Diploma Programme
Programme du diplôme
Programa del Diploma

Design technology
Higher level
Paper 1

Wednesday 8 November 2017 (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]**.

8817 – 6201

21 pages

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 of the following terms best describes being aware of what is happening around you?

A. Psychological understanding

B. Telepathy

C. Alertness

D. Perception

3. **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

Removed for copyright reasons

What waste mitigation strategy is this an example of?

A. Re-engineering

B. Re-use

C. Reconditioning

D. Dematerialization

4. Which of these is a non-renewable resource?

A. Geothermal

B. Biomass

C. Wind

D. Coal

5. 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

6. Which of the following are drivers for green design?

I. Cheap set up costs

II. Consumer pressure

III. Government legislation

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

7. Which of these contributes to a product's embodied energy?

A. Initial use

B. Disposal

C. Assembly

D. Disassembly

8. What type of design and manufacture mimics biological processes?

A. Cradle to grave design

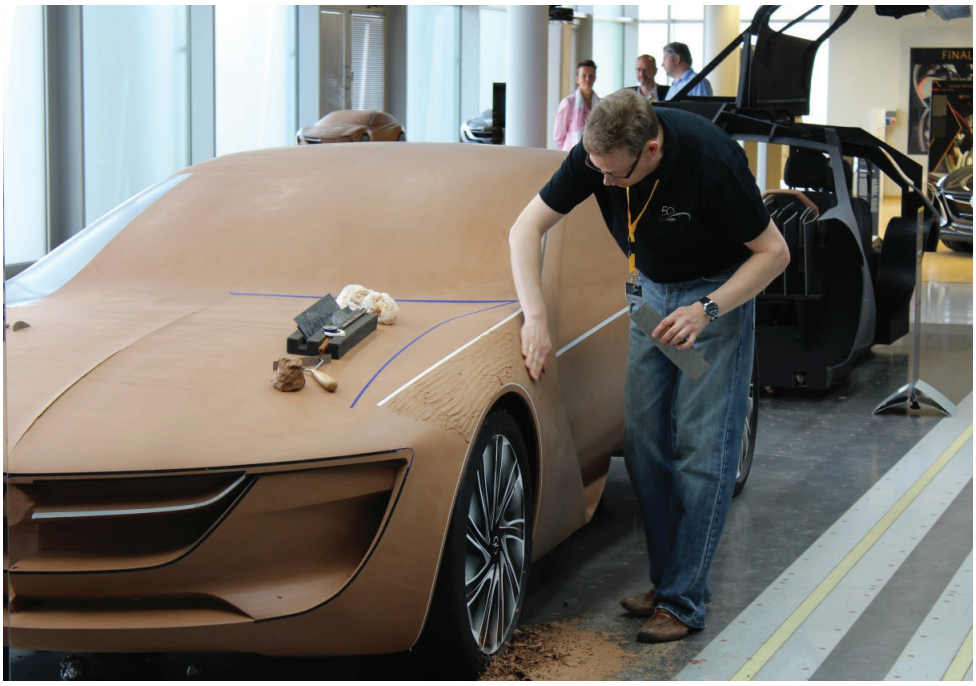
B. Sustainable design

C. Green design

D. Cradle to cradle design

9. **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, 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

10. What is an advantage of rapid prototyping for the designer?

A. It allows models to be made that record data

B. It allows designers to simulate stress within parts

C. It allows models to be made quickly for ergonomic testing

D. It allows for feedback via a sense of touch

11. **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

12. Photochromic materials change in response to what stimulus?

A. Heat

B. Light

C. Electric current

D. Pressure

13. What type of tree is considered “leaf losing”?

A. Coniferous

B. Softwood

C. Deciduous

D. Spruce

14. What material would be used in the compression moulding process?

A. Polyvinyl chloride (PVC)

B. Carbon fibre

C. Acrylonitrile butadiene styrene (ABS)

D. Urea-formaldehyde

15. What best describes a second generation robot?

A. A robot that works completely autonomously

B. A robot that has sensors allowing it to adapt to changes in its environment

C. A robot that has to be constantly supervised when in use

D. A robot that can only carry out a single task

16. Which type of glass would be used when constructing a car windscreen?

A. Toughened glass

B. Soda glass

C. Borosilicate glass

D. Laminated glass

17. **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

18. When does an invention become an innovation?

A. When it has been protected by copyright

B. When it is first manufactured

C. When it is the first to market

D. When it diffuses into the market

19. Rogers identifies five characteristics that impact on consumer adoption of an innovation. Which of the following terms best describes Rogers' characteristic of relative advantage?

A. Increased effectiveness of a new product over an existing one

B. The level of compatibility that an innovation has to be assimilated into an individual's life

C. If the innovation is perceived as complicated or difficult to use, an individual is unlikely to adopt it

D. When it is a success in the market

20. **Figure 6** shows 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

21. 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

22. **Figure 7** shows a range of Global knives which have a textured surface on the handle.

Figure 7: Global knives

[Source: I. Grunwerg Ltd]

Which of the following terms best describes pleasure derived from the feel or touch of a product?

