Diploma Programme
Programme du diplôme
Programa del Diploma

Design technology
Standard level
Paper 1

Friday 13 November 2015 (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]**.

8815 – 6204

1. What would be a constraint on the design brief for a new car (automobile)?

A. Complies with relevant safety legislation

B. Is fuel-efficient

C. Is suitable for a wide target market

D. Is ergonomically designed

2. Which ideas generating technique focuses on the key features of a design?

A. Constructive discontent

B. Morphological synthesis

C. Attribute listing

D. Brainstorming

3. At what stage of the design cycle could an orthographic drawing be useful?

I. Researching

II. Developing solutions

III. Realizing solution

A. I and II

B. I and III

C. II and III

D. I, II and III

4. Why is the design cycle often seen as difficult to interpret?

A. Because it is sequential

B. Because it is iterative

C. Because it is linear

D. Because it has different stages

5. Which ideas generating technique requires teamwork?

A. Analogy

B. Adaptation

C. Brainstorming

D. Attribute listing

6. In which cycle(s) is the designer most influential?

	Design cycle	Product cycle
A.	No	No
B.	No	Yes
C.	Yes	No
D.	Yes	Yes

7. What is often **not** a characteristic of a lone inventor?

A. Business-like

B. Creative

C. Determined

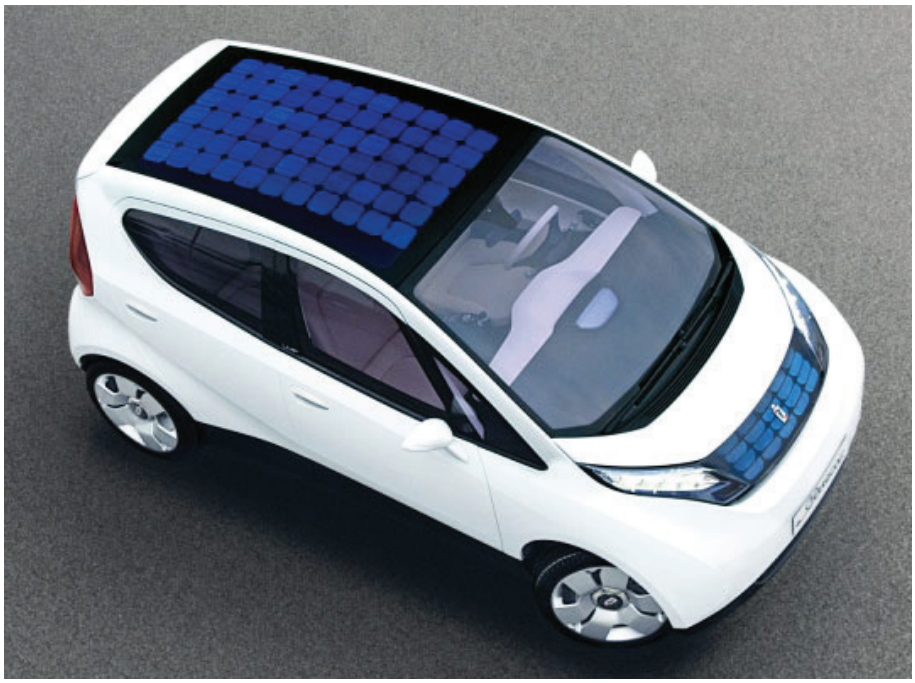
D. Tenacious

8. Which combination of manufacturer resistance and consumer resistance may make a “take back” policy for washing machines difficult to implement?

	Manufacturer resistance	Consumer resistance
A.	No	No
B.	No	Yes
C.	Yes	No
D.	Yes	Yes

9. **Figure 1** shows the prototype of a solar-powered electric car – the Blue car – that was developed collaboratively by Italian car designer Pininfarina and French battery manufacturer Bolloré. The Blue car has solar panels on its roof. It has a top speed of 80 mph and a range of 155 miles per charge. The prototype went into mass production and was available in Europe from 2010.

Figure 1: The Blue Car



[Source: Concept car designed and developed by Pininfarina. www.pininfarina.com.]

