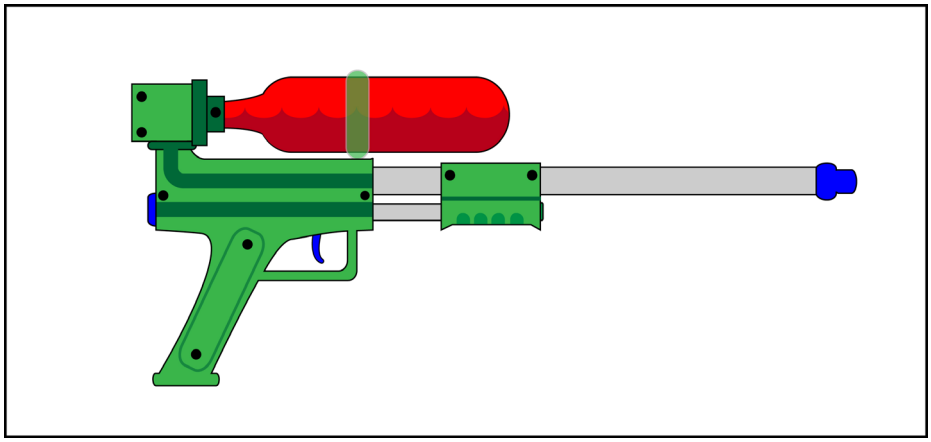
B. Sheets

C. Particles

D. Matrix

17. While working on a new type of refrigeration system, Lonnie Johnson connected a hose to his system to test a part when water shot out at high pressure. This gave him the start of the idea for the Super Soaker water gun, see **Figure 4.**

Figure 4: Water gun in a Super Soaker type design



[Source: © International Baccalaureate Organization 2018]

What strategy for innovation is this an example of?

A. Market pull

B. Analogy

C. Technology transfer

D. Chance

18. What is it called when a company produces different models of the same product at different prices?

A. Product generations

B. Product versioning

C. First to market

D. Product diffusion

19. Which best describes people who are reluctant to use a new technology?

A. Innovators

B. Early adopters

C. Late majority

D. Laggards

20. The design of mobile phones has changed over time. **Figure 5** shows the evolution of mobile phones before the launch of the iPhone, while **Figure 6** shows the evolution of smartphones since the launch of the iPhone.

Figure 5: The evolution of mobile phones before the launch

Figure 6: The evolution of smartphones after the launch

[Sources: image adapted from Anders https://commons.wikimedia.org and © International Baccalaureate Organization 2018]

A design that contains those implicit features of a product that are recognized as essential by a majority of manufacturers and purchasers is known as…

A. Robust design

B. Dominant design

C. Emotional design

D. Form following function

21. Which of the following are considered criteria for a retro design?

I. The design uses the same materials as the original

II. The design uses the decoration of the original

III. The design uses the form of the original

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

22. On most modern laptops, when the user switches on the machine, a sound or tune will play. What characteristic of a good user product interface is this an example of?

A. Feedback

B. Affordance

C. Constraints

D. Mapping

23. What is the name given to products that are accessible and useable by as many people as possible, without the need for adaptation?

A. Ubiquitous design

B. Iterative design

C. Participatory design

D. Inclusive design

24. **Figure 7** shows packaging for a wine bottle made from eco-friendly packaging known as Mushroom® Packaging. Invented to replace polystyrene packaging, it is made using agricultural waste. At the end of its life it is completely biodegradable and can be made into compost.

Figure 7: An example of Mushroom Packaging

[Source: Image provided with permission from Ecovative design]

Which of Datschefski's five principles of sustainable design does the Mushroom® Packaging best fulfil?

A. Safe

B. Solar

C. Cyclic

D. Efficient

25. Which of the following sustainable consumption strategies would have the most impact on the consumer when choosing an electrical appliance?

A. Eco-labelling

B. Energy labelling

C. Waste Electrical and Electronic Equipment (WEEE) Directive

D. Forest Stewardship Council (FSC)

26. The European Union introduced new labelling laws in 2014 requiring any products that contain palm oil to be listed as an ingredient. This is an example of which type of sustainable innovation strategy?

