Diploma Programme
Programme du diplôme
Programa del Diploma

Design technology
Higher level
Paper 1

Wednesday 13 November 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]**.

8819 – 6201

20 pages

1. A labelled image of a bicycle is shown in **Figure 1**.

Figure 1: A bicycle

[Source: https://unsplash.com]

Which of these bike parts most likely requires the collection of dynamic data rather than static data?

A. Seat length

B. Handlebar grip width

C. Crank length

D. Pedal width

2. Which percentile would be used to calculate the width of a cinema seat?

A. 5th percentile

B. 5th–95th percentile

C. 95th percentile

D. 50th percentile

3. Which part of the human information processing system would most likely be responsible for a user forgetting how to operate a product?

A. Motor processes

B. Input processes

C. Sensory processes

D. Central processes

4. Internet-ready televisions allow access to a number of services including film and television content, internet browsing, social media, cloud photo and file storage and a host of other apps, see **Figure 2**.

Figure 2: An internet-ready television

What is an internet-ready television an example of?

A. Radical solution

B. Green design

C. Converging technology

D. “Design for the environment” software

5. If waste created from an obsolete product is used as a resource again and again in a closed loop system, which waste mitigation strategy is this an example of?

A. Repair

B. Circular economy

C. Cradle to grave

D. Dematerialization

6. Which of the following are considered when carrying out a life cycle analysis (LCA)?

I. Utilization
II. Disposal
III. Amount of labour

A. I and II

B. I and III

C. II and III

D. I, II and III

7. Which of the following drive manufacturers towards green design principles?

I. Legislation
II. Surplus of raw materials
III. Consumer pressure

A. I and II

B. I and III

C. II and III

D. I, II and III

8. Which eco-design system gives a low, medium or high risk rating for each stage of a life cycle analysis (LCA)?

A. Product life cycle

B. Converging technology

C. Environmental impact assessment matrix

D. United Nations Environmental Programme Manual

9. **Figure 3** shows people in a museum. By interacting with the exhibit they are able to understand how the image displayed on the screen feels.

Figure 3: People interacting with an exhibit in a museum

[Source: image provided with kind permission from Christopher Dean]

Which technology enables the people to understand what the image feels like through their sense of touch?

A. Animation

B. Haptic

C. Motion capture

D. Virtual prototyping

10. Which of the following rapid prototyping techniques does not require structural supports during the build?

A. Selective laser sintering (SLS)

B. Laminated object manufacture (LOM)

C. Fused disposition modelling (FDM)

D. Stereolithography

11. The aircraft canopy of the fighter jet in **Figure 4** allows the pilot to see out while flying. It is made from a thick polycarbonate which can absorb the impact of any debris.

Figure 4: An aircraft canopy

[Source: https://pixabay.com]

What mechanical property does this demonstrate?

A. Ductility

B. Hardness

C. Toughness

D. Plasticity

12. Sunglasses can be made using a smart material that, if deformed, will return to its original shape through the application of heat. What smart material is this describing?

A. Shape memory alloy

B. Photochromic material

C. Piezoelectric material

D. Magneto-rheostatic material

13. Basketball shoes can be designed by individual customers to personalize the colour and style. What scale of production is this an example of?

A. Batch production

B. Mass customization

C. Mass production

D. Continuous flow

14. What describes the technology that enables networked devices to exchange information and perform actions without the manual assistance of humans?

