

# **MARKSCHEME**

**November 2000**

**DESIGN TECHNOLOGY**

**Standard Level**

**Paper 3**

**Option A — Raw material to final product**

**A1. (a) Advantages:**

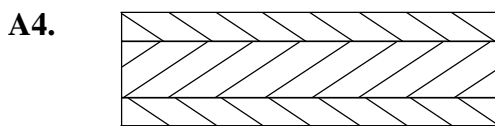
Transparent lid so can see food cooking without taking the lid off.  
Aesthetically more pleasing - modern looking.  
*([1] for either statement)*

(b) The cast-iron pot is heavier.  
The stainless steel pot is easier to clean.  
The stainless steel pot will not rust.  
*(maximum [2] for a comparison referring to **two** statements,  
[1] for reference to **one** type of pot only)*

(c) Wood and plastic do not have high thermal conductivity properties but metal does. *[1]*  
Therefore, during cooking, a metal handle would become very hot. *[1]*  
This would be dangerous for the user. *[1]*  
*(for maximum [3], reference must be made to thermal conductivity)*

**A2.** From the syllabus - either NMR brain scans **or** levitating trains, *i.e.* in a levitating train without a superconductor, the energy losses would be so great the system would be uneconomic.  
*([1] for an appropriate example)*

**A3.** The process of drying out timber after conversion. *[1]*



*([1] for showing odd number of plies or veneers, [1] for showing them glued together with the grains at right angles to each other)*

**A5.** It can be shaped to resemble natural food, *e.g.* chunks of beef or chicken thighs. *[1]*

**A6.** *([2] for each relevant point made comparing the two materials – maximum of [4])*  
Both materials have a high tensile strength but cotton absorbs water and is stronger when wet.  
Nylon is more elastic so stretches easily.  
Cotton is more resistant to high temperatures.  
Cotton can be attacked by microbes so is less durable than nylon.

**Option B — Products in context**

**B1.** (a) Utilisation and disposal.

*([1] for each)*

- (b) (i) using fewer parts means using fewer materials and less energy to make the machine *[1]*, hence conserving resources and causing less pollution *[1]*.
- (ii) using less water helps conserve water supplies *[1]* and conserves energy as there is less water to heat *[1]*.

**B2.** New technology may be developed to extract copper which is currently not available.

The market for copper may decrease, hence increasing the life-span of the resource.

More reserves of copper may be located around the globe which can be converted into a resource.

More recycling of copper may alleviate demand for copper mining.

*(two reasons suitably explained; [2] each)*

**B3.** The ‘expert’ may have biased views, or use a product in a different way from other ‘experts’.

*([1] for either statement)*

**B4.** A consistent supply of wind is required to work the turbines.

A large amount of space is required for the turbines.

The turbines may cause visual pollution of the landscape.

The turbines may cause noise pollution.

*(any two limitations suitably discussed [2] each; [1] for a statement rather than a balanced discussion)*

**Option C — Mechatronics**

- C1.** (a) Class 3. [1]
- (b) It is used to change the direction of movement of the component, *i.e.* acts as a link between the hand and the screw part of the corkscrew with the cork. [2]
- (c) moment = force  $\times$  distance, therefore,
- $$5 \times 200 = \text{force} \times 50 \quad [1]$$
- $$\text{Therefore force} = \frac{5 \times 200}{50} \quad [1]$$
- $$\text{Force required} = 20 \text{ N} \quad [1]$$
- C2.** (a) Light-dependent resistor (accept LDR). [1]
- (b) The voltage at point X changes. [1]  
It either rises as the light level falls **or** falls as the light level rises.  
([1] for either statement)
- (c) It sets the light/dark threshold. [1]
- C3.** It can drive a larger load. [1]  
It is less likely to slip. [1]
- C4.** There is insufficient negative feedback [1] leading to overshooting [1] and oscillation [1].

**Option D — Food technology**

- D1.** (a) The staff are not qualified chefs (cooks) and are trained to carry out specific tasks. For efficiency purposes the food products must all be the same. Consumers buy such food products regularly and know what to expect from a standardised product.  
*([2] for one reason suitably explained)*
- (b) Size; ingredients; shape; colour; texture; taste.  
*(any two aspects, [1] each)*
- (c) Advantages:  
Customers know what to expect; a limited menu, so high volumes and lower costs for the customer. Efficient production cuts waiting time.  
Easier quality control across a narrow range of products.  
*([1] for any one)*
- Disadvantages:  
Could get bored with the same menu each visit; an unbalanced diet.  
*([1] for either)*
- D2.** Taste - if the dough is pre-frozen, for example, and then baked.  
Texture - the length of time left in the oven or the temperature variation.  
*(any suitable explanation related to a specific organoleptic property, [2])*
- D3.** A generic term for substances which are added to foods during processing to modify properties. *[1]*
- D4.** Irradiation of food involves exposure of foods to radioactivity. *[1]*  
This kills bacteria completely.  
shelf-life of product can be extended massively, e.g. strawberries 40 days. *[1]*  
*([1] per distinct point up to a maximum of [2]).*
- D5.** It must be able to withstand very cold temperatures.  
It must be able to withstand very hot temperatures.  
It must protect the contents during distribution and storage.  
It must 'advertise' the product on display.  
It must be environmentally friendly for disposal.  
It must not affect the quality or taste of the food.  
It must be suitable for eating the food directly from the package. -  
It must contain instructions for storing and cooking.  
It must state the ingredients and quantities.  
*([1] each, maximum of [4])*

