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ADVANCED GCE

A2 7822
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AS 3822
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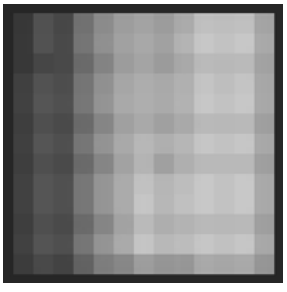
DESIGN AND TECHNOLOGY

COMBINED MARK SCHEME AND REPORT FOR THE UNITS
JANUARY 2005

AS/A2



3822-3/7822-3/MS/R/05J

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MARK SCHEME ON THE UNITS

REPORT ON THE UNITS

Mark Scheme 2520
January 2005

Section A

1 (a) Design requirements / justifications include:
- Qualified safety / security requirements
- Qualified ergonomic/anthropometric requirements
- Fits in with environment;
- Well built, robust, take mis-use , easy to maintain
- Weather resistant.

(i) for **two** appropriate design requirements 1 x 2 **[2]**
(ii) appropriate justification 1 **[1]**

(b) Examples could be:
- Buttock width
- Inside knee to floor
- Inside knee to back
- Arm/back rest

As a guide, a clear description up to 2 marks (must include detail of relationship of body shape / part to product for full marks), 1 mark for sketch
for **three** examples described 3 x 3 **[9]**

(c) discussion could include:
- Vandalism
- Material selection
  - Safety / security
  - Anthropometric considerations
- Finish/Protection

P relevant points/issues up to 3 marks
Q quality of explanation of two issues up to 2 marks
S specific example/ evidence 1 mark **[6]**

Total [18]

2 **(a)** Reasons could include:
– will eventually run out
– environmental effects of extraction
– environmental effects of using/burning
– costs of transportation

for **two** reasons well explained 2 x 2 **[4]**

(b) examples could include:
– tidal barriers
– Salters Duck/Wave power
– Underwater turbines
– Offshore wind?

Clear sketch 1 mark,
clear description of how energy is harnessed and converted (up to 3 marks)

for **two** descriptions with sketches 2 x 4 **[8]**

(c) Discussion could include:
– Smaller batteries
– Improved life
– Solar supplies/charges
– Extends work place
Examples: Laptops, calculators, PDA's mobile phones, power tools

P	relevant points/issues	up to 3 marks
Q	quality of explanation of two issues	up to 2 marks
S	specific example/evidence	1 mark **[6]**

Total [18]

3 **(a)** Design requirements / justifications include:
- Electrically safe
- Easy to use/operate e.g. on/off
- Attractive design to encourage use
- Lightweight
- Qualified ergonomic/anthropometric
- Resist knocks

1 appropriate design requirement (1 mark) with appropriate justification (1 mark) **[2]**
2 appropriate design requirement (1 mark) with appropriate justification (1 mark) **[2]**

(b) Features could be:
- texture of grip/controls
- balance
- physiological factors/pressure applied to switches
(other than anthropometric)

1 ergonomic feature (1 mark) well explained (1 mark) **[2]**
2 ergonomic feature (1 mark) well explained (1 mark) **[2]**

(c) benefits could be:
- reduced storage requirements
- respond to demand/limited wastage
- reduced need for high level working capital

1 benefit (1 mark) well explained (1 mark) **[2]**
2 benefit (1 mark) well explained (1 mark) **[2]**

(d) discussion could include:
- technical factors e.g. space for essential working components
- importance of visual impact to attract interest/sales
- specific product use
- chosen material
- colour and fashion trends

P	relevant points/issues	up to 3 marks	
Q	quality of explanation of two issues	up to 2 marks	
S	specific example/ evidence	1 mark	**[6]**

Total [18]

4 **(a)** Design requirements / justifications include:
– hold waste
– securely attach to surfaces without damage
– sharpen pencils effectively
– easy to remove and empty waste
– fit in with office/school environment

(i) for **two** appropriate design requirements 1 x 2 **[2]**
(ii) appropriate justification 1 **[1]**

(b) Reasons could be:
– low number of parts;
– simple production process;
– material availability/demand/cost
– easy assembly.

for **three** reasons 1 x 3 **[3]**

(c) checks could be:
– blade sharpness
– component size, shape
– assembly
– no flash/colour check (if plastic specified)

for **three** checks described 3 x 2 **[6]**

(d) discussion could include:
– cost benefit/value for money
– convenience
- fashion
– no maintenance
– disposal / packaging / waste
– performance

P relevant points/issues up to 3 marks
Q quality of explanation of two issues up to 2 marks
S specific example/evidence 1 mark **[6]**

Total [18]

5 **(a)** Design requirements / justifications include:
– Qualified safety
– Robust
- Appeal to child
– Easily cleaned
– Interest/educational

(i) for **two** appropriate design requirements 1 x 2 **[2]**
(ii) appropriate justification 1 **[1]**

(b) Considerations could be:
– maximize use of material/reduce waste
– minimize components
– simple assembly
– simplest quickest manufacturing/finishing processes

for **three** considerations 1 x 3 **[3]**

(c) criteria could include:
– target group
– age/gender
– volume of sales
– cost of appropriate forms of advertising
– place/timing of promotion/specialist market

for **three** factors described in depth 3 x 2 **[6]**

(d) discussion could include:
– human error/workforce skills
– machine failure
– tool wear
- quality control systems
– quality/variation in materials/components

P relevant points/issues up to 3 marks
Q quality of explanation of two issues up to 2 marks
S specific example/ evidence 1 mark **[6]**

Total [18]

Section B

1 (a) (i) e.g. ash, mahogany, oak, beech, hickory, sycamore - 1 mark for each **[2]**

(ii) strong, often easy to work, hardwearing(durable) good appearance, take a variety of finishes, stable/non warping, resistant to rotting **[2]**

(b) marking out of mortise and tenon – use of marking/mortise gauge/try square (2)
wasting – for mortise use of drills/ mortise chisels/morticer-for tenon use of tenon saw/chisels, power router (2)
fitting - sawing and fitting fox wedges/use of adhesive (2)
finishing – cleaning up surfaces with plane/glass paper – fitting panel into plough/groove (2)

(c) where the product is going to be used ie interior/exterior
the nature of finish required – ie tough, glossy
whether the material has any natural oils
cost/time taken to apply
quality of finish

P	relevant points/issues	up to 3 marks
Q	quality of explanation of two issues	up to 2 marks
S	specific example/ evidence	1 mark **[6]**

2 (a) (i) aluminium, stainless steel, brass, bronze, steel, duralumin, 1 mark for each **[2]**

(ii) any appropriate property eg strength, toughness, lightweight, non rusting
1 mark for each **[2]**

(b) Die casting (high pressure)
mention should be given to:
mould design – female, rounded corners, tapers/draft angles, the use of retractable cores, surface finish – 1 mark for each – **3 marks**
molten aluminium poured/forced under pressure **2 marks**
cooling time **1 mark**
ejection from the mould/breaking of sand mould **1 mark**
fettling **1 mark** **[8]**

(c) reduces production costs, reduces production time, ease of manufacture, easy/cheap to replace, uniformity/consistent quality

P	relevant points/issues	up to 3 marks	
Q	quality of explanation of two issues	up to 2 marks	
S	specific example/ evidence	1 mark	**[6]**

3 **(a)** very good finish, glossy appearance, tough/durable, lightweight, easily formed, easy to clean, colourful1 mark for each **[2]**

(b) high volume process, good surface finish can be achieved, thermoplastics used, low unit cost, quality, detail, accuracy, complexity of design, not wasteful of materials **[2]**

(c) details of moulds – split, rounded corners, draft angles, sprue, ejector pins
the process
clear annotated diagram showing: granules heated, injected under pressure into mould
cooling time/water cooled
moulding ejected – sprue removed **[8]**

(d) E.g. cost, fashion/trend/ function/performance, appearance, marketing/advertising, ergonomic issues 9ease of use), storage

P	relevant points/issues	up to 3 marks
Q	quality of explanation of two issues	up to 2 marks
S	specific example/ evidence	1 mark **[6]**

4 **(a)** left justified – text is aligned to the left column
bleed – over printing tolerance
600pt – the height of the text is 600 points (3pts = 1mm approx)
sans serif – lettering without tails(serifs) **[4]**

(b)

- artwork/origination – digitising/scanning **1 mark**
- colour separation **1 mark**
- individual films produced – printers marks attached 1 mark for film production two marks if 4 separate films mentioned **1/2 marks**

For each screen (x4)

- screen prepared by coating with light sensitive emulsion with controlled lighting **1/2 marks**
- screen exposed to UV light **1 mark**
- screen washed to remove emulsion **1 mark**

[8]

(c) For the manufacturer
quality control testing helps to reduce scrap and wastage
ensures higher quality/consistent/accurate product
Increases productivity – hence profits
improves company reputation – company/brand loyalty

Improving technology ensures high quality outcomes/quality
Social issues – eg few workers required
Fast process, can be personalised
Cost effective as there is little pre-press i.e. no litho plates needed
Very cost effective on short production runs
Smaller machines therefore less space needed
Less specialist knowledge needed by operators

P	relevant points/issues	up to 3 marks	
Q	quality of explanation of two issues	up to 2 marks	
S	specific example/ evidence	1 mark	**[6]**

5 (a) (i) low cost, relatively tough, very absorbent, easily printed, lightweight **[2]**

(ii) lamination, uv varnish, spirit varnish, waxed paper **[2]**

(b) description of flexography (note flexography is similar to the old letter press process)

- artwork/origination **1 mark**
- image setter – colour separation, film images produced for each colour **2 marks**
- production of rubber flexograhic image roller – **raised image** photo-mechanically **etched** onto **rubber** surface **3 marks**
- machine setting – ink charging – web feeding **1 mark**
- paper/card fed between image and impression rollers and impression made **1 mark**

[8]

(c) discussion could include:
quality of substrate (paper, card, etc), flexible, variety of suitable substrate materials
cost – the more complex the finish the more expensive the production costs
protective qualities required – eg lamination completely water proof
automated process – low labour costs
machines very expensive, set up times long, quality is good, use of solid colour (high definition),

P	relevant points/issues	up to 3 marks	
Q	quality of explanation of two issues	up to 2 marks	
S	specific example/ evidence	1 mark	**[6]**

6 **(a)** lightweight, warm, comfortable, easy to clean/wash, low cost, easy to breathable **[4]**

(b) preparation – marking out (correct orientation, alignment) (2)
fitting – tacking/sewing **pinned**, **tacked**, **checking,** **double sewn**/**machine** (5)
finishing – removing loose ends (1)

(c) discussion could include:
wear properties, strength, streamlined fabrics in sport eg sharkskin swim suits, wearable electronics clothing, self ironing fabrics, smart materials

P	relevant points/issues	up to 3 marks
Q	quality of explanation of two issues	up to 2 marks
S	specific example/ evidence	1 mark **[6]**

7 (a) (i) pull strings, elasticated wrists, sealed, closed zips **[3]**

(ii) e.g. pvc, polyester **[1]**

(b) company name/logo designed on computer 1 mark
logo printed on to transfer print paper 1 mark
logo positioned with some form of position control – e.g. template, position marks 2 marks
transfer pressed/ironed with heat + (1 mark for cloth between) 2 marks
finishing – wipe with damp cloth, check for quality 2 marks **[8]**

(c) discussion could include:
the cost of materials, labour and manufacturing, scale of production, fashion, demand, distribution costs, marketing costs
finishing processes applied
quality of manufacture

P	relevant points/issues	up to 3 marks	
Q	quality of explanation of two issues	up to 2 marks	
S	specific example/ evidence	1 mark	**[6]**

Mark Scheme 2521
January 2005

Section A

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(c) discussion could include:
- Vandalism
- Material selection
- Safety / security
- Anthropometric considerations
- Finish/Protection

P relevant points/issues up to 3 marks
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– tidal barriers
– Salters Duck/Wave power
– Underwater turbines
– Offshore wind?