A. Education

B. Bottom-up

C. Top-down

D. Product stewardship

27. Separating economic growth from negative ecological impact is known as…

A. Macro energy sustainability

B. Micro energy sustainability

C. Sustainability reporting

D. Decoupling

28. Which of the following are part of the marketing mix?

I. Product

II. Place

III. People

A. I and II

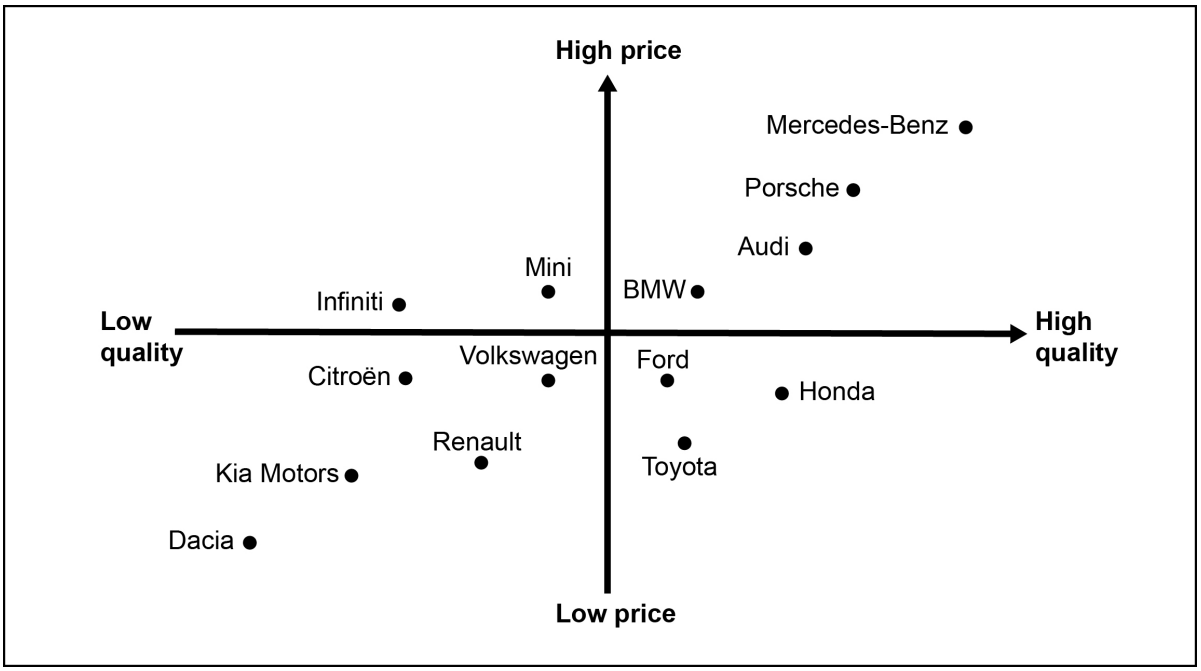
B. I and III

C. II and III

D. I, II and III

29. **Figure 8** below shows a market research strategy.

Figure 8: A market research strategy



[Source: © International Baccalaureate Organization 2018]

What is this strategy?

A. Environmental scanning

B. Perceptual mapping

C. SWOT analysis

D. Literature search

30. What is an advantage to the consumer of buying the products of a reputable brand?

A. Products will be cheaper

B. There will be less demand for the product

C. The quality will be the same as a cheaper competitor

D. They can be almost certain of a quality product

31. **Figure 9** shows a car production line.

Figure 9: A car production line

[Source: Lotus 60th Celebration - Final assembly (https://www.flickr.com/photos/32659528@N00/2868489384). Image by Brian Snelson under CC licence: https://creativecommons.org/licenses/by/2.0/]

The company does not allocate space to the storage of components or completed cars. This is an example of which production strategy?

A. Just in case (JIC)

B. Just in time (JIT)

C. Workflow analysis

D. Kaizen

32. Which of the following would be included in a company's fixed costs?

I. Machinery

II. Rent

III. Materials used in production

A. I and II

B. I and III

C. II and III

D. I, II and III

33. At the car manufacturing plant, teams work together to eliminate waste such as cutting time spent waiting for parts to arrive, reducing unnecessary movement in work cells, eliminating over-processing and over-production.

This strategy, where everyone works together to eliminate waste during manufacture, is a key principle of…

A. Mass customization

B. Lean production

C. Automation

D. Computer integrated manufacturing (CIM)

34. The 5 S system was developed in Japan and is an important part of lean production.

Arranging the items on a production line so that they are easy to find, use and put away, is an example of which of the 5 Ss?

A. Setting

B. Sorting

C. Sifting

D. Shifting

35. Statistical process control (SPC) is a quality control tool that uses statistical methods to ensure that a process operates at its optimum efficiency.

Which of the following are elements of statistical process control (SPC)?

I. Dramatically reducing variability and waste

II. Reducing costs

III. Predicting demand

A. I and II

B. I and III

C. II and III

D. I, II and III

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

The Centriphone is an original design by Nicolas Vuignier, a professional skier. The product enables users to attach their mobile phone into the device and take 360 degree dynamic video footage of themselves skiing. The Centriphone is attached to a cable with a handle on the end, which the skier swings around their head.

From simple foam-board models, through to plywood and a final 3D printed prototype, Vuignier went through several iterations of the Centriphone, see **Figure 10**.

Figure 10: Different iterations of the Centriphone

[Source: Images provided by Nicolas Vuignier]

Figure 11: A skier using the Centriphone

[Source: Images provided by Nicolas Vuignier]

36. **Figure 11** shows a skier spinning the Centriphone around their head. The cable can be seen, while the mobile phone is taking the shot.

Which of the following best describes the mechanical property required of the cable?

A. Ductility

B. Compressive strength

C. Hardness

D. Tensile strength

37. If Vuignier wanted to protect his invention globally from other people copying his idea, which intellectual property protection strategy would be most appropriate?

A. Copyright

B. Trademark

C. Registered trademark

D. Patent

38. Vuignier manufactured the Centriphone using rapid prototyping. The process uses a spool of plastic filament to create the product layer by layer.

Which of the following best describes this process?

A. Select laser sintering (SLS)

B. Fused deposition modelling (FDM)

C. Stereolithography

D. Laminated object manufacturing (LOM)

39. The Centriphone is made to order, and the latest iteration uses less material than previous versions by including holes in the main body.

Which waste mitigation strategy is this an example of?

A. Re-engineering

B. Radical solution

C. Dematerialization

D. Product recovery

40. The Centriphone could be repackaged to appeal to skateboarders rather than skiers.

Which corporate strategy would this be an example of?

A. Market development

B. Product development

C. Market penetration

D. Diversification