**Option E — Computer aided design and manufacturing**

- E1.** (a) Computer-integrated manufacturing. [1]
- (b) The efficiency of both batch production and mass production depends upon uniformity of product reducing the options for flexibility of type of output but increases productivity, *i.e.* economies of scale. [2]
- (c) Computer-integrated manufacturing allows greater flexibility as the production system is linked directly to sales and customers' requirements via the computer. [2]
- E2.** Change of skills.  
Cleaner environment.  
Reduction of hazardous activities.  
Reduced employment needs.  
Flexible working hours.  
Less social interaction.  
(*any one impact outlined in relation to CAD/CAM, [2]*)
- E3.** Advantages:  
Cheaper products owing to increased production  
More choice with greater amount of products and increased competition.  
Technically complex products available at a reasonable cost.  
Better quality control so better value-for-money.
- Disadvantages:  
The loss of craft skills and individuality of products.  
Increased consumerism - more waste and pollution.  
The products have less intrinsic value.  
(*[2] each for one advantage and one disadvantage, suitably described*)
- E4.** Wire frame modelling allows the user to see through the object. Solid modelling depicts only the outside surface.  
Solid modelling allows for changes of colour, tone and texture to the surface treatment but wire frame modelling is uniform.  
Solid modelling depicts a more realistic version of the actual object, while wire frame modelling is for structural purposes only.  
(*any two aspects suitably comparing the two techniques, [2] each*)

**Option F – Invention, innovation and design**

- F1.** (a) Smaller engines. **[1]**
- (b) Increased market for different sized cars, *e.g.* two-car families.  
Efficiency of production techniques caused cheaper cars, making them available to more people.  
Increased wealth of people in industrialised countries.  
In the 1960s, energy costs were low, so large cars were relatively cheap to run.  
(*one reason suitably outlined, [2]*)
- (c) Increased technological developments may produce designs to compete with petrol-driven cars.  
Change of attitude of the car-buying public towards more environmentally friendly transport.  
Spiralling costs of oil and oil-based products, making electricity a cheap energy source.  
New legislation forcing manufacturers to produce more environmentally-friendly vehicles.  
Households with more than one car may prefer to have one electric car and one petrol-driven car for longer journeys.  
Fashions may change and electric cars may become trendy.  
New legislation curbing pollution from petrol and diesel engines.  
(*any three reasons, [1] each*)
- F2.** Digital telephones allow for more interface with other communication devices.  
Digital signals are more reliable and have less interference.  
Digital systems have a far greater capacity for transmitting information.  
Digital telephones allow for speed dialling and faster connections.  
Within a frequency band width there is scope for greater capacity.  
(*any two advantages, [1] each*)
- F3.** The correct temperature for cooking the food at different parts of the cooking process is always maintained.  
Users do not need to know how to cook the food or for how long.  
Users do not need to monitor the cooking of the food.  
Ovens can more easily be used by users such as the infirm or disabled.  
(*any three points, [1] each*)
- F4.** More people are health-conscious and willing to take more exercise.  
Changes in attitude to environmental awareness means more people are cycling instead of going by car.  
Increased leisure time for adults.  
Greater interest in outdoor pursuits, and exploring the countryside.  
Mountain-biking is an increasingly popular sport.  
(*any two aspects, suitably discussed, [2] each*)

**Option G — Health by design**

- G1.** (a) 1987. [1]
- (b) Listeria and VTEC0157 are recorded in hundreds and Campylobacter and Salmonella in tens of thousands, so the scale of one graph would be huge and not allow for easy comparison of patterns. [1]
- (c) Since 1987 it has shown a decline [1], while all the others have increased [1].
- (d) The popularity of fast-food outlets [1] which sell an increasing amount of burgers [1].
- G2.** A technique for producing an image of a slice through the body. [1]
- G3.** Both plastic and cosmetic surgery involve the repairing or improving of damaged, diseased or unsatisfactorily shaped parts of the human body [1], but cosmetic surgery is carried out at the request of the individual for needs of personal satisfaction and self-esteem rather than medical need [1].
- G4.** Disposable, one-day or one-week contact lenses are available.  
Planned obsolescence means products are designed with a known, limited life-span.  
The benefit to the consumer is not having to clean and store conventional lenses each day.  
([1] per distinct point up to a maximum of [2])
- G5.** The possibility of contamination of the sample from poor packaging or environmental conditions.  
The time scale involved in obtaining results of the test and the inconvenience.  
The possibility of samples being mis-labelled and hence incorrect results for the patient.  
The possibility of biochemical changes occurring to the sample, affecting the result.  
(any **two** difficulties, suitably explained, [2] each)
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