A. Computer numerical control (CNC)

B. Machine to machine (M2M)

C. Computer-aided design (CAD)

D. Computer-aided manufacture (CAM)

15. What process allows plastic or metal to be forced through a die to make tubes and rods of uniform cross-section?

A. Vacuum forming

B. Extrusion

C. Injection moulding

D. Compression moulding

16. Which thermosetting plastic is used for fibreglass?

A. Melamine resin

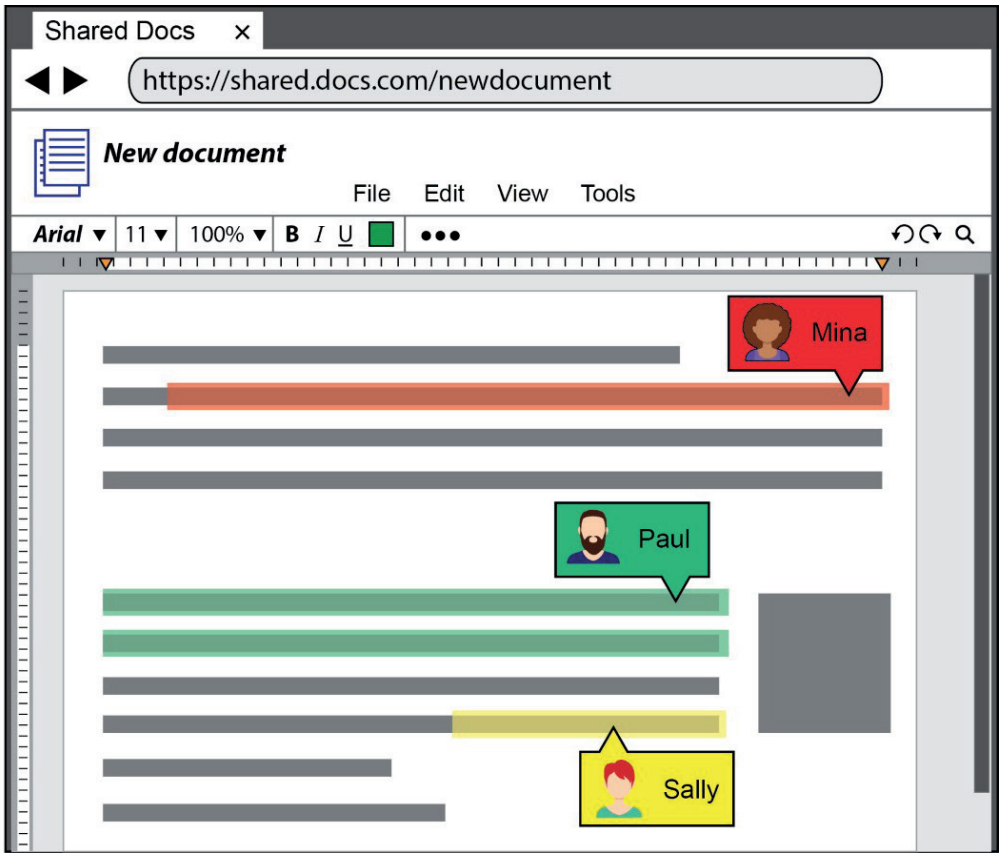
B. Urea formaldehyde

C. Polyurethane

D. Epoxy resin

17. **Figure 5** shows a Shared Docs file. Instead of each user having to work on separate files, Shared Docs allows the three different collaborators to work on a single file.

Figure 5: An example of a Shared Docs file



[Source: © International Baccalaureate Organization 2019]

Which category of innovation is used in Shared Docs to allow collaboration with other people?

A. Architectural innovation

B. Modular innovation

C. Sustaining innovation

D. Disruptive innovation

18. Which strategy for protecting intellectual property applies to words or symbols used to represent a company?

A. Patent

B. Copyright

C. Trademark

D. Registered design

19. Which of the following best describes a product champion?

A. An individual working outside or inside an organization who is committed to the invention of a novel product.

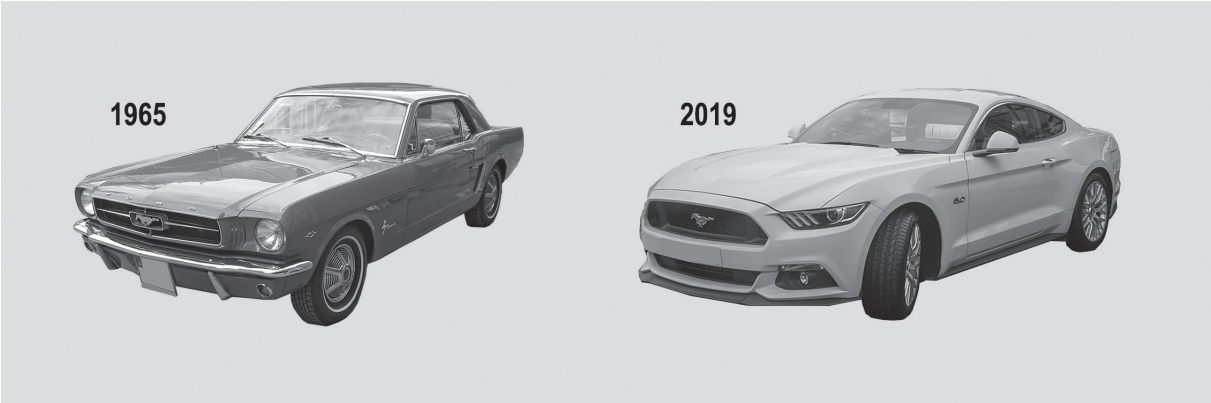
B. An influential individual, usually working within an organization, who develops an enthusiasm for a particular idea or invention and uses the resources available to help successfully launch the product.

C. An influential individual who can take an invention to market, often by financing the development, production and diffusion of a product into the marketplace.

D. A specific person within the target market at which a product or the marketing message of a product is aimed at.

20. **Figure 6** shows the Ford Mustang, which was first manufactured in 1965 is still being manufactured in 2019. The engineers of the new car have designed the sound of the engine to replicate the original model.

