

# **MARKSCHEME**

**May 2001**

**DESIGN TECHNOLOGY**

**Higher Level**

**Paper 3**

**Option D – Food technology**

- D1. (a)** [1] for identification of appropriate substrate  
Upper gastro-intestinal tract symptoms (nausea, vomiting).
- (b)** [1]  
2 hrs - 6 days (usually 12-36 hrs)
- (c)** up to [2] for appropriate suggestion  
Bacillus cereus [1] Fried rice [1]
- (d)** [1] for appropriate action and [1] for explanation  
Cook rice and eat immediately [1] so no time for growth of bacteria [1]  
Cook rice and store in fridge/freezer [1] so no bacterial growth [1]  
Cook rice in hygienic surrounding/personal hygiene [1] so no bacterial contamination [1]
- D2.** [2] for explanation  
Ability to compare food products, especially blended products e.g. Tea/wine [1]. Look holistically at product [1] and check that it meets the specification [1].  
Feedback from consumers [1] to inform product development [1].
- D3. (a)** [1] for definition to the effect below  
The formation of a gel e.g. with gelatin or by the heat treatment of starch.
- (b)** [2]  
Uncooked starch containing products have a gritty/not smooth texture [1]. Heating causes gelatinisation of starch and thickening of product and makes it smoother [1]. Resolves grittiness [1].
- D4.** [1] for named food, [1] for each named method up to [2 max], [1] for effect of each method on micro-organisms, [1] for effect of each method on storage properties and similarly [1] for each effect on nutritional properties of food. Arrangement in table not essential but would help student (and examiner).

Method	Effect on micro-organisms	Storage properties	Nutritional properties
Method A [1]	[1]	[1]	[1]
Method B [1]	[1]	[1]	[1]

e.g. fish

Method	Effect on micro-organisms	Storage properties	Nutritional properties
Freezing (-18 °C)	Water freezes and therefore unavailable. Enzyme activity stopped at low temperature.	Will store for 6-12 months	No effect

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

- E1. (a)** *[1] for definition to effect of*  
The ability to simulate a real situation on a screen and interact with it in a near natural way.
- (b)** *[2], [1] each for a distinct benefit.*  
Can view designs, *e.g.* buildings, before built *[1]*. Can project ideas in 3-D *[1]*.  
Consumer can see what design is likely to be like before spending money thus more cost-effective *[1]*.
- (c)** *[3], [1] per distinct reason*
- saves time
  - saves raw materials
  - saves energy
  - saves money

- E2. [2] for explanation**  
Spreadsheets can be used for numeric modelling and can enable a designer to do what-if type operations. Can ‘plug’ the equations into the spreadsheet and then change factors and see effect on material amounts, strength, *etc.*

- E3. (a)** *[1] for definition*  
that links design and manufacture to the point of sale/consumers.

- (b)** *[1] for advantage [1] for disadvantage*

**Advantages:**

Parts easily manufactured and changed.  
Less lead time, labour, waste.  
Better machine utilisation.  
Improved productivity and quality control.  
Greater consistency.  
Fewer errors.  
Higher quality finish.

**Disadvantages:**

High initial investment.  
Training issues.  
Staffing issues.  
Job losses.

**E4.** *[1] per distinct point up to a maximum of [8], [1] for balancing argument*

- not subject to strikes, hangovers, *etc.*
- loss of jobs for operatives.
- robots will repeat jobs infinitely without deterioration in quality.
- need to be supervised and controlled.
- humans can be isolated from air-borne dust and therefore reduce impact on health.
- air can be filtered before being circulated outside cutting area.
- high capital investment.
- reduced wage bill.
- 24 hour working possible.

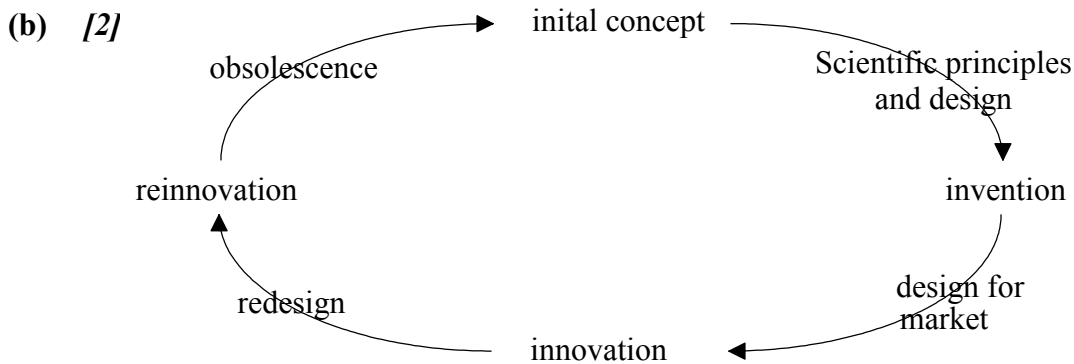
Ideally a student will consider advantages and disadvantages and balance pros and cons at the end.