At what stage of its life cycle would life cycle analysis of the Blue car be likely to enable the greatest additional reduction in its environmental impact?

A. Production

B. Distribution

C. Use

D. Disposal

10. **Figure 2** shows ballpoint pens produced by injection moulding.

Figure 2: Ballpoint pens produced by injection moulding

[Source: "4 Bic Cristal pens and caps" by Carlos Delgado. Licensed under CC BY-SA 3.0 via Wikimedia Commons - https://commons.wikimedia.org/wiki/File:4_Bic_Cristal_pens_and_caps.jpg#/media/File:4_Bic_Cristal_pens_and_caps.jpg]

Which considerations would have been important in the design of the product shown in **Figure 2**?

I. Design for materials

II. Design for process

III. Design for disassembly

A. I and II

B. I and III

C. II and III

D. I, II and III

11. Which combination of “environmental impact” and “volume of production” characterizes a product category that would benefit most from life cycle analysis?

	Environmental impact	Volume of production
A.	Low	High
B.	Low	Low
C.	High	High
D.	High	Low

12. What is defined as: “a mixture of two or more substances with one acting as the matrix or glue”?

A. Compound

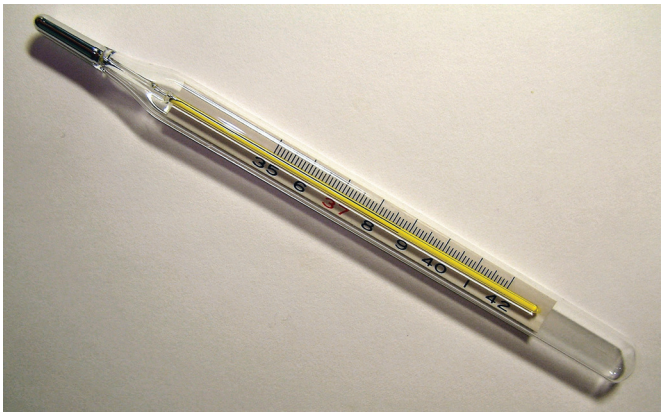
B. Molecule

C. Alloy

D. Composite

13. Which is the most important property in relation to the selection of the liquid for use in a liquid-in-glass thermometer (**Figure 3**)?

Figure 3: Liquid-in-glass thermometer



[Source: “Clinical thermometer 38.7” by Menchi – “Clinical thermometer 38.7” by Menchi - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons - https://commons.wikimedia.org/wiki/File:Clinical_thermometer_38.7.JPG#/media/File:Clinical_thermometer_38.7.JPG]

A. High thermal expansivity

B. High thermal conductivity

C. High electrical resistivity

D. High electrical conductivity

14. What is an advantage of using softwood timber, rather than metal or plastic, as the material for the replacement window frames of a house?