Clear sketch 1 mark,
clear description of how energy is harnessed and converted (up to 3 marks)

for **two** descriptions with sketches 2 x 4 **[8]**

(c) Discussion could include:
– Smaller batteries
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– Solar supplies/charges
– Extends work place
Examples: Laptops, calculators, PDA's mobile phones, power tools

P	relevant points/issues	up to 3 marks
Q	quality of explanation of two issues	up to 2 marks
S	specific example/evidence	1 mark **[6]**

Total [18]

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Q	quality of explanation of two issues	up to 2 marks	
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Total [18]

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- securely attach to surfaces without damage
- sharpen pencils effectively
- easy to remove and empty waste
- fit in with office/school environment

(i) for **two** appropriate design requirements 1 x 2 **[2]**
(ii) appropriate justification 1 **[1]**

(b) Reasons could be:
- low number of parts;
- simple production process;
- material availability/demand/cost
- easy assembly.

for **three** reasons 1 x 3 **[3]**

(c) checks could be:
- blade sharpness
- component size, shape
- assembly
- no flash/colour check (if plastic specified)

for **three** checks described 3 x 2 **[6]**

(d) discussion could include:
- cost benefit/value for money
- convenience
- fashion
- no maintenance
- disposal / packaging / waste
- performance

P	relevant points/issues	up to 3 marks	
Q	quality of explanation of two issues	up to 2 marks	
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Total [18]

5 **(a)** Design requirements / justifications include:
– Qualified safety
– Robust
- Appeal to child
– Easily cleaned
– Interest/educational

(i) for **two** appropriate design requirements 1 x 2 **[2]**
(ii) appropriate justification 1 **[1]**

(b) Considerations could be:
– maximize use of material/reduce waste
– minimize components
– simple assembly
– simplest quickest manufacturing/finishing processes

for **three** considerations 1 x 3 **[3]**

(c) criteria could include:
– target group
– age/gender
– volume of sales
– cost of appropriate forms of advertising
– place/timing of promotion/specialist market

for **three** factors described in depth 3 x 2 **[6]**

(d) discussion could include:
– human error/workforce skills
– machine failure
– tool wear
- quality control systems
– quality/variation in materials/components

P relevant points/issues up to 3 marks
Q quality of explanation of two issues up to 2 marks
S specific example/ evidence 1 mark **[6]**

Total [18]

Section B

1 (a) (i) **Any <u>one</u> from:**
Keep the propeller facing into the wind
Counter balance the weight of the propeller
Or any other appropriate reason **[1]**

(ii) Any one from:
Allows the generator to rotate
Acts as a thrust bearing – downward load of generator assembly
Reduce wear **[1]**

(b) (i) Answer calculated i.e.

$$\frac{R2}{R1 + R2} = \frac{V0}{VIN} \rightarrow \frac{15K}{R1 + 15K} = \frac{5}{12} \rightarrow 5\,R1 = \underline{105} \rightarrow R1 = 21K$$

Substitution into formula (1) Correct answer (1)
No working – correct answer **[2]**

(ii) Amplify the output/signal from the comparator in part A of the circuit **[1]**
to enable sufficient current to energise relay coil. **[1]**

(iii) The voltage rating of the coil
The current rating of the switch contacts
(or number of 'ways'/terminals for the switch output)
Relay is small enough to fit into system (Any two)
[2]

(c) (i) Appropriate LED (typical) indicators from the transistor output
Or Bi-Colour LED and circuit
Or metered outputs
Or viable alternative **[2]**

(ii) Suitable heat sensor (1) and cooling fan (1)
Also accept – heat sink (1)
Increase cooling surface area (1)
Bolted to regulator or higher current rated regulator (2)
Or viable mechanical speed limiter for propellor **[2]**

(d) P – Identify 3 relevant issues:
Renewable energy source
Energy source does not pollute atmosphere
Noise pollution
Visual impact
Disposal of batteries
Any 3 (1 mark each) **[3]**

Q – (Discuss) explain 2 issues
e.g. fossil fuels are a finite energy source as opposed to wind energy..2x1 **[2]**

S – Give an example
e.g. when lead/acid batteries reach the end of their life, the component parts are both harmful to the environment and should be recycled/disposed of safely. **[1]**

Total 18 marks

2 (a) (i) Advantages could be:
- Allows slippage in case of jam
- Lower power loss
- No need for lubrication **[1]**

(ii) Motor pulley = 35
Cutter shaft pulley = 175
1 mark each **[2]**

(b) (i) Purpose of the key is to allow the pulley to slide on the shaft and transfer drive efficiently. **[1]**

(ii) Purpose of the grubscrew is to lock the pulley to the shaft. **[1]**

(c) (i) Reasons for Mild Steel could be:
Cost effective
Malleable
Easily turned and shaped **[1]**

(ii) Reasons for High Carbon Steel could be:
Low wear and rate
Maintains a good edge
Will not bend easily **[1]**

(iii) Reasons for Aluminium Policy could be:
Good heat dissipation
Light weight
Good mechanical grip **[1]**

(d) Methods shown in the candidate's answers could be:
Rubber mountings
Sprung bolt seats
Rubber matting under motor flange
Metallic bushes
Balance shaft **[4]**

(e) Issues raised (P) (3)
Quality of explanation (Q) (2)
Supporting examples/evidence (S) (1)

Total 18 marks

3 (a) Factors could be:
Power supply
Noise
Venting
Pressure regulation
Connections to machine
Weight **[2]**

(b) (i) Problems could be:
No hand protection
Ball could jam
Spring return may not cope
No way of telling where the piston is at any one time **[2]**

(ii) Table should be completed as:

A+	a+	B+
B+	b+	A-
A-	a-	B-
B-	b-	A+

(1 mark for each) **[6]**

(iii) Explanation could be along the lines of:
The machine has to continue until A- is reached.
The time will be fairly short but there is no way to interrupt the sequence
(1 mark each) **[2]**

(c) Issues raised (P) (3)
Quality of explanation (Q) (2)
Supporting examples/evidence (S) (1)

Total 18 Marks

Mark Scheme 2524
January 2005

1	(a)	(i)	Name of suitable hardwood, e.g. beech, oak	(1)	**[1]**
		(ii)	Name a suitable manufacture board, e.g. plywood, mdf	(1)	**[1]**
		(iii)	Two suitable finishes that could be used, 1 mark for each finish, e.g. • Polyurethane varnish • Wax • Lacquer	(2x1)	**[2]**
		(iv)	Describe how the seat of stool A could be attached to the frame. Correct use of woodscrews e.g. • Counter-bored • Round head screws • If counter-sink screws are used shown as countersunk into rail • Screw through rail into seat Accept a suitable jointed method e.g. dowelled joint	(4x1)	**[4]**
	(b)		How would the manufacturer produce a run of under-frames? E.g. • Descriptions using diagrams to show how the lengths of wood would be cut • Description of the joints used • Description of how it would be assembled (jigged) • Description of how it would be held while adhesive dries/cures	(2) (2) (2) (2)	**[8]**
	(c)		Discuss the implications of using hardwood in the production of furniture. 1 mark each for three implications given, e.g. • Environmental issues such as deforestation • Loss of habitat • Land erosion • Cost (only acceptable with comparisons) • Availability of material 1 mark each for the explanation of each of the implications given, e.g. • De-forestation takes place due to the amount of time it takes to replace felled trees • Large areas of topsoil is washed away from land that have been cleared as there are no roots to hold soil etc 1 mark for each example of type or where hardwood has been used in furniture.	(3x1) (3x1) (2x1)	**[8]**
					[24]

2 (a) (i) Give two requirements of a drinks can
1 mark for each requirement e.g.
- To protect contents from contamination
- Material not to contaminate the drink
- Withstand pressure if carbonated
- Easy to open
- Hollow round shapes
- Thin walls
- Wide neck etc

(2x1) **[2]**

(ii) Name two suitable metals used to make cans,
1 mark for each material e.g.
- Tinplate
- Steel
- Aluminium

(2x1) **[2]**

(iii) State four properties that make metals suitable for food and drink cans,
1 mark for each property e.g.
- Malleability
- Ductility
- Plasticity
- Impervious to gas

(4x1) **[4]**

(b) (i) Describe, using annotated sketches, how a drinks can would be formed e.g.
- Cold forming process 1 mark each for showing:
- Two stage process shown
- Stage 1 drawing – press tool
- Die and dish being formed
- Stage 2 ironing – downward pressure of press tool
- Ironing ring
- Metal being thinned and smoothed
- Base profile being formed.

(8x1) **[8]**

(c) Discuss the environmental implications of using metals for food and drinks cans.
1 mark each for three implication given, e.g.
- Ore extraction such as bauxite mining
- Energy requirements to refine ore

(3x1)

1 mark each for the explanation of each of the implications given, e.g.
- Land-scarring due to mining
- Global warming due to high energy levels required to refine metals

(3x1)

1 mark each for two types of can discussed in the answer, e.g.
- Aluminium drinks cans
- Processed food cans

(2x1) **[8]**

[24]

3 (a) (i) Name a suitable plastic for making the body of the switch, E.g. urea formaldehyde (1x1) **[1]**

(ii) Give three reasons why thermosetting plastics are suitable for making light switches.
1 mark for each reason e.g.
- Non-conductivity
- Ability to be moulded
- Will not soften with heat once moulded (3x1) **[3]**

(iii) Additives can change the characteristics and properties of plastics. Give four changes that can be achieved by using additives with plastics.
1 mark for each change e.g.
- Pigments/colour
- Stabilisers/helps prevent deterioration
- Lubricants/reduction of viscosity
- Fillers/increasing volume, blowing agents/expansion
- Flame retardants (4x1) **[4]**

(b) Describe in detail the process of compression moulding.
1 mark for each detail shown e.g.
- Male mould
- Female mould
- Slug
- Ram
- Pressure
- Heating
- Air vents
- Correct temperature being reached
- Flashing
- Cleaning of flashing (8x1) **[8]**

(c) Discuss the implications to the manufacturer in ensuring the safety of potential users of domestic appliances.
1 mark each for three requirements given, e.g. insulation testing prior to sale, fused equipment, pre fitted plugs etc (3x1)

1 mark each for the explanation of each of the requirements given, e.g. the equipment needs to be properly insulated to meet the standard demanded by legislation, the equipment needs to be fused to the correct rating so that in the case of an electrical surge the equipment is isolated, pre-fitted plugs are supplied with the equipment to ensure that they are correctly wired and earthed. (3x1)

1 mark each for two examples of electrical equipment e.g. computers, kettle etc. (allow specific safety measures e.g. testing to British Standards etc.) (2x1) **[8]**

[24]

4 (a) (i) Name two suitable surface finishes for the DVD case e.g.
- Laminating
- Poly-coating
- Varnishing

(2x1) **[2]**

(ii) Give two reasons why the board needs to have a surface finish e.g.
- Attractive/clean finish
- Moisture resistant
- Surface protection

(2x1) **[2]**

(iii) The front of the DVD case has raised lettering produced by embossing. Describe, using annotated sketches, the embossing process. Roller and Plate embossing acceptable e.g.
- Wet/damp paper/board
- Male mould/die
- Female mould/die
- Heat used
- Pressure used

(4x1) **[4]**

(b) (i) Describe, using annotated sketches, how a multicoloured insert would be printed using suitable printing process such as offset lithography
1 mark each for identified part of process e.g.
- Roller litho plate shown
- Roller litho plate being dampened
- Roller litho plate being inked
- Inked image offset onto blanket cylinder
- Image transferred to paper
- More than one set of rollers to produce multicolour

(8x1) **[8]**

(c) Discuss the implications to the manufacturer of making the DVD case using a combination of board and plastic
1 mark each for three implication given, such as joining dissimilar materials, different manufacturers for each of the components, (3x1)
1 mark each for the explanation of each of the implications given
E.g. the covers will be printed in one plant and the plastic inserts in another, the products will need to be transported to the assembly point adding to the cost, specialist machinery will have to be developed to assemble the two components together which will add to the cost (3x1)
1 mark each for two examples
E.g. specific plastic named such as HIPS, or glue such as a low melt adhesive (2x1) **[8]**

[24]

5 (a) (i) State two reasons why these carriers would be distributed in a flat form.
1 mark for each reason e.g. storage, transportation, printing (2x1) **[2]**

(ii) Give two reasons why this material is suitable for this type of packaging
E.g. produced in a greater thickness, gives some slight padding, good strength to weight ratio (2x1) **[2]**

(iii) Give four design requirements for the bottle carrier
1 mark for each requirement e.g.
- Holds standard size bottles
- Can lock into position
- Easily made up at checkout
- Can be produced in one piece (4x1) **[4]**

(b) (i) Describe, using annotated sketches, a suitable development for the carrier
1 mark awarded for
- Drawn as a net or easily to understand diagram
- Will fold up into a single piece unit
- Has flaps which form the base of holder
- Will reinforce the bottom
- Will it lock
- Chamfers shown on locking tabs
- Is made from one piece of card
- Will fold easily (8x1) **[8]**

(c) Describe the implications of using CIM in the packaging industry
1 mark for each of three issues raised, e.g. Graphics are now produced on computers, the machines used to produce the dies etc are controlled by computers, the business operations of the company are now performed using computers (3x1)
1 mark for each of the explanation of each of the issues raised, e.g. Graphics can be shared by designers across the world and easily altered to suit customers requirements, accurate dies can be produced using laser cutter controlled by computers leading to better quality control over products, efficiency of the company is improved by linking stock control/ordering and invoicing through same computer system (3x1)

1 mark for each of the examples given (2x1) **[8]**

[24]

6 (a) (i) Give three reasons why a PVC laminated cotton fabric is suitable for the apron e.g.

- Waterproof
- Stain resistant
- Colourful fabrics available
- Wipes clean easily
- Tough, hardwearing, durable

(3x1) **[3]**

(ii) Give two reasons why a quilted fabric is suitable for the oven gloves e.g.

- Protection/insulation from heat
- Attractive
- Pliable so good grip
- Washable

(2x1) **[2]**

(iii) Give three reasons why the edges of the kitchen set are finished with bias binding e.g.

- To stop edge of fabric fraying
- Gives a smoother edge
- Can be used on curved edges
- Decoration

(3x1) **[3]**

(b) Describe the process of quilting the fabric used for the oven gloves.
Information can be note or diagram form e.g.

