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**DESIGN TECHNOLOGY**
**STANDARD LEVEL**
**PAPER 1**

Monday 7 November 2011 (afternoon)

45 minutes

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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.


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**1.** **Figure 1** shows designers working on a 1:4 scale clay model of a car.

**Figure 1: Designers working on a clay model of a car**

[Source: http://www.cardesignonline.com/design/modelling/clay-modelling.php]

What can be evaluated using a 1:4 scale clay model as part of the design development process?

A. Performance

B. Ergonomics

C. Safety

D. Aesthetics

**2.** Divergent thinking in the design process is

I. solution focused.
II. conceptual.
III. used to generate ideas.

A. I and II

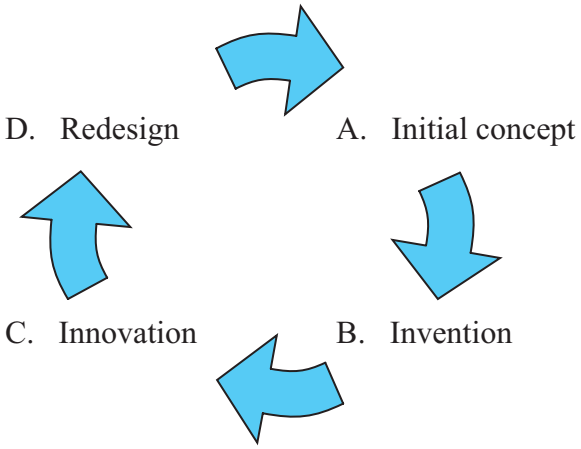
B. I and III

C. II and III

D. I, II and III

**3.** **Figure 2** shows four stages of innovation. At which stage of innovation would constructive discontent be an appropriate ideas generating strategy?

**Figure 2: Stages of innovation**




**4.** Which information would be part of the design specification but not the design brief?

A. Performance characteristics

B. Major design constraints

C. Target market

D. The criteria for success of the design

**5.** Which combination of product and market relates to the corporate strategy of market development?

| | Product | Market |
|---|---|---|
| A. | New | New |
| B. | New | Old |
| C. | Old | New |
| D. | Old | Old |

**6.** Which descriptors apply to both the mature and the late stage of the product cycle?

I. Gained acceptance

II. Diffused into the marketplace

III. Selling well

A. I and II

B. I and III

C. II and III

D. I, II and III

**7.** The Global Eco-labelling Network (GEN) represents eco-labelling programmes from different countries. Which aspects of GEN's work are most useful in the short-term to companies who export products?

I. GEN promotes the standardization of eco-labelling programmes.

II. GEN provides information about eco-labelling standards from different countries.

III. GEN participates in international conferences promoting eco-labelling.

A. I and II

B. I and III

C. II and III

D. I, II and III

**8.** **Figure 3** shows a Kodak FunSaver disposable camera. Which aspect of the design of the FunSaver camera would promote reuse?

**Figure 3: Kodak FunSaver disposable camera**


[Source: http://store.kodak.com/store/ekconsus/en_US/pd/FUN_SAVER_Camera/productID.164407600; used with permission]

A. Increasing the product life cycle of the FunSaver camera

B. Increasing the number of parts made from recycled material

C. The casing of the FunSaver camera can be opened using a special tool so that the removed parts are not damaged

D. Reducing the material content used in the manufacturing process

**9.** **Figure 4** shows the Grigoros Kayak shoe designed by Nike for the Beijing Olympics.

Content removed for copyright reasons

Which features of the design contribute most to ease of recycling?

I. No adhesives are used in construction of the shoe

II. Minimal tooling required for production

III. Made of one material (rubber)

A. I and II

B. I and III

C. II and III

D. I, II and III

**10.** Which green design objective relates to "take back" legislation for car batteries?

A. Taking full account of the effects of the disposal of the product

B. Increasing efficiency in the use of materials

C. Ensuring that the instructions encourage efficient use

D. Ensuring that the product functions efficiently throughout its product life cycle

**11.** Which is the major environmental consideration in the life cycle analysis of a wind turbine?

A. Water pollution

B. Soil pollution

C. Air pollution

D. Noise pollution

**12.** Which material group can be divided into "ferrous" and "non-ferrous"?

A. Metal

B. Ceramic

C. Timber

D. Textile

**13.** Which process results in small grain size in a metal?

A. Heat treatment after solidification

B. Selective cooling

C. Slow cooling

D. Rapid cooling

**14.** Which material would be most useful for spectacle (eye-glass) frames?

A. Magneto-rheostatic

B. Electro-rheostatic

C. Piezoelectric

D. Shape memory alloy

**15.** Which combination of bond strength relates to a thermoplastic material?

| | Bonds within the linear chains | Bonds between the linear chains |
|---|---|---|
| A. | Weak | Weak |
| B. | Weak | Strong |
| C. | Strong | Weak |
| D. | Strong | Strong |

**16.** Why is softwood timber usually cheaper than hardwood timber?

A. It only grows in temperate regions

B. It grows quicker

C. It is more difficult to work with

D. There is less demand for it

**17.** Which property makes glass bricks suitable for the interior wall of a house?

A. Brittleness

B. Thermal conductivity

C. Resistance to tensile forces

D. Resistance to compressive forces

**18.** Which type of fastener is shown in **Figure 5**?

**Figure 5: A type of fastener**

Image by Three-quarter-ten.