Figure 6: The Ford Mustang



[Source: adapted image (cropped and recoloured) “1965 Ford Mustang 2D Hardtop Front” by Kroelleboelle (en.wikipedia.org). Under copyright and creative commons licence 3.0 (https://creativecommons.org/licenses/by-sa/3.0/deed.en) and adapted image (cropped, blurred and recoloured) “2018 Ford Mustang GT 5.0 Front” by Vauxford (en.wikipedia.org). Under copyright and creative commons licence 4.0 (https://creativecommons.org/licenses/by-sa/4.0/deed.en)]

What is this an example of?

A. Practical function

B. Psychological function

C. Retro styling

D. Conflict and compromise

21. What type of design contains features that are recognized as essential by a majority of manufacturers and purchasers?

A. Obsolescent design

B. Mass produced design

C. Omnipresent design

D. Dominant design

22. Which members of a user-centred design (UCD) team study the customs of people and cultures to provide a detailed description of social life and culture belonging to a particular society?

A. Anthropologists

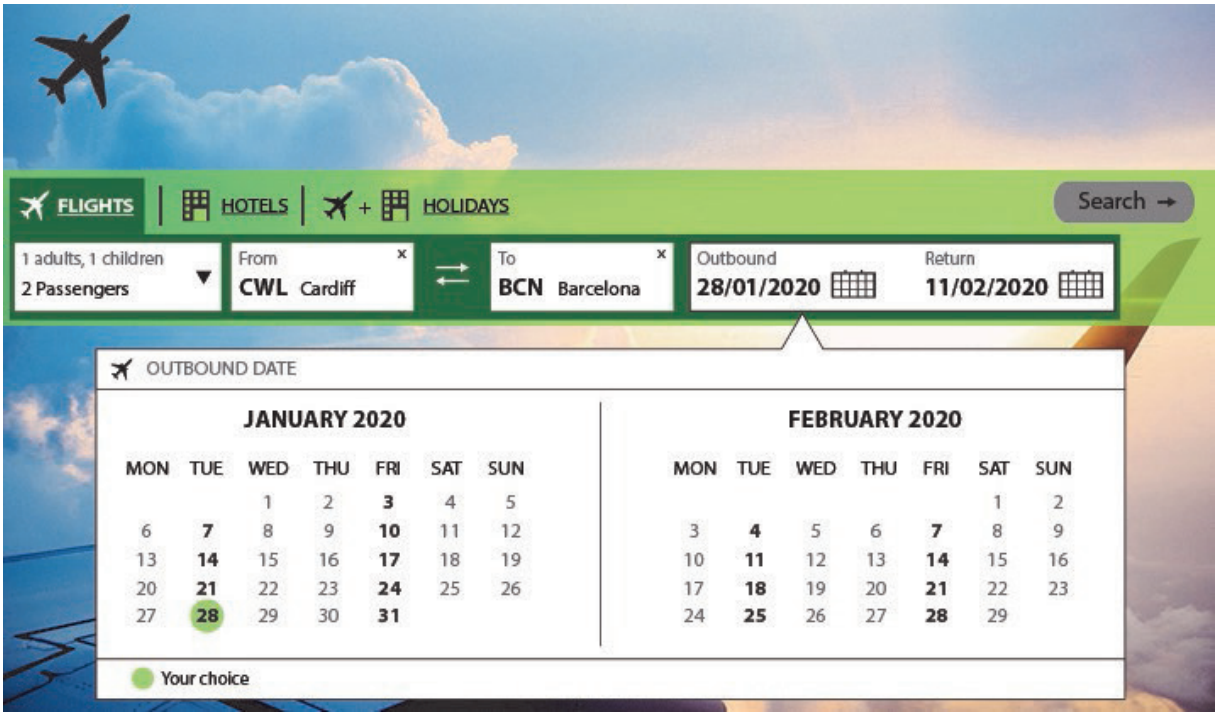
B. Ethnographers

C. Psychologist

D. Advertising Executive

23. **Figure 7** shows a screenshot of an online flight booking website. When selecting flights, users can only select valid dates from the drop down calendar.

Figure 7: An online flight booking website



Which characteristic of a good user-product interface is this an example of?

A. Visibility

B. Mapping

C. Affordance

D. Constraint

24. Which of the following research methods in user-centred design (UCD) gathers large quantities of data and groups them based on their natural relationships?

A. Usability testing sessions

B. Focus groups

C. Affinity diagramming

D. Field research

25. **Figure 8** shows a Fairphone 3. The company uses sustainable practices to produce a phone in an ethical way. Focusing on eliminating child labour and providing fair wages for the workers.

