



**DESIGN TECHNOLOGY
HIGHER LEVEL
PAPER 1**

Tuesday 3 November 2009 (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.

1. What is an example of convergent thinking?
 - A. Brainstorming
 - B. Adaptation
 - C. Analogy
 - D. Attribute listing

2. What is an advantage of using mathematical models?
 - A. Symbolic representation
 - B. Physical representation
 - C. Scale representation
 - D. Graphical representation

3. Which drawing technique demonstrates foreshortening?
 - A. Freehand
 - B. Isometric
 - C. Perspective
 - D. Orthographic

4. Which statement relates to innovation?
 - A. A novel idea
 - B. Diffusion into the market place
 - C. Incremental design
 - D. Constructive discontent

5. Which products are in the mature stage of their product life cycle?

- A. Solar panels
- B. Smart buildings
- C. Ballpoint pens
- D. Steam engines

6. Who would dislike discussing environmental protection?

- A. Eco-champion
- B. Eco-fan
- C. Eco-warrior
- D. Eco-phobe

7. What is a consideration of life cycle analysis?

- A. The effect a product has on the customer
- B. The design in relation to customer needs
- C. The effect a product has on the environment
- D. The predicted life span of a product

8. Which material can be easily and economically recycled?

- A. Nickel
- B. Thermoset plastic
- C. Superalloy
- D. Plywood

9. Which combination of properties is important in the design of a frying pan handle?

A.	Stiffness	Thermal expansivity
B.	Toughness	Thermal conductivity
C.	Toughness	Thermal expansivity
D.	Stiffness	Thermal conductivity

10. What is an alloy composed of?

- A. Only metals
- B. At least one metal
- C. Two or more substances
- D. Only ceramics

11. What is a characteristic of laminated wood?

- I. Uniform strength
 - II. Use of an adhesive
 - III. Resistant to decay
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

- 12.** What characteristic makes metal a good electrical conductor?
- A. Positively charged nuclei
 - B. Crystalline structure
 - C. Free electrons
 - D. Small grain size
- 13.** What is a composite made of?
- A. At least two materials of which one is metal
 - B. A mixture where one material acts as the matrix or glue
 - C. At least three different materials, one of which is glue
 - D. Two compatible materials
- 14.** Which manufacturing technique would be used to design for disassembly?
- A. Using adhesives
 - B. Using fasteners
 - C. Fusing
 - D. Stitching

15. Which product is least likely to be mass produced?

A. The Airbus A380



[Source: www.zdnet.com.au]

B. The Ford Model T



[Source: www.musclecarclub.com, reproduced with permission.]

C. iPod



Courtesy of Apple

D. Plastic cutlery



16. Which production system allows for variations on a basic product?

- A. Assembly line
- B. Computer-aided manufacturing
- C. Mass production
- D. Mass customization

17. Which cost is a major contribution to the final cost of a new wind turbine design?

- A. Advertising
- B. Materials
- C. Energy in manufacturing
- D. Research and development

18. Which design consideration does **not** apply to motorcycle helmets?

- A. Range of sizes
- B. Adjustability
- C. Suitable for 50th percentile
- D. Safety

19. Which combination of evaluation techniques would be a low cost strategy to obtain qualitative data?

A.	User research	User trial
B.	User research	Performance test
C.	Field trial	User trial
D.	Field trial	Performance test

20. What is an advantage of conducting a literature search for data collection?

- A. Data is difficult to obtain
- B. Data may come from many sources
- C. Data is always free
- D. Data is always reliable

- 21.** What is a disadvantage of large-scale electricity production?
- A. Allows distribution of electricity over a large area
 - B. Security of supply
 - C. High capital costs
 - D. Allows volume production
- 22.** What is a suitable location for solar cookers?
- A. Remote locations
 - B. In a restaurant
 - C. Urban areas
 - D. Where constant use is required
- 23.** What is a consideration of the increased use of nuclear power?
- A. Suitable for all locations
 - B. Power grid distribution
 - C. Short life cycle
 - D. Storage of waste
- 24.** What are the units for mass?
- A. N/m^2
 - B. kg
 - C. kg/m^2
 - D. m^2/N

25. What mechanical motion is used with this screwdriver?



- A. Torque
- B. Rotary
- C. Reciprocating
- D. Irregular

26. Which mechanism includes a linkage?

- A. TV remote control
- B. Water tap
- C. Foot operated rubbish bin
- D. Frying pan

27. Which of the following is an example of a third class lever?

A.