- Cut fabric to same size
- Place three layers together – wadding in the middle, inner fabric and outer fabric facing right sides outwards
- All fabrics must be smooth and flat
- Pin and tack together – start in centre and work outwards
- Mark stitching lines/use stitching guide attachment on machine
- Use longer stitch on machine – possibly adjust tension
- Dual feed/walking foot to help feed fabric through
- Start in centre and work outwards
- Remove tacking
- Cut loose threads
- Press lightly

(8x1) **[8]**

(c) One mark for each point raised up to three (3x1)
One mark each for explanation of each point raised up to three (3x1)
One mark for each example up to two (2x1)

Discussion could involve reference to

- Improved accuracy of designs
- Speed of testing colour ways
- Manipulation of design e.g. rotate, reverse, copy and paste etc
- Save designs
- Modelling ideas in 3D
- 'Try' fabrics on products on screen

- Fast prototyping
- Can download information directly to manufacturing systems

[8]

[24]

7 (a) (i) Give two reasons why Tee shirts remain popular items of clothing.
1 mark for each reason e.g.
- Suitable for males and females
- Suitable for any age group
- Used for leisure activities
- Can be decorated in a variety of ways

(2x1) **[2]**

(ii) Name two alternative methods of applying a design to the front of the Tee shirt.
1 mark for each method e.g.
- Embroidery
- Batik
- Printed

(2x1) **[2]**

(iii) List four performance characteristics needed by the fabric used for the Tee shirt e.g.
- Absorbent
- Easy after care/washable/easy dry etc
- Easy to colour/dye
- Comfortable next to skin/softness of material
- Stretchable
- Not too hot to wear/cool material

(4x1) **[4]**

(b) Describe the order of manufacture of the Tee shirt including details of the pattern pieces and the application of the tie-dye design to the front.
1 mark for each point e.g.
- Details shown of pattern pieces
- Sleeves
- Front/Back
- Stitching/over-locking
- Use of lighter coloured tee shirt than dye
- Pinch up front
- Tie yarn/cord/elastic bands to create circles
- Make up cold water dye
- Soaking period
- Or use of washing machine dye
- Allow to dry
- Untie and iron

(8x1) **[8]**

(c) Discuss the environmental implications of using dyes when colouring textiles products.
One mark for each point raised up to three (3x1)
One mark each for explanation of each point raised up to three (3x1)
One mark for each example up to two (2x1)

Discussions could include reference to
- Mordents are chemicals that could be harmful if released into the environment

- Damage to the environment by the collection of raw materials
- Natural products not as harmful as some synthetic materials
- Safe disposal of chemicals
- Possible fume release

[8]

[24]

QUESTION 1,2,3,4,5	GENERIC MARK SCHEME FOR SECTION B UNIT 2524/02		MARKS AVAILABLE

SPECIFICATION POINTS (SP) A3 Sheet 1 of 4			
SP	10 Specification Points which are qualified and justified 2 marks each. 10 clear statements which are specifically related to the focussed topic 10 clear and relevant justification points A clear relevant statement 1 mark A clear relevant justification 1 mark Any generic statements that are not explicitly related to the focus = 0 marks A point repeated or a simple repetition of information already stated in the question is awarded a circled lower case 'r'. A circled lower case 'r' = 0 marks	10 x 1 10 x 1	**20**

INITIAL IDEAS (ID) A3 Sheet 2 of 4 and A3 Sheet 3 of 4			
R	Range of ideas 0-1 No-weak range of initial ideas (superficial change of shape lacking any depth or detail) 2-3 Limited-some evidence of variation and range of ideas logically laid out 4-5 Clear-detailed evidence of a range of significantly different ideas clearly laid out and understood by a third party.		**5**
S	Design ideas relating to the <u>functional aspects of the specification</u> 0-1 No-little functional aspects of the specification identified or considered 2-3Limited-some functional aspects of the specification identified or considered 4-5 Clear-detailed evidence of the majority of the functional aspects have been considered innovatively		**5**
M	Quality of design thinking relating to volume production and wider market issues. 0-1 No-little consideration given to market issues or volume production in the design thinking 2-3 Limited-some consideration given to market issues or volume production in the design thinking 4-5 Clear-detailed evidence that consideration has been given to market issues or volume production in the design thinking		**5**

D	Consideration of specific materials and components (may include calculations). Generic terms not acceptable: Plastics-thermoplastics, thermosetting. Wood-hardwood, softwood, Cloth-natural fibre, synthetic fibre Metal-ferrous, non-ferrous Paper, card and board 0-1 No-little mention of relevant and appropriate specific materials and components 2 Some consideration given to relevant and appropriate specific materials 3 Clear evidence of relevant and appropriate specific materials and components Consideration of dimensional detail (may include calculations). *Overall dimensions plus some detailed dimensions required (circuit diagrams/layouts, systems diagrams, flow diagrams.)* 0 No indication of scale, dimensions or calculations 1 Limited indication of scale, dimensions or calculations 2 Clear detailed evidence of scale dimensions and calculations	3 2	**5**
C	Consideration of production. Methods/construction/assembly detail, appropriate to the product and the chosen materials. 0-1 No-little consideration given to appropriate (alternative) methods of construction or assembly 2-3 Limited-some consideration given to appropriate (alternative) methods of construction or assembly 4-5 Clear-detailed evidence has been considered in relation to appropriate (alternative) methods of construction or assembly		**5**
E	Evaluation of the suitability of the ideas with reference to the specification. 0-1 No-little evidence of evaluation commentary 2-3 Limited-some evidence of evaluation commentary 4-5 Clear-detailed evidence of evaluation commentary (may-must include some objective content)		**5**

FEATURES SUITABLE FOR DEVELOPMENT (FD) A3 Sheet 4 of 4.			
F	Appropriate features identified and clearly described. All major aspects of the design should be evident; this may be in the form of annotation of a final drawing or part drawings, or may be in the form of expanded text e.g. bullet point-listing. Candidates could refer to the design features in terms of strengths and weaknesses 0-1 No-little features identified-concept drawing only, superficial commentary 2-3 Limited-some internal and or external appropriate features identified. Lacks realistic proposals and detail. 4-5 Clear-detailed evidence of internal and or external appropriate features identified. Contains realistic proposals and detail.		**5**
J	Appropriate justification of the choices made With reference to the specification 0-1 No-little evidence of justification made, (descriptive, superficial and subjective) 2-3 Limited-some evidence of justification (descriptive statements with elements of objectivity) 4-5 Clear-detailed intellectual constructive justification is *evident. Justification is fluent and appropriate*		**5**

EFFICIENT COMMUNICATION (EC) A3 Sheets 1-4			
EC	Communication skills and techniques 0-1 No-weak level of graphical skill/annotation evidenced by poor use of communication methods no apparent quality 2-3 Low level of graphical skill/annotation 4-6 Limited-some graphical skill/annotation evidenced by one form of communication method (e.g.2D only) lacking appropriate techniques of detail. 7-9 Reasonable evidence of variation and range of graphical techniques/annotation appropriately used 10 Fluent range of a variety of graphical presentation techniques in evidence with some annotation 11 Fluent range of a variety of presentation techniques in evidence with detailed annotation 12 Creative, fluent design thinking that is evident and easily read and followed by a third party. (Circuit diagrams, systems diagrams exploded views, sectional views 2D and 3D views enlarged detail views and fluent annotation are appropriately used)		**12**

Mark Scheme 2525
January 2005

Section A

1 (a) (i) Torque is the 'turning effect' or 'turning power' of a system √
(Allow any reasonable explanation) **[1]**

(ii) Correct alignment of a worm gear and a worm wheel √
30 teeth labelled on worm gear (for a single-start worm) √ **[2]**

(iii) Allows rotation to be turned through 90 degrees √
Offers large reduction ratio in one step √
High torque transfer √
Will not allow output shaft to drive the worm gear (system locks up), etc **[2]**

(b) (i) Reduction ratio per stage = 40/12
= 3.333 √
Number of stages = 3
Therefore, total reduction ratio = 3.333^3
= 37:1 √ **[2]**

(ii) Plain bearing material:
brass, phosphor bronze, ptfe, nylon etc. √ **[1]**

(iii) A – spin freely √
B – attached to shaft √
C – spin freely √ **[3]**

(iv) To be attached to the shaft, the gear bore needs to be fractionally smaller than the diameter of the shaft (interference fit) √
OR the gear fitted to the shaft whilst hot then allowed to cool √
OR, describe the use of a grub screw, a pin, splined shaft or Woodruffe key, etc. **[2]**

(c) (i) Diagram to show labelled slotted or reflective opto-switch √
Suitable encoder disk shown and interaction with opto-switch √ **[2]**

(ii) Schmitt trigger used to 'clean up' the signal from the opto-switch √ **[1]**

(d) Candidates may investigate a wide range of uses for CAD and its uses during the design of a system. Some of the issues are:

- CAD allows a designer to quickly experiment with components or parts;
- Library of standard parts;
- System calculations can be done quickly;
- The CAD system can produce parts lists, costings etc.
- Total product modelling can be achieved;
- The use of CAD reduces the expense of producing several prototypes and models.
- CAD can include 2D/3D modelling or system modelling;
- CAD operators will need training and practice to become skilful;
- Designs can be easily distributed around a network or E-mailed.

Identify a range of relevant issues/points √ √ √
Explain why these issues are relevant √ √ √
Use of specific examples or evidence √ √ **[8]**

TOTAL [24]

2 (a) (i) Two hazards identified √√
e.g.
danger of loose snaking pipes,
danger of directing compressed air against body,
danger of getting fingers trapped in moving parts. **[2]**

(ii) Method of reducing each hazard √√
e.g.
check connections/wear face mask,
train users in safe operating practice,
guard moving parts and use warning signs. **[2]**

(b) (i) Graph to show slow increase of pressure with time. √ **[1]**

(ii) After valve A operates there will be a time delay before Q operates √
which is a pressure-sensitive valve that will change over when pressure threshold is reached. √ **[2]**

(iii) If the car moves quickly, it will operate valve B before the reservoir has had time to fill √
Therefore valve Q will not be operated and there **will** be an air signal from Q into the AND-valve R √
This signal, along with the signal from valve B will trigger the 5-port valve and cause the cylinder P to outstroke. √ **[3]**

(iv) 1 mark – correct modification.
1 – mark for explanation.
To reduce the threshold braking speed,
The flow restrictor can be closed further, √
so that the reservoir will not have filled by the time the slower car passes valve B. √

OR,
The two valves A and B can be moved closer together, √
So that the signal from B is present at the AND-valve before the reservoir has had time to fill. √

OR,
A larger volume reservoir can be used, √
So that it will not have filled by the time the slower car passes valve B. √ **[2]**

(c) (i) The brake will always operate √ for any speed of car. √ **[2]**

(ii) The brake will never operate √ for any speed of car. √ **[2]**

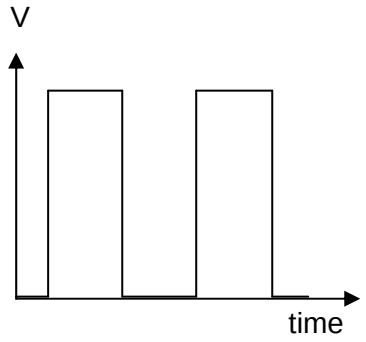
(d) Candidates may investigate a wide range of control systems in various critical applications. Some of the issues are:

- A critical control system should have risk-assessments associated with the use of the system;
- The designer should be aware of the consequences of various parts of the system failing;
- Redundancy may need to be built Into the control system;
- A schedule for inspection and maintenance should be produced;
- Automatic diagnostic and fault-finding systems may need to be included in the critical control system;
- The system should be designed to fail-safe;
- The use of high quality components needs to be considered against their cost;
- Accelerated lifetime testing may be needed on prototype systems to investigate likely modes of failure;
- The use of computer modelling may be useful in predicting likely modes of failure.

Identify a range of relevant issues/points √ √ √
Explain why these issues are relevant √ √ √
Use of specific examples or evidence √ √ **[8]**

TOTAL [24]

3 (a) (i)



Periodic waveform √
Square wave √ **[2]**

(ii) Resistance of LDR = between 0.6k to 0.7k √

(iii) **[1]**

$$\text{frequency} = \frac{1.44}{(R1 + 2R2) \times C}$$

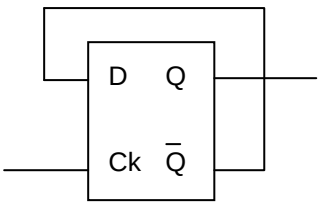
$$= \frac{1.44}{(1000 + 2\times600) \times 10^{-6}} \quad \surd$$

$$= \frac{1.44}{2.2 \times 10^{-3}}$$

= 654Hz √ (f = 600 Hz if R2=07k) **[2]**

(iv) As illumination increases, frequency **increases.** √ **[1]**

(b) (i)



Q-bar to D √
Input to clock, output clear √
(Use of JK flip-flops allowed) **[2]**

(ii) Total division = 2^{16} = 65536 √ **[1]**

(iii) Sun illumination increases so frequency of astable increases (or vice versa) √
Output pulses from divider stage cause BCD counter to increment √
As BCD counter counts, the illuminated LED progresses along the bargraph √
When final LED lights, buzzer also sounds √ **[4]**

(iv) Total number of pulses from astable = 65536 x 9
= 589824 √
(ALLOW ECF from (b)(ii). Also ALLOW x10 instead of x9) **[1]**

(v) At 200 lux, astable frequency = 654Hz (ALLOW ECF from (a)(iii))

Time before buzzer sounds = 589824/654 = 902 seconds √
(ALLOW ECF from (b)(iv))

Time in minutes = 902/60 = 15 minutes √ **[2]**

(c) Candidates may investigate a wide range of issues relating to the use of programmable microcontroller ICs (e.g. PICs). Some of the issues are:

- PICs allow advanced product features;
- Features can be developed easily with changes in software;
- Product upgrading is easy;
- PICs are relatively cheap components;
- The overall component count (and cost) of the product is reduced;
- Reduced product manufacturing costs;
- Product development costs are lowered;
- Product size can be minimised;
- Etc.