Figure 8: The Fairphone 3

[Source: with kind permission from Fairphone]

Which part of triple bottom line sustainability does this specifically relate to?

A. Environmental

B. Economic

C. Social

D. Efficient

26. Which of the following can be used by governments to drive sustainable innovation?

I. Subsidies for public transport

II. Education

III. Regulation of fossil fuel use

A. I and II

B. I and III

C. II and III

D. I, II and III

27. In some countries, governments require manufacturers to cover the costs of collecting and recycling their products. This is an example of…

A. Take back legislation

B. Lifestyle consumerism

C. Eco-labelling

D. Re-engineering

28. Everyone involved in making, selling, buying or handling a product takes responsibility for minimizing the environmental impact throughout its life cycle. What is the name given to this type of sustainable development?

A. Triple bottom line sustainability

B. Product stewardship

C. Decoupling

D. Sustainability reporting

29. When a new product is launched in a supermarket, free samples are given out to promote it to customers who wouldn't normally buy the product, see **Figure 9**.

Figure 9: Free samples of a new product given to customers

[Source: https://unsplash.com]

What promotional strategy is this an example of?

A. Personal selling

B. Perceptual mapping

C. Celebrity endorsement

D. Advertising

30. Which of the following corporate strategies presents the least risk for a company?

A. Product development

B. Product diversification

C. Market penetration

D. Market development

31. Which price setting strategy focuses on measuring all of the costs involved in producing a given product and adding a profit margin?

A. Demand pricing

B. Cost-plus pricing

C. Product line pricing

D. Psychological pricing

32. **Figure 10** shows the symbol used to indicate a company has ISO 9001 certification. This guarantees the company considers the quality of raw materials, assemblies, products and components, services related to production, and management and inspection processes.

Figure 10: The symbol used to indicate a company has ISO 9001 certification

Removed for copyright reasons

What is this symbol an example of?

A. Quality assurance

B. Quality control

C. Lean production

D. Kaizen

33. Which of the following costs are lower in just in time (JIT) production?

I. Storage for finished products

II. Marketing costs

III. Labour costs

A. I and II

B. I and III

C. II and III

D. I, II and III

34. Which of the following best describes lead time?

A. The time for a product to be ordered.

B. The time for a product to be manufactured.

C. The time for delivery of a finished product.

D. The time from order of a product to delivery to the customer.

35. Which of the following lean production concepts values the opinions and suggestions of the workforce in order to ensure continuous improvement?

A. Product family

B. Kaizen

C. Workflow analysis

D. Value stream mapping

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

Puma's new shoe packaging changes the idea of the shoebox by wrapping footwear in a simple cardboard structure held in place by a reusable bag.

Puma's new design of shoe box is known as "Clever Little Bag" and was designed by a company led by designer Yves Béhar, see **Figure 11**.

Figure 11: An example of the Puma Clever Little Bag

[Source: images and details with kind permission from fuseproject]

Clever Little Bag contains 65 % less cardboard, by using a bag made of recycled plastic as the outer layer that holds the inner cardboard structure and has no top/lid.

The bag's handles slip through a hole at one end of the inner box, securing the bag to the cardboard and providing a plastic bag-free way to carry the shoes.

Due to using 8500 fewer tons of paper, and the new packaging's lighter weight, Puma expects to cut carbon dioxide emissions by 10 000 tons per year and water, energy and diesel use by 60 %. That works out to 1 million litres of water, 20 million megajoules of electricity, 1 million litres of fuel oil and 500 000 litres of diesel, see **Figure 12**.

Figure 12: A graphic illustrating the manufacturing process of Clever Little Bags

[Source: images and details with kind permission from fuseproject]

36. The Clever Little Bag is designed in a way where there is no need for the top of the box to hold in the shoes. Which waste mitigation strategy is this an example of?

A. Re-use

B. Recycle

C. Dematerialization

D. Recondition

37. Which modelling technique would the designer use to test whether the cardboard insert can be removed from the plastic sleeve easily?

A. Graphical modelling

B. Surface modelling

C. Physical modelling

D. Solid modelling

38. The Clever Little Bag is sent to retailers as a flat pack for assembly using slots and tabs. Which joining technique is this an example of?

A. Temporary joining

B. Permanent joining

C. Adhering

D. Fusing

39. Which of the following was most likely a driver for invention for the Clever Little Bag?

A. Technical curiosity

B. Desire to make money

C. Scientific curiosity

D. Constructive discontent

40. The Clever Little Bag allows Puma to promote their commitment to sustainable practices. Which corporate strategy is this an example of?

A. Market development

B. Corporate social responsibility

C. Pioneering strategy

D. Imitative strategy