A. Screw

B. Bolt

C. Nut

D. Rivet

**19.** What is achieved through automation?

| | Precision | Price |
|---|---|---|
| A. | Low | Low |
| B. | Low | High |
| C. | High | Low |
| D. | High | High |

**20.** The Terracotta Army is a collection of approximately 8000 full-sized clay soldiers and horses produced in about 210 BCE. The various body parts were manufactured in different workshops.

**Figure 6: Terracotta army soldiers**

[Source: http://en.wikipedia.org/wiki/File:Soldier_Horse.JPG
Created by Robin Chen.]

Which production process was used to make the various body parts for the Terracotta Army?

A. Craft production

B. Assembly line production

C. One-off production

D. Mass customisation production

**21.** What is high for craft production?

A. Productivity

B. Labour costs

C. Break-even point

D. Fixed costs

**22.** What is likely to be a result from applying life cycle analysis to a product?

| | Product modification | Production process modification |
|---|---|---|
| A. | No | No |
| B. | No | Yes |
| C. | Yes | No |
| D. | Yes | Yes |

**23.** Which product would be designed to ensure that it can be used by the 5$^{th}$ percentile of an adult population?

A. The width of a cinema seat

B. Position of a light switch on a wall

C. The height of a door

D. The length of a bed

**24.** Which product has been made obsolete as a result of new technologies?

A. Typewriter

B. iPod

C. Refrigerator

D. Car

**25.** **Figure 7** shows children's building bricks made of thermoplastic. The building bricks are low cost/high volume products. It is very important that each building brick is made to a precise specification so that they can fit together in a variety of ways. Which combination of evaluation strategies will result in a product which meets its specification?

**Figure 7: Lego® bricks**

[Source: http://en.wikipedia.org/wiki/File:Lego_Color_Bricks.jpg
Created by Alan Chia.]

| | Quality control | Quality assurance |
|---|---|---|
| A. | No | No |
| B. | No | Yes |
| C. | Yes | No |
| D. | Yes | Yes |

**26.** **Figure 8** shows a cycle helmet. Which strategy would be used to evaluate the cycle helmet for safety?

**Figure 8: Cycle helmet**

[Source: http://en.wikipedia.org/wiki/File:Bicyclehelmet_da_060713.jpg
Created by: Jorgen Larsen]

A. User research

B. User trial

C. Performance test

D. Expert appraisal

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

**Figure 9** and **Figure 10** show devices called "cat's eyes" which are fixed into road surfaces to improve safety. A cat's eye comprises four self-cleaning glass and metal reflective beads (see **Figure 11**) mounted in a rubber stud (see **Figure 12**). Most cat's eyes are white and found in the centre of roads. Other colours are now available, *e.g.* red cat's eyes are used to indicate hard shoulders, amber ones to indicate central reservations and green ones to indicate junctions. As part of the design development process, 50 cat's eyes were installed in a stretch of road where previously a number of accidents had occurred.

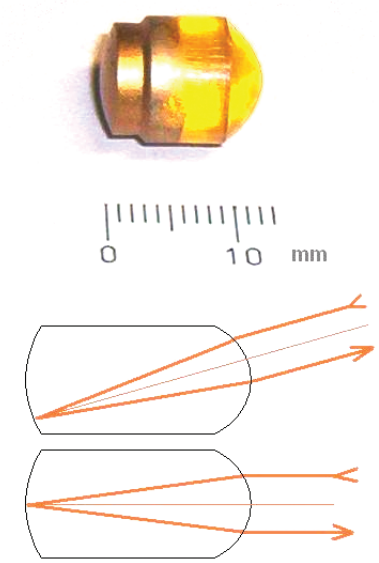
**Figure 9: Cat's eye in road**

[Source: http://en.wikipedia.org/wiki/File:LIGHTDOME.JPG
Created by: ELIOT2000.]

**Figure 10: Cat's eye**

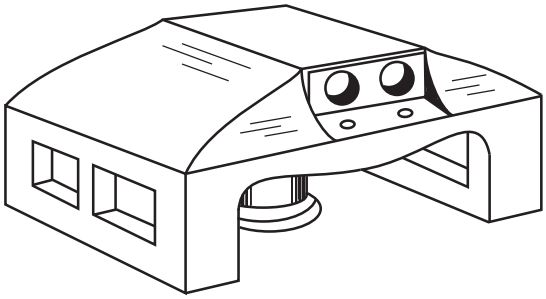
[Source: http://en.wikipedia.org/wiki/File:Catseye_closeup.jpg
Created by Wikipedia user Loganberry.]

**Figure 11: Reflective bead used in cat's eyes**




[Source: http://en.wikipedia.org/wiki/File:Katzenauge2.jpg
Created by: Ulf Seifert]

**Figure 12: Structure of a cat's eye**



[Source: http://www.design-technology.info/inventors/page14.htm]
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**27.** Which ideas generating strategy are cat's eyes an example of?

A. Adaptation

B. Analogy

C. Attribute listing

D. Morphological synthesis

**28.** Which corporate strategy is producing cat's eyes in a range of colours an example of?

A. Market penetration

B. Market development

C. Product development

D. Diversification

**29.** Which combination of stiffness and toughness is relevant to the choice of the material that is used to hold the reflective glass beads?

| | **Stiffness** | **Toughness** |
|---|---|---|
| A. | Low | Low |
| B. | Low | High |
| C. | High | Low |
| D. | High | High |

**30.** Which strategy was used by the inventor to evaluate the cat's eyes in the design development process?

A. User trial

B. User research

C. Performance test

D. Field trial