Diploma Programme
Programme du diplôme
Programa del Diploma

Design technology
Standard level
Paper 1

11 May 2023

Zone A afternoon | **Zone B** morning | **Zone C** 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]**.

2223 – 9236

13 pages

1. Advances in 3D printing have led to lighter and more aesthetic prosthetic products, see **Figure 1**.

Figure 1: A 3D printed prosthetic product

Which human factors were considered by the designer?

I. Physiological factors
II. Psychological factors
III. Aesthetic factors

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

2. A designer would label items by name using…

A. a ratio scale.

B. an ordinal scale.

C. a nominal scale.

D. an interval scale.

3. Which of the following can be used to ensure a worker remains alert?

A. Keeping the duration of tasks short

B. Providing dim light in the working environment

C. Removing all background sounds in the room

D. Providing repetitive tasks

4. The company *Remade* collects old smartphones and rebuilds them so they perform as new before reselling them, see **Figure 2**.

Figure 2: Rebuilt smartphones

What waste mitigation strategy is being employed by the company?

A. Re-engineering

B. Recycling

C. Re-using

D. Reconditioning

5. Natural resources that have been identified in terms of both quantity **and** quality are known as…

A. reserves.

B. depleted reserves.

C. resources.

D. depleted resources.

6. Which of the following are reasons why radical solutions for waste mitigation are unlikely to be adopted by organizations?

I. Success is not guaranteed

II. Requires considerable research and development

III. Time consuming

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

7. Reducing the total amount of material and energy used in the production of a product is called…

A. end-of-pipe.

B. minimization.

C. dematerialization.

D. quantification.

8. Which of the following lists only contains renewable energy sources?

A. Geothermal, hydro, oil, tidal, wind

B. Coal, geothermal, hydro, tidal, wind

C. Geothermal, hydro, solar, tidal, wind

D. Gas, geothermal, hydro, solar, tidal

9. Which economic model utilizes its resources so they remain in use for as long as possible?

A. Linear economy

B. Zero waste economy

C. Eco-friendly economy

D. Circular economy

10. The Simodont® Dental Trainer is a device used by university students to practice surgery skills during their dentistry training, see **Figure 3**. The device uses sensors that measure forces exerted by the user on the interface and recreates a sense of touch.

Figure 3: The Simodont® Dental Trainer

What name is given to this type of technology?

A. Motion capture

B. Virtual reality

C. Haptic technology

D. Augmented reality

11. Prototyping objects using plastic powder deposition is known as…

A. laminated object manufacturing (LOM).

B. fused deposition modelling (FDM).

C. stereolithography.

D. selective laser sintering (SLS).

12. What best describes the term *digital human*?

A. A graphical model of the mechanical and biological aspects of the human body

B. A visual model of the mechanical and biological aspects of the human body

C. A virtual model of the mechanical and biological aspects of the human body

D. A mathematical model of the mechanical and biological aspects of the human body

13. Which type of drawing shows how parts of a product fit together?

A. Annotated drawings

B. Assembly drawings

C. Part drawings

D. Detailed drawings

14. A material that generates electricity when it is compressed…

A. is electro-rheostatic

B. is piezo-electric

C. is thermos-electric

D. has shape memory

15. What best describes a composite material?

A. Two or more materials chemically combined together

B. Two or more materials separated to form a new material

C. Two or more constituent materials combined having different properties

D. Two or more materials combined having similar properties

16. Polyester fibre is used in the manufacturing of seatbelts in cars due to its high…

A. stiffness.

B. elasticity.

C. tensile strength.

D. viscosity.

17. Super alloys are used for medical implants.

Why are super alloys used for this purpose?

I. Surface stability

II. High corrosion resistance

III. Has thermal creep

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

18. Which of the following gives laminated veneer lumber (LVL) its strength?

I. The use of adhesives
II. The grains in the veneers lie in alternate directions
III. It is not affected by timber defects

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

19. Which property allows a material to be drawn into thin wires without breaking?

A. Plasticity

B. Elasticity

C. Ductility

D. Malleability

20. The process of drying wood naturally to reduce its moisture content is called…

A. vapourising.

B. equilibrium moisture content.

C. seasoning.

D. kilning.

21. **Figure 4** shows IKEA's flat-pack refugee shelter. The design was developed by the not-for-profit IKEA Foundation to provide a better shelter than the usual emergency tents used in crisis locations.

Figure 4: IKEA's flat-pack refugee shelter

What type of driver for invention motivated the IKEA Foundation to develop this shelter?

A. Desire for change

B. Desire to help others

C. Constructive discontent

D. Desire to promote the company's image

22. Which intellectual property (IP) practice is used to identify a service rather than a product?

A. Service identity

B. Service patent

C. Service mark (SM)

D. Service copyright

23. According to the categories of consumers, the individuals who are willing to take risk and be the first to adopt an innovation are known as…

A. laggards.

B. early majority.

C. innovators.

D. late majority.

24. Planned obsolescence is used to…

A. prevent radical changes in new products.

B. reduce the consumption of resources.

C. ensure new models of the product are sold.

D. prevent products from becoming iconic.

25. **Figure 5** shows the Silver Cross® Pram. It was first developed for the British Royal Family in 1877 and since then it has been chosen for royal babies. The Silver Cross® Pram is considered a classic design.

Figure 5: The Silver Cross® Pram

Removed for copyright reasons

What has contributed to the Silver Cross® Pram being considered as a classic design?

A. It is handmade and produced in limited edition only

B. It has a timeless appeal

C. It is very comfortable for babies

D. It is characterized by its luxurious design

26. What best describes ubiquitous design?

A. A product which is available in limited quantity

B. A product which is available for a specific period of time only

C. A product which is familiar and present everywhere

D. A product which is usually used by a specific group of people

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

Marco Maran's X3 Chair is elegant, flexible, strong and manufactured using innovative technologies, see **Figure 6**. The chair is widely used in restaurants due to its low price and its particular characteristics. The price is approximately US$50.

The seat and back of the chair is created by bio-injection moulding. The chair is manufactured from a clear polycarbonate called Desmopan®.

Desmopan® is a thermoplastic polyurethane elastomer which has the strength of polyurethane, but the characteristics of rubber. The geometric arrangement in the structure gives the chair a distinctive look, structural strength and performance characteristics that many consumers like.

Figure 6: The X3 Chair

[Source: Images with permission from Maxdesign.]

27. Why would designers use digital humans in the early design stages of the X3 Chair?

A. To reduce the need for physical prototyping

B. To assist the manufacturer in obtaining feedback about the comfort of the product

C. To evaluate performance of the product after it has been manufactured

D. To provide accurate data when testing the final prototype

28. Which production method would be used for the X3 Chair?

A. Batch production

B. One-off customization

C. Mass production

D. Mass customization

29. Which manufacturing method is most suitable for the seat and back of the X3 Chair?

A. Laminating

B. Moulding

C. Casting

D. Weaving

30. A company charges different prices for different models of the same product.

What is the business practice the company is applying?

A. Competitive pricing

B. Product versioning

C. Price variation

D. Product generations

References:

Figure 1 Anna Shvets / Pexels.

Figure 2 DariuszSankowski / Pixabay.

Figure 3 Images provided with permission from Nissin Dental Products B.V. / Nissin Inc.

Figure 6 Images with permission from Maxdesign.