

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].

1.	Wha	t woul	d be a constraint on the design brief for a new car (automobile)?
	A.	Com	plies with relevant safety legislation
	B.	Is fue	el-efficient
	C.	ls su	itable for a wide target market
	D.	Is er	gonomically designed
2.	Whic	h idea	as generating technique focuses on the key features of a design?
	A.	Cons	structive discontent
	B.	Morp	phological synthesis
	C.	Attrib	oute listing
	D.	Brair	nstorming
3.	At wi	nat sta	age of the design cycle could an orthographic drawing be useful?
		I.	Researching
		II.	Developing solutions
		III.	Realizing solution
	A.	I and	l II
	B.	I and	III
	C.	II and	d III
	D.	I, II a	and III
4.	Why	is the	design cycle often seen as difficult to interpret?
	A.	Beca	ause it is sequential
	B.	Beca	ause it is iterative
	C.	Beca	ause it is linear
	D.	Beca	ause 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.

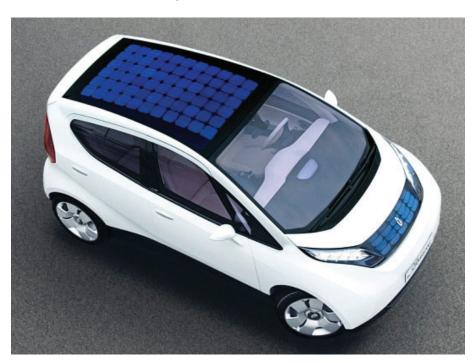


Figure 1: The Blue Car

[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.





[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?

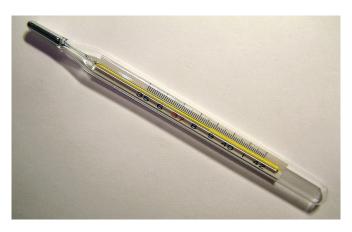
- I. Design for materials
- II. Design for process
- III. Design for disassembly
- A. I and II
- B. I and III
- C. II and III
- D. I, II and III

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.

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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

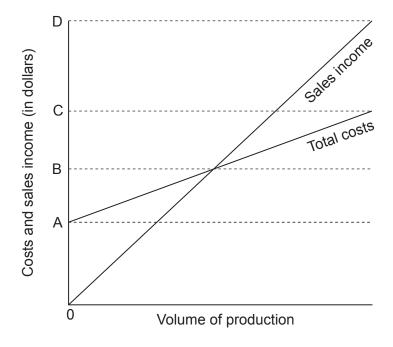
Which plastic material would be most suitable for making foam cushions?

17.

	A.	Polypropene
	В.	Polyethene
	C.	Polyurethane
	D.	Polyvinyl chloride
18.	Wha	t 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.		ch property of a material would enable it to be used in the development of a sensor for an ag 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. Land 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