[Source: www.flyingfingers.com]

B.



[Source: Pearson Scott Foresman, donated to the Wikimedia Foundation]

C.



[Source: www.eleganzainternational.net]

D.



[Source: www.gettyimages.co.uk]

28. Why are plastic bottle caps standardized?

- A. To reduce fixed costs
- B. To reduce variable costs
- C. To limit design specifications
- D. To encourage recycling

29. Which products are most likely to be formed by a spray-up process?

- A. Pipes
- B. Oars
- C. Pleasure Boats
- D. Fishing rods

30. What is an advantage of die-casting?

- A. It is a clean technology
- B. It can be used for a wide range of alloys
- C. It has a high rate of production
- D. It has low tooling costs

31. How can water resources be **best** conserved in house design?

- I. Low flush toilets
 - II. Push taps (faucets) on hand basins
 - III. Water collection tanks
- A. I and II only
 - B. II only
 - C. III only
 - D. I, II and III

32. What makes a technology appropriate?
- A. High in capital costs
 - B. Uses renewable resources
 - C. Complex to maintain
 - D. Includes planned obsolescence
33. Why is it difficult for governments and manufacturers to agree on targets for sustainable development?
- A. Achieving imposed targets may reduce profits
 - B. Government is local and manufacturing is global
 - C. Manufacturing is important
 - D. Consumers determine the targets
34. Which recommendations would make a house more sustainable?
- I. Planting of trees and shrubs in an appropriate location
 - II. Installing daylighting
 - III. Installing water saving shower heads
- A. I and II only
 - B. II and III only
 - C. I and III only
 - D. I, II and III
35. What is **not** an advantage of using technology in an intelligent building?
- A. User productivity
 - B. Energy efficiency
 - C. Improved immediate surrounding environment
 - D. Healthy building environment

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Questions 36–40 relate to the following case study. Please read the case study carefully and answer the questions.

The Sydney Harbour Bridge is a steel arch bridge (Figure 1) across Sydney Harbour, carrying rail, vehicular, and pedestrian traffic between the north and south shores. In 1932, the average annual daily traffic was around 11,000 and now it is around 160,000 cars per day, causing a massive strain on the bridge capacity. The bridge's four original traffic lanes have been increased to eight to compensate for the extra cars.

The bridge deck portion of the highway is concrete and lies on steel beams that run along the length of the bridge. There are 58,000 tons of steel in the bridge, and the members are joined with approximately 6,000,000 rivets.

Figure 1: Sydney Harbour Bridge



[Source: www.commonswikimedia.org/wiki/file:SydneyHarbour]

36. What characteristic of steel makes it appropriate for use in the arch section of the bridge?

- I Compression
- II Tension
- III Torsion
- A. I only
- B. II only
- C. III only
- D. I and II only

37. Why were rivets used as the main joining technique for the bridge members?
- A. So it could be easily disassembled at a later date
 - B. Parts were preassembled and transported to the site
 - C. They are a form of permanent joint
 - D. They resist moisture and do not rust
38. What design decision could be taken to make the bridge more compatible with sustainable development?
- A. Widen the bridge to increase the number of car lanes
 - B. Narrow each car lane to make room for more
 - C. Construct an extra deck on the bridge
 - D. Increase the number of “bus only” lanes
39. What is the result of increasing the number of car lanes on the bridge without making modifications to the structure?

	Factor of safety	Normal maximum load
A.	Up	Down
B.	Down	Down
C.	Up	Up
D.	Down	Up

40. What is the result when external load is applied to the beams suspending the bridge deck?
- A. Plastic deformation
 - B. Elastic deformation
 - C. Elastic and plastic deformation
 - D. No deformation