Identify a range of relevant issues/points √ √ √
Explain why these issues are relevant √ √ √
Use of specific examples or evidence √ √ **[8]**

TOTAL [24]

QUESTION 1,2,3	GENERIC MARK SCHEME FOR SECTION B UNIT 2525/02		MARKS AVAILABLE

SPECIFICATION POINTS (SP) A3 Sheet 1 of 4			
SP	10 Specification Points which are qualified and justified 2 marks each. 10 clear statements which are specifically related to the focussed topic 10 clear and relevant justification points A clear relevant statement 1 mark A clear relevant justification 1 mark Any generic statements that are not explicitly related to the focus = 0 marks A point repeated or a simple repetition of information already stated in the question is awarded a circled lower case 'r'. A circled lower case 'r' = 0 marks	10 x 1 10 x 1	**20**

INITIAL IDEAS (ID) A3 Sheet 2 of 4 and A3 Sheet 3 of 4			
R	**Range of ideas** **0-1** No-weak range of initial ideas (superficial change of shape lacking any depth or detail) **2-3** Limited-some evidence of variation and range of ideas logically laid out **4-5** Clear-detailed evidence of a range of significantly different ideas clearly laid out and understood by a third party.		**5**
S	**Design ideas relating to the <u>functional aspects of the specification</u>** **0-1** No-little functional aspects of the specification identified or considered **2-3**Limited-some functional aspects of the specification identified or considered **4-5** Clear-detailed evidence of the majority of the functional aspects have been considered innovatively		**5**
M	**Meaningful explanations of design ideas.** **0-1** No-little consideration given to explaining design ideas **2-**3 Limited-some consideration given to explaining design ideas **4-5** Clear-detailed evidence that consideration has been given to explaining design ideas		**5**

D	**Consideration of specific materials and components (may include calculations).** Generic terms not acceptable: Plastics-thermoplastics, thermosetting. Wood-hardwood, softwood, Cloth-natural fibre, synthetic fibre Metal-ferrous, non-ferrous Paper, card and board **0-1** No-little mention of relevant and appropriate specific materials and components **2** Some consideration given to relevant and appropriate specific materials **3** Clear evidence of relevant and appropriate specific materials and components Consideration of dimensional detail (may include calculations). *Overall dimensions plus some detailed dimensions required (circuit diagrams/layouts, systems diagrams, flow diagrams.)* **0** No indication of scale, dimensions or calculations **1** Limited indication of scale, dimensions or calculations **2** Clear detailed evidence of scale dimensions and calculations	**3** **2**	**5**
C	Consideration of production. Methods/construction/assembly detail, appropriate to the product and the chosen materials. **0-1** No-little consideration given to appropriate (alternative) methods of construction or assembly **2-3** Limited-some consideration given to appropriate (alternative) methods of construction or assembly **4-5** Clear-detailed evidence has been considered in relation to appropriate (alternative) methods of construction or assembly		**5**
E	Evaluation of the suitability of the ideas with reference to the specification. **0-1** No-little evidence of evaluation commentary **2-3** Limited-some evidence of evaluation commentary **4-5** Clear-detailed evidence of evaluation commentary (may-must include some objective content)		**5**

FEATURES SUITABLE FOR DEVELOPMENT (FD) A3 Sheet 4 of 4.			
F	Appropriate features identified and clearly described. All major aspects of the design should be evident; this may be in the form of annotation of a final drawing or part drawings, or may be in the form of expanded text e.g. bullet point-listing. Candidates could refer to the design features in terms of strengths and weaknesses **0-1** No-little features identified-concept drawing only, superficial commentary **2-3** Limited-some internal and or external appropriate features identified. Lacks realistic proposals and detail. **4-5** Clear-detailed evidence of internal and or external appropriate features identified. Contains realistic proposals and detail.		**5**

J	Appropriate justification of the choices made With reference to the specification **0-1** No-little evidence of justification made, (descriptive, superficial and subjective) **2-3** Limited-some evidence of justification (descriptive statements with elements of objectivity) **4-5** Clear-detailed intellectual constructive justification is evident. *Justification is fluent and appropriate*		**5**

EFFICIENT COMMUNICATION (EC) A3 Sheets 1-4			
EC	**Communication skills and techniques** **0-1** No-weak level of graphical skill/annotation evidenced by poor use of communication methods no apparent quality **2-3** Low level of graphical skill/annotation **4-6** Limited-some graphical skill/annotation evidenced by one form of communication method (e.g.2D only) lacking appropriate techniques of detail. **7-9** Reasonable evidence of variation and range of graphical techniques/annotation appropriately used **10** Fluent range of a variety of graphical presentation techniques in evidence with some annotation **11** Fluent range of a variety of presentation techniques in evidence with detailed annotation **12** Creative, fluent design thinking that is evident and easily read and followed by a third party. (Circuit diagrams, systems diagrams exploded views, sectional views 2D and 3D views enlarged detail views and fluent annotation are appropriately used)		**12**

REPORT ON THE UNITS
January 2005

Chief Examiner's Report

There was a significant rise in entries this January. Where in previous years, most entries were re-sits or re-submissions; it appears that a number of Centres are now entering candidates for first attempt in January. It may be that some Centres are using the January exams as a 'mock' examination; others appear to have planned their year to complete a unit/s in January to enable focus on other units for May / June. Whatever reasoning is employed it is essential that Centres ensure that candidates are fully prepared and ready, particularly for the written papers.

This January was the last occasion where the old specification assessment criteria applied to the Product Study (2519). All future submissions will be assessed on the new 3rd Edition Specification. Whilst the overall ethos and content remains the same for this unit, minor amendments have been made to the assessment criteria such as the increase of marks available for the generation of initial ideas from 6 to 15.

As a result of discussions with examiners and feedback from INSET, minor modifications have been introduced to the written papers. In 2520/01 the introductory parts of questions were revised. From January 2006 the introduction to part (a) will read 'State two (or three) justified design requirements for…)
The overall performance on 2520 /01 and 2520/02 was good (particularly on 2520/02) with candidates showing particular improvement on the section of questions requiring candidates to discuss. Many candidates raised three issues, explained two of the issues and included an example or appropriate supporting evidence. This was not the case in 2524/01 and 2525/01 where many responses to discuss questions contained general unexplained statements and had very limited supporting evidence.

When preparing for written papers, Centres are reminded to ensure that candidates:

- read all of the questions carefully and make a considered choice. Too many candidates attempted questions in 2520/02 and 2524/01 using expertise gleaned from GCSE courses (particularly Textiles and Graphics related questions). This knowledge base does not equip candidates to achieve high marks at AS or A2. Further preparation and specific subject knowledge is required;
- avoid the use of generic statements that do not make specific reference to the product in part (a) of questions;
- answer the correct number of questions. Over 10% of candidates answered all 5 2520/01 questions, most responses were thin and lacking the necessary detail to achieve high marks;
- use the correct technical terminology and accuracy required for 2520/02, 2524/01 and 2525/01. Many candidates do not make specific reference to tools, components and processes.

A wide range of coursework projects was submitted for 2522 (Designing). Whilst many folders were being submitted for assessment for the first time, a significant number were re-entries. A number of the re-entries did not show any significant enhancement from the original entry.

Centres are reminded of the importance of using OPF's prior to commencing coursework to avoid candidates embarking on inappropriate projects and ensure that projects have the potential to access all areas of the assessment criteria.

When preparing for coursework, the following points must be considered;

- try to ensure that candidates do not have a preconceived idea of their final outcome, the solution should be arrived at as a result of careful research, the generation of a wide range of appropriate ideas and making sound, reasoned decisions to develop and produce a viable proposal;
- ensure that time plans are unique to the candidate (not class generated) and are updated and modified as appropriate;
- follow guidelines on the required number of sheets for Units 2522 and 2523;
- structure folders to meet the assessment criteria but ensure that there is a genuine flow of work and design thinking.

Written papers for A2 (2524 and 2525) included the following slight modifications:

- less information in pre-release and stems of questions to enable candidates to generate their own specification points and avoid repetition;
- the assessment criteria for 2524/02 and 2525/02, materials maximum 3 marks, dimensioning maximum 2 marks.

Performance on 2524/01 and 2525/01 tended to be weak, with responses lacking the specific terminology and accuracy expected at this level. 'Discuss' questions were particularly disappointing with many candidates failing to explain the issues considered and very few introducing appropriate examples or evidence.
The presentation of work for 2524/02 and 2525/02 continues to improve with many examples of clear communication with detailed annotation. A significant number of candidates, however, produce superficial outline designs and do not demonstrate an understanding of construction and technical knowledge in their design thinking.

2519 Product Study (Coursework)

General Comments

January 2005 was the final opportunity to enter candidates on the original 2000 Unit specification. All subsequent entries from June 2005 will be to the new specification, which the majority of Centres adopted for teaching candidates from September 2004. The new specification has some minor alterations to marks in most sections, either on the overall mark criteria or the banding of marks, with some larger alterations and changes in other sections. The overall ethos and content of the Unit remains unchanged. This report will outline the changes to the specification section by section. Characteristics of good projects and typical aspects of projects, which could be improved, are listed where appropriate.

OCR advises that the whole study can be completed in 20 sheets of A3. A recommended page allocation is given for each section.

FROM MAY 2005:

A. Product Analysis and Design (60 Marks)

1. Analysis of Chosen Product (24 marks)

Purpose and criteria.

- **Examine the intended purpose of a product and identify the key criteria used in its design. (9) (2 x A3)**

The marks in this section have been reduced from 10 to 9. For marks in the top band all of the following should be addressed in depth:

- Detailed description of the intended purpose of **one** product. (not a range)
- Key criteria used in the design of the product.
- The needs of the manufacturer.
- The needs of the consumer.

Where all four of the above have not been covered the Centre should consider awarding marks in the lower bands.

Strengths and weaknesses- comparison

- **Analyse the strengths and weaknesses of the product in comparison to other similar products. (9) (2 x A3)**

The marks in this section have been reduced from 10 to 9. For marks in the top band all of the following should be addressed in depth:

- Detailed analysis of the strengths and weaknesses of **the** product;
- In comparison to similar products;
- In terms of function, suitability of materials and manufacturing processes, ergonomics, aesthetics and cost.

Where all of the above are not included the Centre should consider awarding marks in the lower bands.

Moral Implications

- **Identify and analyse the moral implications associated with environmental, social and economic issues in the design and use of the product. (6) (1 x A3)**

The marks in this section have been reduced from 10 to 6. The focus has changed from environmental, social and moral issues to the **moral implications** associated with environmental, social and economic issues. The difficulty of resourcing this section is acknowledged. The ethos of this section of the specification is now in line with resource material prepared by the Intermediate Technology Development Group. Access to this material is available through their Sustainable Design Award Web Site: (www.sda-uk.org).

2. Initial design of Improved product. (36 marks)

- **Write a detailed brief for improving the product in some way. (3) (1/3 x A3)**

Marks in this section have been reduced from 6 to 3. This is a large reduction, which now has a differential between the award of marks for this section and the ideas and sketching section. In the previous specification the marks were identical.

Good candidates will identify an improvement for their selected single product.
Centres should award marks in the lower bands where an improvement is not identified or where the proposal is to redesign a complete product.

- **Develop and justify an objective design specification. (6) (2/3 x A3)**

The requirement is to develop a specification, which is justified. Candidates should be encouraged to present specification points with an identifiable justification of each point. Where there is no justification Centres should mark work in the lower bands.

- **Use annotated sketching to generate a wide range of initial ideas which explore possible improvements (15) (5 x A3 max)**

Marks in this section have increased considerably from 6 to 15. All of the available marks gained from reductions elsewhere have been added here to reflect the relative time and emphasis placed on this section by Centres.

Marks awarded to the top band should be reserved for candidates who present a range of innovative and creative ideas – with appropriate annotation. Simplistic ideas, which are not annotated, should be awarded marks in the lower band.

- **Evaluate ideas against the specification and justify the choice of one idea to be taken forward. (6) (1 x A3)**

This section can not be completed without reference to the specification. Some good candidates annotate their ideas sheets; others complete a chart to achieve this. Whichever method is adopted centres should only award marks in the top band where there is a clear justification of one idea to be taken forward. No marks should be awarded where no reference is made to the specification.

- **Use a combination of text, graphical techniques and ICT, as appropriate to present information. (6) (All previous A3 sheets in section A)**

For marks in the top band there must be a range of different techniques. Work which relies heavily on one of the above techniques to the exclusion of others should be marked in the lower band.

B. Product development, Modelling and testing (60 marks)

Design constraints

- **Analyse the influence of relevant design constraints on the proposed idea e.g. issues of materials choice, manufacturing issues, ergonomics, aesthetics, environment etc. (6) (1 x A3)**

For marks in the top band candidates should consider all of the above in relation to their chosen idea. Five issues are highlighted, others e.g. sustainability or economics could also be relevant. There are six marks for considering a number of points not six marks for one point. Candidates who have difficulty with this section should be encouraged to debate the constraints of their idea in a number of contexts – the school workshop studio, a small manufacturing firm and a much larger manufacturing company.

Models

- **Make sufficient first generation, experimental 2D and 3D prototype models to establish the validity of the proposed idea in terms of; physical requirements, e.g., construction, movement, stability, strength, etc, aesthetic qualities, suitable manufacturing processes, and issues, suitability of materials or components. (36) (3 x A3 drawings, images, photographs)**

A range of 2D models and a range of 3D models is required. One prototype however well made does not meet this requirement and should be awarded marks in the lower band. Formal drawings, unfolded nets, croc, clip circuits, textile patterns, paper and card models and pro desktop images can all support the 2D section. Plasticine, polymorph, clay and foam can all precede the use of more resistant materials in the development of a 3D solution. Detailed photographs of a range of 2D models and a range of 3D models are required.