A. Cheaper

B. Easy to adapt on-site

C. No finish required

D. Resistance to decay

15. What is responsible for metals being very good electrical and thermal conductors?

A. The sharing of electrons between atoms

B. The movement of free electrons

C. The release of an electric charge on impact

D. The molecules are not tightly packed

16. Which is the principal component of glass?

A. Silicon dioxide

B. Lead oxide

C. Sodium oxide

D. Calcium oxide

17. Which plastic material would be most suitable for making foam cushions?

A. Polypropene

B. Polyethene

C. Polyurethane

D. Polyvinyl chloride

18. What explains the effect of creep in a plastic material under a heavy load?

A. Molecular chains remain static

B. A 3D molecular structure is formed

C. Secondary bonds weaken

D. Primary bonds weaken

19. Which property of a material would enable it to be used in the development of a sensor for an airbag in a car?

A. Electro-rheostatic

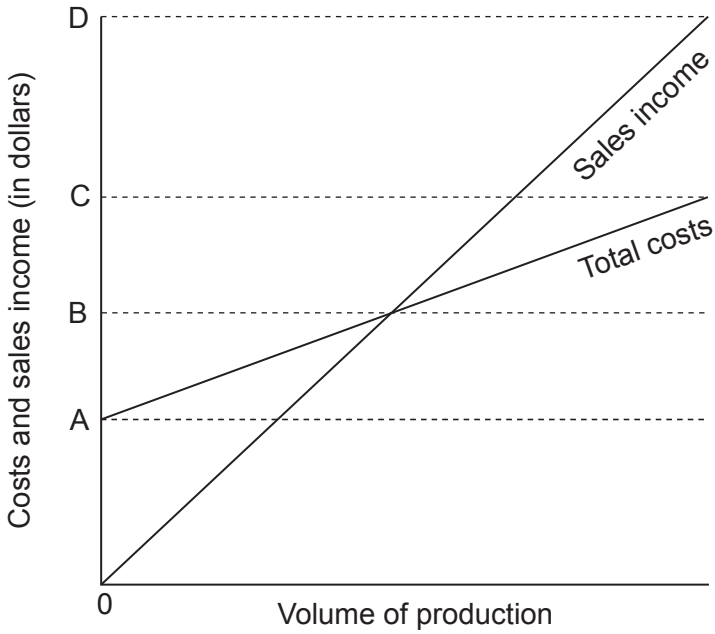
B. Magneto-rheostatic

C. Piezoelectric

D. Shape memory alloy

20. **Figure 4** shows a graph of costs and sales income (in dollars) against volume of production.

Figure 4: Costs and sales income (in dollars) against volume of production



What in **Figure 4** represents the fixed costs of developing a product?

A. A

B. B–A

C. C–B

D. D–C

21. The availability of which new sources of power in the Industrial Revolution led to the introduction of mechanization?

I. Water

II. Electricity

III. Steam

A. I and II

B. I and III

C. II and III

D. I, II and III

22. Which scale of production offers the most flexibility?

A. Craft

B. Mechanization

C. Automation

D. Mass customization

23. For which production approaches do customer requirements dominate?

	Mass customization	Craft production
A.	No	No
B.	No	Yes
C.	Yes	No
D.	Yes	Yes

24. What best describes the product life cycle for fashion and planned obsolescence?

	Fashion	Planned obsolescence
A.	Unpredictable product cycle	Unpredictable product cycle
B.	Unpredictable product cycle	Predictable product cycle
C.	Predictable product cycle	Unpredictable product cycle
D.	Predictable product cycle	Predictable product cycle

25. What best describes the individuals involved in a user trial and an expert appraisal?

	User trial	Expert appraisal
A.	Non-specialist	Non-specialist
B.	Non-specialist	Specialist
C.	Specialist	Non-specialist
D.	Specialist	Specialist

26. What is most likely to promote consumer confidence in relation to a purchasing decision?

A. Guarantee

B. Consumer association reports of similar products

C. Price

D. Value for money

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

The Nokia product portfolio comprises several product families (series), for example, the N series, the E series, the C series. **Figure 5** shows the N series product family.

Figure 5: Nokia N series product family

Please go to this link: http://www.brighthub.com/mobile/symbian-platform/reviews/77489.aspx

27. What is **not** true of a product family?

A. It is based on robust design

B. It is based on modular design

C. Different models are produced through radical design

D. It is cost-effective for a manufacturer as the benefits of investment in research and development costs are maximized

28. What are potential advantages of developing a product portfolio based on product families for manufacturers?

I. Reduced fixed costs

II. Reduced variable costs

III. Shorter time to market

A. I and II

B. I and III

C. II and III

D. I, II and III

29. Why is teamwork an important aspect of the development of hi-tech products, for example, mobile phones?

A. Hi-tech products are constantly updated to make them more commercially viable

B. Hi-tech products are extremely complex and need skills from different disciplines

C. Getting hi-tech products to market includes product launches and marketing

D. A lone inventor may lack the business acumen to push an invention through to innovation

30. If Nokia used just-in-time (JIT) rather than just-in-case (JIC) what would be increased?

A. Product reliability

B. Requirements for capital investment

C. Issues relating to stock control

D. Efficiency of production