A. Socio-pleasure

B. Physio-pleasure

C. Ideo-pleasure

D. Psycho-pleasure

23. Jeffrey Rubin describes four usability objectives. Which of the following terms best fits the usability objective of designing a product that enables a user to achieve their goals?

A. Usefulness

B. Effectiveness

C. Learnability

D. Attitude

24. **Figure 8** shows a Tesla Powerwall. It is a home battery that charges using electricity generated from solar panels or when utility rates are low, and powers users' homes in the evening.

Figure 8: Tesla Powerwall

Removed for copyright reasons

The Tesla Powerwall is an example of how individual action contributes towards energy sustainability.

Which of the following terms best describes this?

A. Macro energy sustainability

B. Energy demand

C. Micro energy sustainability

D. Decoupling

25. Organic cotton uses non-genetically modified plants and is grown without the use of any pesticides. Clothing manufacturers can be involved at the growth stage of this material, right through to seeing it made into products given to retailers.

What is this an example of?

A. Sustainability reporting

B. Decoupling

C. Product stewardship

D. Eco-labelling

26. Biopol is a plastic manufactured from plant materials. It can be placed in landfill or composted at the end of its useful life and will decompose harmlessly far quicker than conventional plastic.

Which of Datschefski's principles of sustainable design does this satisfy?

A. Solar

B. Efficient

C. Social

D. Cyclic

27. Which type of consumer would be most likely to join a protest by an environmental pressure group?

A. Eco-warrior

B. Eco-phobe

C. Eco-fan

D. Eco-champion

28. **Figure 9** shows related products manufactured by a single company, Maxwell Technologies, Inc.

Figure 9: Maxwell Technologies products

[Source: Maxwell Technologies, Inc]

Which of the following best describes a group of products that have common parts and assemblies, are branded consistently and share aesthetic characteristics?

A. Product line

B. Product family

C. Product range

D. Product group

29. Brand identity can be changed to appeal to different market segments by considering which of the following?

I. Geographical location

II. Gender

III. Culture

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

30. Which term describes a price setting strategy of adding expenses involved in production, design and distribution as well as the desired profit?

A. Psychological pricing

B. Product line pricing

C. Cost-plus pricing

D. Demand pricing

31. Which is true of the following statements regarding corporate social responsibility (CSR)?

I. CSR can be defined as the belief that a company needs to be responsible for its actions

II. CSR only considers the economic impact of its business model

III. CSR is often published as part of a company's corporate objectives

A. I and II

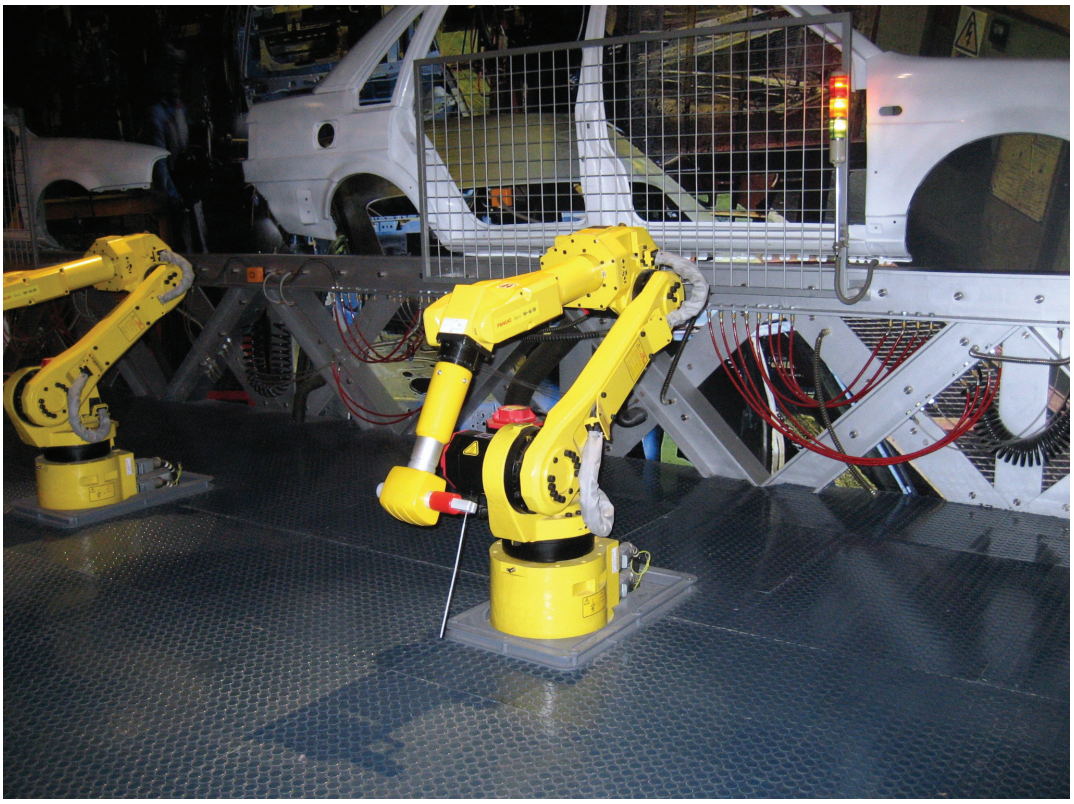
B. I and III

C. II and III

D. I, II and III

32. **Figure 10** shows computer integrated manufacturing (CIM).