Test Rig

- **Make using workshop tools a self contained test rig to formally test either, one of the above physical requirements, or the suitability of the proposed materials or components. (12) (2 x A3 including test results from summary)**

The requirement here is to make a rig – to manufacture in a workshop. Where no rig has been made no marks should be awarded. Questionnaires, surveys or using a model or models does not meet this requirement. Assembly of scientific equipment or the exclusive use of assembled kits is not acceptable. Detailed photographs of the rig are required.

Summary of results.

- **Produce a summary of the results of this modelling which includes analysis of information gained from models, details and analysis of the results gained from testing with suggestions for further improvement to the proposed idea. (6) (2 x A3 test results presented with test rig)**

There are three distinct sections to the above. For marks in the top bands all three areas need to be considered.

2520: Product Design 1 (Written Examination)

General Comments

The January paper was the eleventh written paper since the introduction of the new D&T: Product Design specification. The format of written papers appears to be well received by Centres and question setters have responded to requests by examiners and teachers at INSET to make very minor adjustments to the style of questions.

The introductory part (a) of some questions has been modified to request that candidates 'state two design requirements' (1 mark each) and 'justify one of the requirements' (1 mark) E.g. questions 1, 4 and 5, or 'state and justify two design requirements '(2 marks each), as in question 3. This format applies to the January and June 2005 papers. From January 2006 the instruction will read 'state two or three justified design requirements' (1 mark each)
The overall standard of response to the paper was good. A number of candidates achieved maximum marks, presenting comprehensive, clear and fully detailed answers to their three selected questions and many others achieved very high marks.
Most candidates responded appropriately by stating and justifying design requirements but a significant number were not awarded marks for giving single word or generic responses e.g. ergonomic. Design requirements must be specifically related to the given product.
Candidates will not receive credit for answers such as for question 4 (a) (i) 'It must sharpen pencils' and for (a) (ii) 'Because a sharpener must sharpen pencils.'

There has been continued improvement on questions requiring candidates 'to discuss'. Most candidates raise three issues, explain two of the issues and introduce an example or appropriate supporting evidence.

Some candidates focus on one single issue and consequently can only hope to achieve a maximum 3 of the 6 marks available. A number of candidates produced a list of brief bullet points, which is not an appropriate response for this type of question.

Many candidates did not read the questions carefully and there were a number of misinterpretations and errors. The most common instances were:

- Question 2 (b) 'energy from the sea'
- Question 3 (b) 'ergonomic features, other than anthropometric'
- Question 4 (c) 'quality control checks carried out during the manufacture'
- Question 5 (b) 'considerations that keep manufacturing costs low'

Some candidates started parts (a) and (b) of question 2 and were unable to make a detailed response to part (c)

Almost 10% of candidates answered all 5 questions. Responses were often very brief and lacking the necessary level of detail to achieve good marks. Spending too long on 2520/01 must have some effect upon performance on paper 2520/02.

Question 1 was the most popular, question 2 the least popular.

2520/01 Product Design

Comments on Individual Questions

1) The most popular question and generally very well answered.

(a) Most candidates referred to specific safety requirements and the environment in which the bench would be situated.
A significant number of candidates used single word or generic answers e.g. ergonomic and did not receive credit.

(b) Candidates are generally well prepared for this type of question and most responses were very detailed and achieved very high marks.
Candidates must make clear reference to specific anthropometric data in relation to the product in order to achieve full marks. E.g. dimensions of inside of knee to foot to help decide seat height.

(c) There were a large number of fully detailed responses to this question. The majority of candidates focussed on benches, children's playgrounds or litter bins to develop their answers.

2) The least popular question. Many candidates started part (a) and (b) but did not fully complete part (c)

(a) Virtually all candidates referred to the environmental consequences of using fossil fuels and the eventual depletion of fossil fuels.

(b) Responses were varied. Some candidates had a very good understanding of tidal barriers and devices to obtain energy from waves and were able to produce clear sketches. Others ignored the instruction to look at methods of obtaining energy from the sea and described a range of alternative energy systems.

(c) The best responses included consideration of power requirements, different power sources and their design implications, the use of batteries and environmental considerations and recharging systems.
Many candidates produced very brief responses focussing on one issue.

3 Generally well answered although a number of candidates misinterpreted part (b)

(a) Well answered with most candidates referring to specific anthropometric and safety requirements.

(b) Mostly well answered but a significant number referred to features requiring the use of anthropometric data.

(c) Most candidates are aware of JIT manufacturing systems and referred to the lack of wastage due to the response to set target orders and the reduced storage requirements for materials, components and completed assembled stock.

(d) There were many excellent answers to this part, making specific reference to issues such as shape in relation to the function of the product, shape and colour in relation to customer attraction, fashion and trends and the influence of materials and finishes selected.

4 Generally well answered although part (d) proved difficult for a number of candidates.

(a) Well answered with most candidates stating the need for a container to house shavings, of reasonable size to not clutter up a desk and the easy attachment to a range of desk tops.

(b) Very well answered with most candidates referring to the limited number of parts for production, ease of assembly and the availability of standardised or bought in parts.

(c) Some candidates gave very detailed answers stating the use of go / no go gauges to check the size of pencil holes, the sample testing of the sharpness of blades and the visual sampling for colour continuity (plastic body) and blow holes (cast metal body).
A large number did not refer to checks carried out during the manufacture. Many referred to material or initial prototype testing.

(d) There were a number of excellent responses to this question, mostly focussing on issues of environmental concern, value for money and moral discussions regarding convenience and life styles. The most common products discussed were razors and cameras.
Some candidates focussed solely on the issue of recyclabilty and were unable to achieve full marks.

5 Parts (a), (b) and (c) were answered well. A number of candidates did not refer to factors that affected the quality of a manufactured product.

(a) Very well answered with most candidates referring to requirements for specific safety features and enjoyment/engagement factors.

(b) The best responses included details of effective use of materials, bulk purchase/ tessellation, minimal components and production processes and ease of assembly.

(c) Very well answered with a significant number achieving full marks. A number of candidates, however, produced very brief responses focussing on the merits of different advertising media and did not relate their answers to selection of an appropriate form of advertising for children's toys.

(d) The best answers discussed issues relating to the quality of materials used and the processes employed. Human error, machine wear and malfunction were often raised, as was the use of quality control procedures.
A number of candidates did not refer to factors that affect the quality of manufactured products. Some discussed matters relating to methods of identifying quality e.g. BSI kitemark and customer satisfaction but missed out on the main point of the question.

2520/02 Product Design

General

The standard of answers has improved over last year, especially with the quality of answers for the last part of each question where candidates are giving much fuller answers and covering relevant points using quality answers with the use of specific examples. Some candidates are still attempting questions on knowledge gained at GCSE level with the result that they do not do very well.

The general level of technical language has improved significantly; responses to the part b of each questions demands correct and accurate use of technical language. A combination of detailed sketches and notes is a good way of demonstrating candidate's understanding; however, candidates' descriptions of processes need to include more specific detail and provide the correct names of tools and equipment used.

Responses to part (c) are much improved. Candidates are more regularly using practical examples to support their discussions; very few candidates now merely provide a bulleted list. Candidates who used the following format almost always achieved well on this question:

– one key issue/consideration is … this is because ... A good example to illustrate this is …

Answers to part (a) of each question must be qualified – to ensure marks are awarded, single word responses such as 'cheap' are insufficient.

Most candidates showed that they used their time effectively and gave full answers to the questions attempted.

Very few candidates attempted more than the two questions asked for. The usual misreading of questions resulted in answers that failed to gain any credit.

The most common mistakes were:

I(c) Candidates wrote all about the different finishes available for wood rather than discussing the implications of the different finishes.

2(b) Die-casting was described as forging, or sand casting.
4(c) Digital printing was interpreted as digital photography with descriptions of how the image can be manipulated.

Comments on Individual Questions

1 This question was popular with candidates.

(a) (i) Most candidates answered correctly, however one or two put Pine which shows a lack of basic knowledge.

(a) (ii) Nearly all candidates got at least one reason correct, with many getting both marks.

(b) Generally poorly answered because there was not enough detail. E.g. marking out without the correct tools being named. Most named the cutting tools but some got the names of the mortise and tenon the wrong way round on the diagram. There were some clear diagrams. Some had missed showing details of the panel.

(c) Most candidates answered this well with finishes related to the conditions/use of the product.

2 (a) (i) Generally well answered with most candidates naming one or both alloys correctly.

(a) (ii) Some candidates lacked detail knowledge with many only achieving one correct answer.

(b) Many candidates achieved some marks on this question. Again the detail was not there, especially of the mould, to achieve high marks.

(c) This question was well answered with many candidates scoring between 3-6 marks.

3 This was the most popular question.

(a) Generally well answered most candidates picked up at least one mark.

(b) Some candidates muddled their answers with 3a, but most achieved at least one mark.

(c) This was well answered with most candidates achieving 5-7 marks.

(d) Very well answered, most scored full marks. All had heard of Dyson vacuum cleaners and used this is an example within their discussion.

4 Probably the least popular question.

(a) Parts (i) and (iii) mostly right, parts (ii) and (iv) mostly wrong.

(b) Not well answered. Generally students do not have good knowledge of commercial processes only those in the workshop.

(c) Some points achieved marks but this was generally not well answered.

5 Not a popular question.

(a) (i) Most candidates achieved one mark.

(a) (ii) Most candidates achieved two marks. Well answered.

(b) Not well answered because of insufficient detail.

(c) some candidates picked up marks here by describing things in general terms.

6 (a) Most candidates achieved 2-3 marks.

(b) Not enough detail given, not many marks awarded for those who answered this question.

(c) Some candidates answered this very well and others achieved no marks.

7 (a) (i) Generally answered well with candidates scoring 3 marks.

(a) (ii) Mostly correct

(b) Not well answered. Those that did know the process achieved reasonable marks.

(c) Well answered. All candidates had something to say which achieved marks.

2522: Designing (Coursework)

General Comments

Centres had submitted a wide range of projects for this unit and the vast majority of these were suitable and capable of being developed to a high standard.

Centres are reminded that Outline Proposal Forms are to be submitted before the candidates start work on their projects. This is essential to avoid any possibility of inappropriate projects and to ensure that proposals are suited to the assessment criteria. This is also a helpful teaching strategy in that it provides an official focus to encourage candidates to begin thinking in depth about their projects at an early stage. Proposals should be submitted on the specific OPF forms that have been developed for 2522 and 2523. The structure of these forms is such that their use should prevent a candidate from starting a project that might run into difficulties later when attempting to meet some of the final assessment criteria.

Guidelines have been set out in the specification and significant additional advice has been given at Inset as to the amount of material that should be presented for moderation. The recommended number of sheets for Unit 2522 is 30 pages, and for Unit 2523, 15 pages. In general, Centres had followed this recommendation closely. In one exceptional case, however, the work presented for Unit 2522 exceeded this recommendation dramatically with folders that contained up to 265 sheets of A3. There are two factors to consider here. Firstly that there is a requirement for material to be edited and for it to be relevant and focused. Candidates who do not edit their work as required by the assessment criteria will not be able to access the highest tier of marks. Secondly, these candidates must have spent an inordinate amount of time in producing these folders and this could easily have been at the expense of other work for this specification or for other examinations that they are undertaking. The requirement of folio content at this level of examination is for quality and relevance and not for excessive quantity.

Work presented for this session included project work being entered for the first time and some that had been examined previously and which was being re-entered. A significant proportion of the latter folders showed little or no enhancement from the work submitted for the earlier session. Most if not all of those candidates would have left school in July 2004. It was clear that the majority of them had not put in the effort needed to improve their original folios by any marked extent.

1. Recognition and Investigation of Design Opportunities

The selection of an appropriate project is the key to success and this should involve careful discussion between the candidate and the teacher to ensure that the proposal is likely to allow access to all of the assessment criteria and that the product itself can be made within the facilities available. Where this is done thoroughly, the chances of an OPF being rejected are almost next to negligible. Whilst it is important that the outcome is realistic for this level of making, it is also essential that it provides the candidate with a challenging design-and-make situation that will test their abilities throughout the designing and making stages.

The key to success is that candidates choose an individual project that comes from their own experience or research. Only in this way will the project be able to meet a genuine identified need.

The best work presented had allowed candidates to explore a variety of solutions and had been approached in an open-minded way without having any preconceptions of the final outcomes. This is also very important to success.

Candidates are advised to consider issues outside their focused design problem, as this will often provide wider awareness of possible routes to take and give greater insights into the possibilities offered by the problem. It can help to reinforce the importance of avoiding a preconceived and narrow approach to the work. Section 1.2 was often presented at a very superficial level with little evidence of analysis of the potential of the project.

The time plan is one area that generally needs greater attention if candidates are to avoid a superficial approach. Too often these plans are simply a class exercise against the assessment criteria rather than a genuine plan that is focused upon the specific needs of the individual project. It is also important that the plan is produced for a purpose and that it is used for that purpose. It is only too apparent that many of these plans have been produced, placed in the folio and then forgotten. It is helpful if there is evidence on the plan that it has been used and that it has been adapted, as circumstances require.

When identifying primary and secondary sources of information, the key word is relevance. Candidates need to consider why they are intending to collect this information and what value it will have to the rest of the project. In this respect they would be well advised to look carefully at section 2 of the assessment criteria, 'Synthesis', in which detailed elements for analysis are set out. The identification of suitable sources of information should itself be detailed and not simply a list of vague areas where research might take place, as presented by the weaker candidates. The better work for this section involved specific sources of information and this demonstrated that those candidates had given careful thought to the requirements of this section. The main error in this section was the presentation of generic sources rather than specific named ones.