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

- F1. (a)** [1] for identification of appropriate reason  
There is no line-of-sight connection to the orbiting satellite.
- (b)** [2] for appropriate explanation  
There are not enough tall buildings/high hills everywhere.  
In some places the density of users is so low that it is not economically viable.
- (c)** [1] for appropriate suggestion  
At sea or in other areas of world where no buildings, hills, e.g. desert. In remote areas for armies, etc.
- (d)** [2] for brief explanation of **how**  
Land-based mobile phone systems better solution smaller power packs, handsets can go into pocket or handbag, cheaper, etc. thus need satisfied and later introduction of satellite phone led to failure of innovation.

- F2. [2] for explanation**  
Flexibility i.e. different ratios possible [1]  
Effect – saves on effort going up hills [1]

- F3. (a)** [1] for definition to the effect below  
The process of discovering a principle, a technical advance in a particular field, often resulting in a novel product.



[1] for invention, innovation and redesign only  
[2] for everything and in right order

- F4.** *[1] per distinct lifestyle point and one mark for how it has impacted on oven design. Maximum of [9]*  
Candidate should identify lifestyle issues and then suggest how these have impacted on oven design.

Lifestyle factors - Employment status. Working parents, Leisure activities, Living arrangements, Health consciousness.

Impacts on oven design - fast cooking – microwave, fan-assisted ovens, combination ovens. Fuzzy logic to get more consistent results. Smaller ovens. Less materials, better insulation, Better energy efficiency. Popularity of eating out. Need for fast food. Popularity of cook-chill products. Skills factors. Oven no longer just domain of women, also teenagers, *etc.* less family meal occasions.

**Option G – Health by design**

- G1. (a) [1]**  
Myopia – rays of light from distant object are focussed in front of retina.
- (b) [1] for selecting correct lens**  
Concave lens – lens A
- (c) [2] for appropriate explanation**  
The lens opens out the rays [1] so they focus on the retina [1].
- (d) [2] for brief explanation**  
High refractive index glass can be thinner [1] but provide same degree of refraction of light [1].  
  
Therefore lenses weigh less [1] and are more comfortable [1].
- G2. [2] for explanation**  
No dangerous X-rays involved therefore hazards are reduced for patient and staff operating machines.
- G3. [1] for disadvantage from list below**
- more expensive
  - need to be sterilised
  - narrow range of shapes and sizes
  - not disposable
- G4. [2] for explanation to the effect below**  
filtration to remove particulate material  
then addition of chemicals to sterilise water kill micro-organisms
- G5. [1] per distinct point up to a maximum of [9]**
- A catalytic converter is a honeycomb structure to increase surface area coated with aluminium oxide, platinum or rhodium inside a stainless steel box. They catalyse carbon monoxide and hydrocarbons emissions to carbon dioxide and water which are safer. Nitrous oxides are converted to nitrogen gas. Cannot use with leaded fuel as the lead coats the chemical in the converter and makes them ineffective.
  - Catalytic converters are least effective when they are cold – cold air allows unprocessed compounds come out of exhaust. Only 30 % of emissions removed when cold.
  - This is coupled with inefficiency of internal combustion engine when cold – thus more pollution per second from a cold engine that a warm engine can place converter closer to engine but then does not work as effectively when engine gets hot on a long trip.
  - Can be enhanced with a catalytic heater which is computer controlled so the catalyst reaches their effective temperature more quickly.
  - Older catalytic converters is platinum and rhodium – new designs which are likely to go into production in the next few years use palladium which increases the thermal resistance and speeds catalytic reaction leading to lower emissions of hydrocarbons, carbon monoxide and nitrogen oxide. Rare metals are expensive so can use less if more effective.
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