Figure 10: Computer integrated manufacturing



[Source: https://commons.wikimedia.org/wiki/File:Robot_worker.jpg
Mountain at Shanghai Science and Technology Museum (Wikimedia Commons)]

CIM is a system that uses computers to integrate production, business and manufacturing in order to create more efficient production lines.

Which of the following are elements of CIM?

I. Extraction of raw materials

II. Tracking of financial resources

III. Manufacturing final product

A. I and II

B. I and III

C. II and III

D. I, II and III

33. Which of the following terms best describes the most efficient way of designing and producing a product from the manufacturer's point of view?

A. Cost effectiveness

B. Target costs

C. Cost analysis

D. Cost assurance

34. Which principle of lean production considers sequence, tools and worker movement in manufacture?

A. Value stream mapping

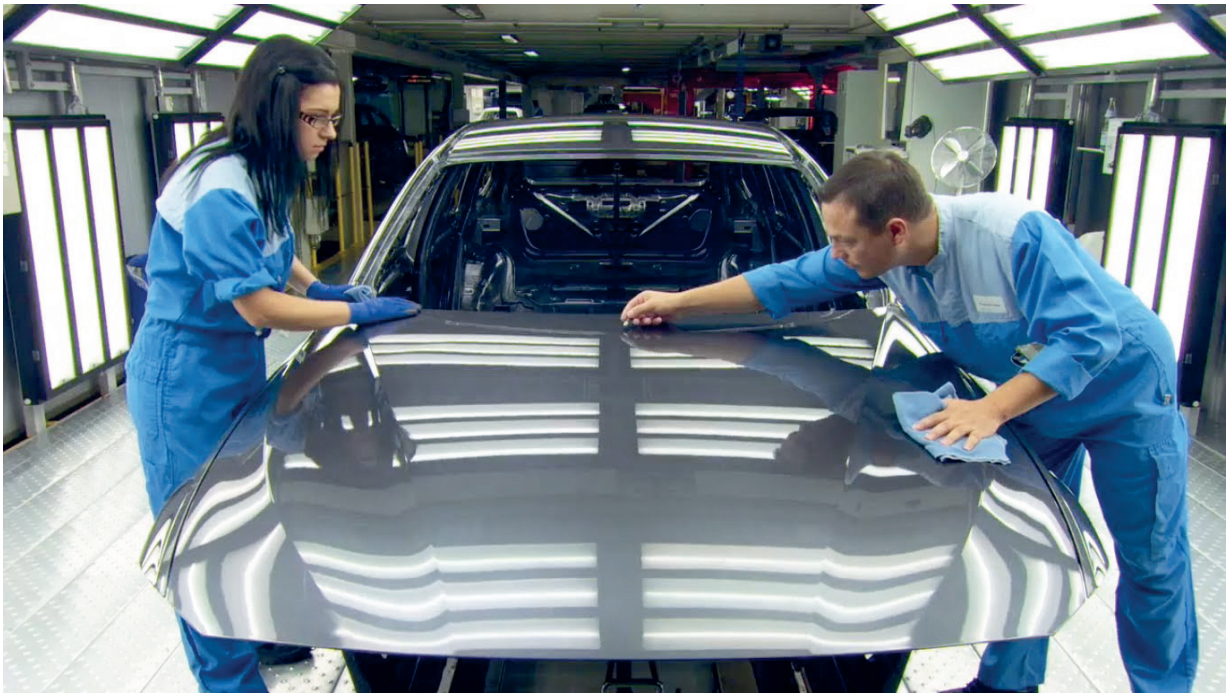
B. Lead time

C. Kaizen

D. Workflow analysis

35. **Figure 11** shows quality control taking place in a car production plant.

Figure 11: Car production quality control



[Source: BMW AG]

Which one of the seven wastes does quality control help reduce?

A. Overproduction

B. Unnecessary inventory

C. Defects

D. Transporting

Questions 36 – 40 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 12 below shows the Konk in a number of applications.

Figure 13 shows where the Konk attaches to backpacks for easy carrying when not in use.

Figure 12: Fire insulator, stove/wok/grill, shovel, bucket sledge, hammock

Removed for copyright reasons

Figure 13: How the Konk attaches to a backpack

Removed for copyright reasons

36. 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

37. 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

38. What percentile range should the Konk be designed for?

A. 50th percentile

B. 5th percentile

C. 5th – 95th percentile

D. 95th percentile

39. 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 12**?

A. Scale model

B. Prototype

C. Mock-up

D. Instrumented model

40. Which strategy for user-centred design would be most beneficial whilst testing a prototype of the Konk?

A. Usability laboratory testing

B. Field research

C. Observation

D. Affinity diagramming