The collecting and recording of data by candidates separated itself into two clear categories. Those candidates who carefully edited the material and then presented only that which was relevant, and those who simply pulled together everything they could find with some link to their project, however tenuous that might have been, and who then inserted all of it into the folio. The candidate who eventually presented a design brief on page 181 of the folio was clearly in the latter group. There are specific requirements from the use of this data, listed in this part of the assessment criteria and again under section 2, which should guide candidates as to the type of information they should be looking for. Many candidates overlooked the fact that the two main aims when analysing this material are to provide information for later use and to provide information for use in the development of a design specification.

It should be noted that this is not the section to present material, ergonomic or technical research, especially when this consists of what is no more than general theory material that has no focus whatsoever. The assessment criteria clearly identify the place for this as the section requiring evidence of further research. The need then is for specific and tightly focused material that is needed for identified aspects of design development and not for endless pages of general theory that show no evidence of direct relevance or editing.

It is essential that candidates develop the ability to seek useful information and to edit this and to present only that, which is directly relevant to future work in the project.

2. Synthesis

This section requires candidates to analyse the edited information under two specific headings:

- The analysis of edited research material to identify strengths and weaknesses in existing products to provide information for later use.

- The analysis of edited research material to identify the constraints caused by environmental factors, moral issues, social issues, user and manufacturer needs, cost factors and market opportunities, to provide information for use in the development of a design specification.

The wording of these criteria provides clear guidance to candidates to help with the initial identification and editing of information and also to help them to focus upon what they should be aiming to obtain by careful analysis. Advice at Inset, and in previous examiner's reports, has focused on the need to integrate this analysis with the actual presentation of information, rather than presenting several sheets of data, followed by separate pages of analysis. Candidates are advised to use annotation directly onto research material, rather than presenting data and analysis separately and to annotate in a way that is analytical and not simply descriptive. This tendency to simply add descriptive comment to data, whether by annotation or, as a separate block of text, was a failing in some of the folders moderated. In some instances work was duplicated and added to the number of pages unnecessarily. Existing products were presented for description and then again for analysis. Careful editing should have prevented this.

The quality of presentation covered the range that one would expect to see at this level. Some work had been set out in a clear and structured manner, making use of a variety of appropriate techniques, including the use of ICT. In weaker projects, however, the material lacked structure had not been carefully edited, and presentation lacked sophistication, often with much untidy cut-and-paste material. Candidates at this level should be able to use ICT at a sophisticated level to enhance the presentation and communication of their work. It should be noted that neatness alone is only part of what is required. Clear communication is equally important and excessive verbosity does nothing to aid communication. Folios that contain page after page of word-processed material are not good examples of design folders. Written material should be kept to a minimum throughout the folio.

3. Generation of Initial Ideas

Candidates produced a variety of appropriate design briefs, most of which were of an acceptable quality. The better briefs offered opportunities to explore a variety of solutions and had encouraged an open-ended approach to designing. Weaker briefs had focused onto too narrow a solution and tended to demonstrate a more preconceived approach to the outcome.

Design specifications were generally detailed and there was evidence that Centres had made full use of the advice given at Inset on this issue. The main area of weakness in some projects, however, was that the specification was not clearly developed and justified from the objective analysis of research data as required by the assessment criteria, but had been presented as a fait accompli. The need to develop a specification and not to simply present it is reinforced in the assessment criteria for this section and for section 2. One further weakness was the inclusion of a high proportion of generic specification points that could have been applied to any product and which were not specifically focused on the chosen need. Often the specification points were statements of what information still needed to be obtained rather than specific criteria that came from research.
It is a specific requirement in the assessment criteria that initial ideas are generated using

annotated sketching. It was pleasing to see that this advice was now being followed by the majority of Centres and that candidates were also analysing their ideas by annotation rather than as separate conclusions on later sheet. This should result in the genuine flow and development of ideas, leading to better solutions, instead of what happens with the inappropriate stop-start approach caused by separation. Presenting ideas using ICT only is not acceptable and does not meet the requirements of the assessment criteria.

When developing initial ideas it is important that candidates explore a variety of routes towards the final solution and that they present a range of significantly different ideas. Weaker candidates tend to present sheets of ideas that are simply minor variations on a theme and not genuinely different approaches. Weaker candidates also tend to take a haphazard approach to the generation of ideas, which generally appear from nowhere and lack genuine analysis and evaluation. It is essential that the specification should form the basis for the objective evaluation of ideas, aiding the identification of strengths and weaknesses and providing the platform for detailed development and refinement.

All projects should have a need for additional research that is only relevant at this point in the design process. The assessment criteria include pointers for what type of research would be appropriate at this stage. This includes such factors as available materials, processes, ergonomics, etc. In some projects this had been done correctly and such research had been focused onto the specific needs of the developing product idea, as it should be. Simply inserting theoretical material is inappropriate and the research must be focused on the specific needs of the design process.

4. Development and Modelling

It has been mentioned in the previous section that the analysis of ideas and the consideration of other constraints should be presented as annotated comments on the ideas sheets themselves. In general this was an aspect of the work that required greater thoroughness. Much of the annotation or written text presented had been of a subjective nature and had not made use of the analysis of data done earlier to provide the basis for such analysis. Such commentary should not be done for its own sake but should be seen as aiding the development of an optimum and thoroughly justified final solution.

Another technique that was used and which is not recommended was the use of tabular analysis in which ideas were given a score against each of the assessment criteria. This is a particularly subjective approach that adds nothing to the design process. Good designing requires the work to flow and this can only be achieved by the use of annotation on the actual design sheets. Tabular analysis prevents the flow and development of ideas.

The use of modelling is a key element in this final development. The better candidates had recognised this and models had been integrated into the designing stage, evaluated and tested, and the information gained had then been used to take the idea forward. It is important that candidates think carefully about the aims of their modelling and the value that they hope to gain from it. It must not be simply an afterthought in an attempt to gain marks but should form a key part of the design process. The standard of modelling has improved significantly in recent years but greater care still needs to be given to the aims of this modelling and what it is hoped to learn from the process.

The key factor in modelling is that models should be evaluated, tested if appropriate and the results of this work set out in a manner that identifies its relevance to further development of the solution. This was variable and often there was little evidence of any genuine evaluation of these models. Comments were often simply descriptive and subjective.

The final part of this section is still not done well by most candidates. There was a general failure to take the final intended solution and to modify or refine it in sufficient depth to

take account of the factors listed in the assessment criteria. This section often consisted of the final idea presented with little or no further development from the modelling stage.

In general, therefore, for Unit 2522, it is essential for candidates to follow a structured approach to their work and to match the requirements of the assessment criteria with greater care. Candidates would greatly benefit from being taken through all of the criteria before they start work and from identifying the nature of the material, or the type of research that is likely to be appropriate at each stage. They should also be encouraged to set out their folders in a structured manner, matching the assessment criteria exactly and with a clear heading for each section. The majority of Centres now encourage their candidates to produce a carefully structured folio but there are still some candidates whose folios are too haphazard.

Of greatest importance is the need to edit material and to present only that, which is directly relevant. Candidates should be encouraged to aim for the recommended number of sheets of A3 as set out in the Specification. Guidance on how to achieve this has been presented at Inset. Centres need to guide candidates carefully on this aspect of folder presentation and avoid submitting excessive material.

It is also necessary to remind some Centres of the instructions on page 58 of the Specification:

Plastic sleeves are not permitted for any work sent for moderation.

No three-dimensional material is to be included.

It would be appreciated if Centres would follow these instructions.

2523: Making and Evaluating (Coursework)

General Comments

There were insufficient entries for this component for a meaningful report to be produced on their success. The following comments are given as guidance and are based upon the advice that has been presented at Inset.

The recommendation for this unit is that the work should be presented in approximately **15 sheets of A3 paper plus photographic evidence**. This figure assumes that each sheet contains a reasonable amount of material and that the work is as compact as possible. Photographic evidence would normally consist of the equivalent of three pages of A3.

The folio must not include three-dimensional work in any form, e.g., material samples, practical experiments, jigs, etc.

Evidence of such work should be included in the form of photographs at the appropriate place within the folio.

Evidence of the end product should be presented in the form of photographs at the end of the folio, as outlined previously. These photographs should include clear sharp photographs of the complete outcome, viewed from various angles, and with some object included to identify the size and scale of the outcome. There should be additional clear photographs that show close up detail of construction and quality of finish.

Video and audiocassettes and computer disks or CD-ROMs should not be included for moderation purposes.

The only material that will be taken into account is the material presented visually on the A3 sheets.

Plastic sleeves must not be used for design sheets presented for moderation for this unit and for unit 2522.

1. Planning and Making

Working drawings:

It is recommended that up to three sheets of A3 be presented for this section. Candidates should:

- produce working drawings in a format appropriate to the type of product;
- produce working drawings to a recognised standard (e.g., orthographic projection);
- produce working drawings that should be sufficient for a third party to make the product.

Centres are strongly recommended to use CAD for these working drawings as this adds a level of accuracy and sophistication that is rarely seen in hand drawn work. The majority of Centres are now using suitable CAD packages.

Plan for making:

It is recommended that two or three sheets of A3 be presented for this section. Candidates should:

- present a plan for making that includes details of materials and processes to be used;
- include in this plan the key health and safety issues to be observed during making;
- include a simple risk assessment to identify potential hazards that might occur during making;
- include basic targets to meet against a time plan for making.

It is essential that this plan be produced before making begins and that it is not produced retrospectively. The latter approach would create problems for the candidate at the evaluation stage.
Plans for making should be detailed lists that meet the above requirements. The use of illustrated step-by-step process sheets is not recommended. Some excellent examples have been seen where spreadsheets have been used to good effect for this section.

It is also important to consider quality control at the planning stage as it can only be evaluated later if it has been included in the making from the start.

Appropriate materials, etc; a well-made product; quality control:

The marks in these sections are allocated for the practical outcome. Evidence of the actual use of quality control may be included in the next section.

Evidence of the use of specific skills, materials and processes, together with key stages of manufacture, such as the use of jigs, quality control, etc, should be presented in the form of clear photographs mounted on A3.

Candidates are advised to keep a photographic record of the key stages of their practical work. Digital photography is ideal for this purpose.
Evidence of the quality and complexity of the **end product** should be presented in the form of clear photographs. These photographs should give an indication of:

- the overall size of the product;
- its appearance from several viewpoints;
- the quality of finish and complexity of construction employed.

It would be expected that a minimum of four photographs would be required to provide evidence of the final product, including some close-up photographs to show necessary detail.

It is the responsibility of the Centre to ensure that sufficient photographs of the end product are provided and that these are of good quality. Digital photography is perfectly acceptable for these final photographs, provided that the prints are produced on photographic quality printing paper.

Record and evaluate progress:

It is recommended that this section should be presented on two sheets of A3. Candidates should:

- identify the key stages of making and comment upon the success or problems experienced;
- use diagrams to show and explain any modifications made during manufacture;
- refer to the use of quality control systems during manufacture.

The important thing to remember is that this is more than a diary of making as the candidate is required to evaluate the effectiveness of their making.

2. Testing and Evaluation

Evidence of testing and analysis against specification:

It is recommended that this section of the folio be presented on two sheets of A3, plus photographs. Candidates should:

- present clear evidence of the testing of the final product, preferably by the use of photographs;
- present an objective evaluation against the design specification which analyses the level of success achieved in meeting each criteria;
- identify the strengths of the product through analysis and testing;
- identify the weaknesses of the product through analysis and testing.

The important factor is that this work should be objective and that it should avoid the personal and purely subjective approach that can be taken by weaker candidates.

A positive and responsive attitude to external evaluation:

It is recommended that the final external evaluation and response be presented on one sheet of A3. Candidates should:

- present any final external evaluation first hand if at all possible;
- present their responses to this final external evaluation;
- show evidence of responding to external evaluation and advice throughout the project.

The key factor here is that external evaluations are much better if presented first hand and not simply reported by the candidate and that clear evidence is presented of how the candidate has responded to this external advice.

Detailed modifications for the one-off prototype:

It is recommended that this section of the folio be presented on one page of A3. Candidates should:

- present detailed modifications to improve the identified weaknesses in their one-off;
- use annotated sketches to present modifications.
- use as little written material as possible.

Candidates should be responding to the strengths and weaknesses that they have identified in their evaluation and need to present detailed modifications for improvements. A simple statement of what needs to be done will not gain many marks, if any.

Cost analysis:

It is recommended that this section of the folio be presented on one sheet of A3. Candidates should:

- identify the costs incurred in making their one-off;
- identify from previous research what would be a competitive commercial price for their product;
- identify the opportunities available to the commercial manufacturer to reduce manufacturing costs for this product.

What candidates need to do for this section is to show some awareness of the pressures and constraints involved in commercial manufacture that are different from those linked to their making of a one-off prototype.

Potential for industrial production:

It is recommended that this section of the folio be presented on one sheet of A3. Candidates should:

- identify and justify an appropriate scale of production;
- identify how time and cost constraints can be overcome during manufacture;
- identify and justify the materials appropriate for the industrial production of this product;
- identify and justify the processes suited to industrial production.

Candidates are best able to approach this section where they have had experience of industrial production at some stage in their course.

Detailed modifications for commercial manufacture:

It is recommended that this section of the folio be presented on one sheet of A3. Candidates should:

- present clear details of the modifications necessary to their one-off prototype to make it suitable for the materials and processes selected as appropriate for industrial manufacture;
- use annotated sketches to present these modifications;
- use as little written material as possible.

It is important that such modifications are detailed and that they are realistic. Since the commercial production process may be very different from the one-off process, it is likely that there will need to be significant changes made to the original design.

2524/01 Product Design 2 (Written Examination)

Introductory Comments

All questions were attempted with numbers 1, 2 and 3 being the most popular. There was little variation in the number of candidates answering these questions; however very few attempted to answer questions 6 and 7.

Section (b) of many of the questions was poorly answered by many candidates. The main reason for candidates failing to gain marks in this section was a lack of a depth of knowledge, especially in the commercial production of articles. They tended to rely on production methods practiced in a school workshop. Centres are again recommended to encourage their candidates to consider how products are made in commercial numbers, rather than one-off or small batch production runs. Candidates with a sound background knowledge of commercial manufacturing techniques performed well in this section.

It is also noted that whilst some centres are improving, there are still many candidates who fail to 'discuss' their responses in section (c), tending to make simple statements without any explanations and giving very few examples. Candidates appear to be centring their answers on generic arguments and there is a tendency for the weaker ones to try and make responses, such as 'recycling' and 'landfill', to fit any question rather than addressing the discussion asked for in the question. Centres are advised that they should not try to train candidates in set responses. Good candidates are able to give reasoned support to the issues they raise and suggest examples in the context of their discussions. Weaker candidates will generally try and give a simple named example such as 'oak', 'kettle', 'table' etc without it being central to the point they are discussing and with it failing to consolidate any explanation they are making.

Centres are again reminded that they should make candidates familiar with the rubric that appears on the front of the examination paper, particularly those points that refer to the instruction to discuss. Candidates are instructed to:

- identify three relevant issues/points raised by the question;
- explain why you consider these points to be relevant;
- use two specific examples/evidence to support your answer.

It appears that, when candidates' responses are compared to typical responses given at AS level, many of them are not developing their knowledge beyond that gained at AS level, to what should be considered A2 standard. As a result the subject-based knowledge of these students can be superficial. It is also noted that in the Graphics and Textile specific questions it seems that some candidates are relying on a perceived knowledge or knowledge gained at GCSE and therefore fail to answer all parts of the questions fully. It is clearly evident, by the responses given by the candidates, which Centres teach Graphics and Textiles beyond GCSE.

Candidates' spelling and the specific use of correct technical terms was at times weak. The quality of annotated sketches was disappointing, with many candidates failing to communicate the detail required to score maximum marks. The candidates that performed well in this examination demonstrated that they had a broad knowledge of more than one area within this subject.

Comments on individual questions:

1) This was one of the most popular questions on this paper.

(a)

(i) Most candidates were able to identify a suitable hardwood. However there were a significant number of candidates who wrongly identified 'pine' as being a suitable hardwood.

(ii) Most candidates were able to identify a suitable manufactured board.

(iii) Most candidates were able to give two responses, but there were many generic terms used such as 'oil'

(iv) The better candidates had a clear understanding of how the top of the stool would be attached. Weaker candidates tended to describe how they would screw through the surface of the seat and into the rails of the stool. There were a number of candidates who responded by centring their answer on the wrong stool.

(b) The standard of the communication skills demonstrated by candidates was disappointing in response to the question. This lack of skill prevented these students from easily amplifying their answers. Many candidates failed to understand how the joint would be manufactured and assembled. Better candidates were able to give a clear description of how a joint, such as a mortise and tenon, would be produced and held during assembly. It is disappointing to note the lack of understanding of simple jigs/fixtures considering that it is a key part of GCSE courses which most of the candidates responding to this question would have taken.

(c) The weaker candidates concentrated their answers on the cost of hardwood in comparison to softwoods and then they proceeded to centre their discussions on the use of softwoods and managed softwood forests. The better candidates considered the environmental and moral issues surrounding de-forestation. They were also able to consider other issues such as using hardwoods in production and the effects of hardwoods on tooling etc.

2) This was a popular question but it was poorly answered by a significant number of candidates.

(a)
(i) This part of the question was generally well answered.

(ii) Most candidates were able to gain two marks for this section. Some of the weaker candidates thought stainless steel was a common material used to make cans.

(iii) This part of the question was poorly answered with a significant number of candidates showing very little understanding of the properties of the metals used for food and drinks cans. The better candidates were able to refer to such terms as 'ductility', 'plasticity' etc.

(b) Very few candidates had an understanding of how cans could be formed. The majority of those who answered this question responded by describing the process of rolling the can body and welding the seam. The knowledge of how the body would be formed into a cylindrical shape was very weak. The better candidates tended to describe the process of cold forming. Their answers included reference to a two-stage process and included details such as how the sides of the can would be 'ironed'.

(c) The weaker candidates concentrated their answers on the recycling of metals and landfill issues. Their responses showed little knowledge of mining implications or to energy requirements. Better candidates were able to use examples such as bauxite mining and land scarring issues. They also gave comparisons of energy level requirements for ore refinement. It was these candidates that were able to look at the recycling issues in context, by comparing the energy usage in refinement to recycling materials such as aluminium.

3)

.

(a)

(i) This part of the question was generally well answered. The weaker candidates tended to name unsuitable thermo-forming plastics.

(ii) Most candidates were able to gain two or three marks for this section.

(iii) Most candidates were able to give at least three characteristics and properties that could be changed by using additives with plastics.

(b) The better candidates who answered this question were able to describe in detail the process of compression moulding and included references to the type of mould required, the slug, flashing etc. There were a number of weaker candidates who confused compression moulding with vacuum moulding or casting.

(c) The weaker candidates concentrated their answers on generic responses such as ‘sharp edges’, ‘children using the product’, etc. They also failed to address the fact that the question asked them to discuss the implications for the manufacturer and not the consumer. The better candidates were able to discuss such issues as testing procedures and the legislation requirements faced by manufacturers, giving examples such as BSI and IEE regulations in support of their responses.

4)

This was not a popular question.

(a)

(i) Generally well answered with most candidates gaining two marks for this section.

(ii) Well answered, most candidates were able to gain two marks for this section.

(iii) The responses to this part of the question were disappointing. The better candidates were able to give an outline of the commercial process of embossing and mentioned such features as using damp board, male and female dies, as well as perhaps the involvement of heat and pressure.

(b) The better candidates who answered this question were able to describe the process of offset lithographic printing by including details such as roller litho plates, how they are dampened and inked, transferred to a blanket cylinder and then to paper. These candidates were also able to demonstrate their knowledge through clearly drawn and annotated sketches. Weaker candidates lacked detail in their answers, which were generally poorly drawn and lacked annotation.

(c) Most candidates were able to discuss the implications of joining dissimilar materials and the extra time and expense that this involved. However many candidates failed to secure all of the marks for this section through a lack of detail in the explanations or examples used to support their answers.

5)

This was a popular question but was generally poorly answered by a significant number of candidates due to the lack of graphical knowledge. As the question is written mainly for candidates who are learning graphics as one of their areas of study, the drawing and sketching skills demonstrated by their answers is surprisingly low.

(a)

(i) Generally well answered with most candidates gaining two marks for this section.

(ii) Well answered, most candidates were able to gain two marks for this section.

(iii) Most candidates were able to score at least two marks for this section. There were a significant number of candidates who did not score maximum marks for this part and who failed to give the obvious answer of 'quickly assembled at the checkout'.

(b) Weaker candidates showed little understanding of the locking mechanism required by the holder and were unable to demonstrate the knowledge they did have due to very poor graphical skills. The better candidates who answered this question were able to describe in detail the form of the net and how it folds up as a single-piece unit. They clearly indicated, through sketches, how the base locked, thereby reinforcing the bottom of the carrier.

(c) Many candidates failed to understand the meaning of 'Computer Integrated Manufacture' and tended to give very simplistic examples of CAD/CAM. They also failed to centre their discussions on the packaging industry as required by the question. They also generally gave very generic computer based responses. The better candidates looked at the broader issues involving computers in the packaging industry and looked at such examples as the globalisation of the industry, stock control/ordering, tracking and invoicing through computer systems.

6)

This question was one of the least popular of this paper and was generally answered poorly

(a)

(i) Generally well answered with most candidates gaining three marks for this section.

(ii) Well answered, most candidates were able to gain two marks for this section.

(iii) Generally well answered, most candidates were able to score at least two marks for this section.

(b) Weaker candidates showed little understanding of how the gloves could be made, with some even suggesting that the gloves would be made first and then the wadding inserted after their manufacture. The better candidates who answered this question were able to describe in detail the process of combining the three layers and how the quilting would be completed using the correct machining techniques. The better candidates made good use of sketches and annotation to explain their answers.

(c) Many candidates failed to discuss how computers have impacted on the development of new fabric designs and again tended to rely on very generic computer based responses. The better candidates looked at the broader issues involving computers in the textile industry and looked at such examples as the testing of colour ways, fast prototyping and the ability to download directly into manufacturing systems.

7) The candidates who answered this question appeared to be basing their knowledge gained at GCSE or based their answers on techniques that are suitable for use within a school rather than techniques that would be used to batch produce Tee shirts commercially.

(a)

(i) Generally well answered with most candidates gaining two marks for this section.

(ii) Well answered, most candidates were able to gain two marks for this section.

(iii) Generally well answered, most candidates were able to score at least three marks for this section.

(b) Weaker candidates showed little understanding of how the Tee shirts could be made up in a batch and tended to centre their responses on how a single item might be produced in school. The better candidates who answered this question were able to describe in detail the process of laying out the pattern pieces/cutting and how the Tee shirts would then be dyed as part of a batch production process.

(c) Many candidates failed to discuss how dyes have impacted on the environment. The better candidates looked at the broader issues involving dyes in the textile industry and looked at such examples as mordents and the possible harmful effect that they could have on the environment, safe disposal of chemicals, possible fume release, collection of raw materials etc.

2524/02 Produce Design 2 (Design Thinking)

(Centres should refer to the published generic mark scheme for this unit when reading this document which is attached to this report.)

Introductory comments

Centres will have noted that the pre-release sheets and the stem of the questions gave limited information. This was to help the candidates in providing specification points that were 'candidate generated' and hopefully gave opportunity for inspired and innovative thinking.
As for the summer session the January sitting was marked against a slightly modified mark scheme

The main areas affected by the changes were in:-
(a) The specification points, where candidates who gave unqualified statements which could be related to any product received 0 marks. Equally in this section, any candidate reiterating a basic statement from the stem of the question, which had not been expanded, constituted a repeat statement and also gained zero marks. Despite continuous mention at previous INSET and in examiners' reports, many candidates are still using generic statements which do not receive credit.
(b) Centres will note that the marks given in the section for dimensioning and materials had been reversed, in that materials are now a maximum of three marks and dimensioning is two.
(c) The rest of the sections of the mark scheme had been broken down to facilitate a differential structure in the awarding of marks commensurate with the quality and depth of responses.

(d) The interpretation and structure of the marking scheme for the effective communication section has provided better differentiation of candidate responses where all candidates could access the full range of marks.

Most candidates interpreted the rubric successfully, and time management seemed reasonable, the majority of candidates offering what appeared to be a 'complete' answer. Some centres are still using treasury tags (or similar) which made the assessment process more difficult than necessary. It would be helpful if the papers were collected and **loosely enclosed** in the headed, folded A2 sheet provided.

The overall performance of candidates was similar to previous years, although the restructuring and re-emphasis of the mark scheme has changed the pattern and range of marks awarded. There was, if anything, an increase in the number of Centres that had obviously guided candidates in answering selected questions, often attempting to second guess the question with the result that candidates produce 'stock' solutions. These often miss crucial aspects of the actual question set. This was very apparent when candidates from entire Centres had approached questions using very similar methods and responses. Even more common was the approach of standard specification headings – which usually result in generic points which are not worthy of credit. It would seem that these Centres are not using the pre-release sheets appropriately and are over preparing their candidates to their detriment. Centres would have found that a reduced amount of information was available both on the pre-release sheets and in the stem of the question.

This certainly paved the way for candidates to interpret a design brief in more depth without repeating specification points indicated in the stem.

Specification Points

Although some candidates continue to make generic statements, or simple repetitions of data points this seems to be less marked than in previous sessions. Some Centres have not fully understood the requirement of this section and as a consequence their candidates perform very badly making broad statements about issues such as social, *environmental issues, target market, advertising, packaging etc.*
Other issues were:

- generalised comments about environmental and social issues were made that did not relate to particular products (all questions);
- generalised comments about keeping the cost of production down to ensure that the product was 'cheap' for the consumer, were common in nearly all specifications;
- most candidates mentioned ergonomics and anthropometrics in their answers, but very few suggested where this data might be useful in their product;
- most specification points were very general. Candidates did not relate the points to their chosen product and the comments could have been valid for any product. Very few candidates scored highly in this section due to repeating points already given in the question and not expanded or qualified. The new marking scheme reduced significantly the marks awarded here, mainly because candidates gave specification points that were not related to the product or were generic in nature. The usual 'repeats' were in evidence for many;

Many candidates will still put generic statements that are not related to the product in question; these are mainly unqualified statements that can relate to any given product. No marks are awarded for such statements.

Initial Ideas

General comments.

Ideas tended to be fairly uninspired 'standard' offerings but in some cases have shown evidence of considerable technical knowledge of materials, components and construction. (Although this varies considerably from Centre to Centre) Weak areas remain M, D (dimensioning) and E which is frequently very cursory.

R *Range of Ideas*

The range of ideas varied. Some candidates only offered slight differences in their ideas, which hindered their chances of gaining full marks in this section. Ideas generally lacked sophistication, sleekness innovation and creativity. There seemed to be an increase in 'different ideas' but still more candidates need to provide significant variations. A few candidates tended to offer one idea with subtle changes for ideas two and three. The weaker candidates resorted to offering changes in basic shape and appearance instead of any rigorous, detailed, in- depth design thinking reflecting 'significantly different ideas'.

S *Functional aspects of the specification*.

In general, candidates scored highly in this section. There was evidence of checking against specification points and candidates seemed to have thought out designs clearly so that they would actually function as intended. Annotation of ideas was quite logical on the whole and easily followed by a distant reader. The weaker candidates made little or no reference to their original specification points in the annotated sketching very often offering basic description to what was obvious in the sketching.

M ***Quality of design relating to volume production and wider market issues***

On the whole this section was poorly attempted. Many candidates gained little or no marks. Very few candidates scored highly in this section. . Annotation in regard to marketability and mass production was weak. There were very few responses that included any thought on quantity manufacture or quality control. Some candidates did mention appropriate manufacturing methods, but failed to go any further than this. It was obvious to very few candidates that volume production and market issues should feature prominently in the design of a product and where there was clear evidence relating to suitable design options in the candidates design thinking and considerations they were rewarded for their detailed inclusions. Unfortunately these candidates were few in number, being the exception rather than the rule. Thoughts and discussion of simplicity of design for manufacturing consideration should be evident in any early design thinking of a commercial product.

D ***Materials***.

Most candidates successfully identified a number of alternative appropriate materials for their designs. Some candidates named materials in generic terms or suggested correct names for materials that were however, unsuitable for the product. It was good to see more of the graphic product candidates suggesting appropriate specific materials in their initial design thinking instead of the obvious generic terms (for which there are no marks). At A2 level it is important that candidates should have a detailed knowledge of specific and appropriate materials and this should be reflected in their responses. There are still many candidates offering inappropriate materials in the context of the design brief and some offering generic terms such as card, hardwood, softwood, thermosetting plastic, thermoplastic, 'stretchy' fabric etc for which 0 marks are awarded.

D ***Dimensioning.***

Very few candidates suggested dimensions other than the ones already given or very basic calculations of size. Many failed to provide detailed dimensions to gain the higher mark.

C ***Consideration of construction***

Very few candidates scored more than 3 marks in this section. Many candidates failed to provide enough detail or thought when considering making or assembling the product that they were designing. Components were mentioned in a lot of answers but technical terms and justification of choices was rare. Where a fabricated solution was suggested very few candidates failed to show any constructional detail or alternative methods of assembly. The naming of processes in itself will not enable the candidate to achieve the higher mark range. Candidates need to propose alternative appropriate methods of construction and provide further detail, including how the process may influence the design of the product, to gain the higher marks.

E ***Formative evaluation of ideas with reference to the specification.***

The better responses for this section showed a depth of thinking and discussion in the annotations but again this was unfortunately in rare cases. Although candidates seemed to be better at reasoning, they still lacked clarity of thought and failed to show evidence of technical knowledge in their annotations. The majority continue to lack formative comments and are in fact little more than descriptions of points evident in the sketches presented.

Features Suitable for Development

Many candidates approached this section with text only answers. This method is perfectly acceptable and candidates can access the full range of marks provided the features are clearly highlighted and justified in the text

F ***Features identified for development*** This section was better than last year. Candidates did successfully identify particular features from their initial ideas, but very few candidates scored full marks. Many are still listing their best design features from their separate initial ideas.
Some candidates evaluated all their ideas using a tick box table taken from their original specification points, therefore no particular features were actually chosen and the subsequent justifications became personal and subjective. There is a wide variation of what is presented dependent upon candidates' time allocation. A list of features for development when done with thought is quite good. Those who provide sketches with a list gave obvious descriptive commentary some with little justification were awarded some marks. The higher marks are on offer to the candidates who provide a clear combination of sketches that identify features and provide objective justification. A good approach to this section would be to identify strengths and weaknesses and then giving a combination of object and some subjective commentary for justifying the positive and negative features for development. However, it is clear some candidates have poor time allocation and do not do well because they have obviously mismanaged their time. For these candidates, this section tends to be completed in haste and consequently some candidates provide superficial detail, missing major points and lacking objective evaluation.

J ***Appropriate justification of the choices made***
Few candidates were able to justify their choices in detail. Many candidates resort to obvious descriptive annotation rather than thoughtful justification of choices made. References were made to specifications, but these references were very general for a lot of candidates. Too many candidates lacked reasoning in their justifications and failed to show any technical skill or knowledge to gain full marks.

Efficient Communication.

There was evidence of a considerable variation of standard. Some very good work with clear graphical communication and appropriate annotation genuinely adding information rather than simple amplification of what is already evident from the drawings which characterises some weaker work. At the other extreme there are many very weak responses in which poor quality sketching and limited annotation lacks any real detail and does not give the impression of work of a candidate on an advanced level course.
The majority of candidates produced sketches in 3D, although the quality was not always high. The new interpretation has certainly allowed reward of good candidates. The range of techniques used was limited (Therefore designs lacked sophistication). Some showed enlarged views that were not, unfortunately, any clearer or more detailed than the original. There was a severe lack of detailed, sectional and exploded views even amongst higher scoring candidates. This relates to the lack of constructional and technical knowledge displayed in the initial design thinking.

Individual questions

Question One: Not particularly well answered, despite students seeming to struggle for inspiration in the ideas section. Many students did not interpret the question well believing that they were asked to design a portable package for the delivery of goods rather than a fixed base. Some candidates ignored the instruction in the stem of the question and proceeded to focus on the locking system of the container. Some candidates were able to produce some interesting solutions which included interesting features for the delivery, security and aesthetic elements of the design areas posed.

Question Two: Very few chose to answer this question. For most candidates this was not well answered. The responses tended to be poor in all areas.

Question Three: This was the most popular question and generally well answered. The theme was one that many students could relate to on a personal level with evidence of first hand knowledge of similar products and the needs of the user of such a product. This was evident in the fluent responses afforded by most if not all candidates that attempted this question.

Question Four: Answered reasonably successfully mainly due to the theme that again candidates could relate to easily.

Question Five: Not well answered with candidates seeming to struggle with all areas of the question. The main thrust of the design thinking should have been centred on that the product was to be a free promotional gift that could be assembled into a 3 dimensional container from the 'flat'. Many candidates failed to bring these concepts together to produce a realistic outcome.

2525/01: Systems & Control Technology

General Comments

A surprisingly small number of candidates chose to sit the paper this session so these comments, although reflecting what transpired in both parts of the paper, may not anticipate trends for the majority who sit the paper in June.

Far too many candidates did not seem equipped to tackle the paper, either in terms of knowledge or preparation. Consequently their responses lacked the accuracy and specialist knowledge needed to attain the higher marks. The new specification, which will be first examined in January 2006, may help candidates in this regard because each focus area is well delineated and documented, and questions will not require knowledge from other focus areas. Equally, candidates will find having six questions in the new examination instead of the current three will greatly improve choice.

The standard of responses for the 'discuss' questions showed very little improvement in quality and depth of thought over those offered for similar 'discuss' questions at AS level. Candidates should have greater knowledge and maturity one year after AS examinations.

The least popular question this session was question 3, and this may be due to the number of calculations required in the question. This was, in fact, a purely electronics question, which should have made it more accessible. However, the candidates who attempted question 3 did not perform well at all and a lot of this must be put down to their computational skills.
Questions 1 and 2 were almost equally popular amongst candidates. Question 1, being mainly mechanical, seemed just to have the edge in popularity.

Comments on Individual Questions

1 (a) (i) Most candidates had some idea about torque but few were sure it was 'the measure of the force applied to produce rotational motion'. Turning effect, turning power or turning force were acceptable.

(ii) The vast majority of candidates had no trouble at all sketching a single-start worm and worm gear with appropriate labelling.

(iii) Most candidates could offer one useful feature but were generally a bit vague on the second reason. Most popular responses explained the large reduction ratio and / or a change of motion through 90^0.

(b) (i) Answers were many and varied but rarely achieved the totally correct solution. Some candidates missed the fact that it was a reduction and used 12/40, while others added the three ratios instead of multiplying.

(ii) The most common answer for this question was steel. Rarely did a candidate offer brass or phosphor bronze, and those that were correct usually offered nylon as the suitable material

(iii) Universally well answered. Candidates were quick to spot that A and C needed to spin freely.

(iv) Quite a few suggestions, some suitable, including the use of a grub screw or pin, but welding was not a suitable answer.

(c) (i) Very few candidates could sketch a diagram of a slotted or reflective opto-switch, nor did they know what an encoder disk was. Suitable diagrams of a sensor / receiver pair were acceptable provided there was some mechanical link between them to ensure the accuracy of the beam.

(ii) Most candidates knew the Schmitt trigger had some effect on the waveform but not many candidates could fully explain how it will clean up the signal. Sketches to help explain the change in the waveform were given credit.

(d) Candidates did not make the most of this type of question. The INSTRUCTIONS TO CANDIDATES explain what the term 'discuss' denotes and therefore what points are expected in the answer. It might help candidates with this type of question if they practised it as homework or, if time is available, a class work exercise.
In this particular question candidates lost their focus and tended to get sidetracked by issues of safety and specific product / sales issues. Two examples to support an answer should have been straightforward, but rarely were two examples offered by candidates.

2 (a) (i) Good standard responses. Snaking pipe work or directing compressed air at a person were the two most common responses.

(ii) Candidates who knew the dangers knew what to do to overcome them. The most common responses were checking connections, guarding and protection.

(b) (i) Sketching a curve, in this case to show an increase over time, was completed fairly successfully by most candidates. Some candidates went to a great deal of trouble but a simple, quick, labelled sketch was sufficient.

(ii) There was some misunderstanding of the circuit operation in this part as well as most of the rest of this question. Candidates were expected to note the time delay function produced by the restrictor and the pressure-sensitive nature of diaphragm valve Q.

(iii) Many candidates missed the fact that valve Q produced a signal at R if it was NOT operated by a signal from valve A. Most realised the purpose of valve R, to outstroke cylinder P when both input signals are present, but not necessarily the how.

(iv) The majority of candidates who attempted this question understood what was required. Bigger reservoir or moving the valves closer together were the two most popular responses. Candidates were expected to explain their reasoning for the full two marks.

(c) (i) Because many candidates failed to spot the fact that valve Q gives an output if valve A is not operated, the success rate on this question was rather low. Many candidates concluded, incorrectly, that the brake would never be applied.

(ii) The answer to this part of the question is the ‘opposite’ of part (i) and the brake will never operate. Unfortunately, misunderstanding the circuit is likely to result in a candidate reversing the answers to both parts of this question.

(d) As was mentioned for question 1, candidates did not make the most of this question. Many candidates got locked into safety and reliability and tended to repeat themselves, suggesting that if it was reliable it would be safe and if it was safe it would be reliable. Higher scoring candidates picked up on failsafe systems, inspections and redundancy but still failed to offer two good examples.

3 (a) (i) A straightforward question that should have posed no problem for A2 candidates but two thirds were unable to draw a square wave.

(ii) Reading a graph should not have presented any difficulty to candidates but the majority of answers were too inaccurate. The allowable answer of 600 to 700 Ohms was easily discernable from the graph.

(iii) Candidates were expected to put their estimate from part (ii) into the given equation to produce an answer of approximately 654 Hz. Few could manage this. Candidates' answers to part (ii) were used when marking this question. Candidates should also be reminded to document all stages in their calculations so that credit may be given.

(iv) All candidates could discern that a change in illumination will result in a change of frequency and that greater illumination gave a greater frequency.

(b) (i) Another reasonably straightforward question that should have presented little or no difficulty to candidates, bearing in mind the D-type flip flop is a basic building block. However, candidates confused the Q and Q-bar as well as the clock and the D input, so many marks were lost.

(ii) The required answer was 2^{16} or 65536. The x^y function on calculators would give the correct numerical answer.

(iii) The majority of candidates had no difficulty with this part of the question. Credit was given for a good explanation of four significant stages of the system.

(iv) This calculation was based on the candidate's answer to part (b) (ii). Generally, candidates failed to see that 9 x 65536 was all that was required.

(v) This calculation was based on the candidate's answer to part (a) (iii) together with their answer from (b) (iv). Correctly answered, this would give 589824 / 654 = 902 seconds. Very few candidates understood where to get either of the figures from to do the calculation. This type of 'applied' numeracy seems to present some candidates with considerable difficulty. Best advice might involve a candidate documenting all stages of their calculation on the examination paper, practising all likely examination calculation questions and becoming acquainted with their calculator.

(c) This 'discuss' question was arguably the most accessible of the three, since the PIC, Stamp or similar is widely used in schools. However, candidates once again lost their focus and 'rambled on' about exploiting third world countries, how reliable it is or is not, and the amount of current it can take. Points were made regarding the reduction in component count, manufacturing costs and development costs but again, examples were rarely offered.

2525/02 – Systems & Control Technology

General Comments

Most candidates, by far, chose to attempt question one.
Generally, candidates' graphical work showed only a basic approach to the task. There were a number of exceptions to this and their use of isometric sketches, highlighters and coloured pencils brought their ideas to life.
A number of candidates incorrectly assumed that grading ideas in a grid of "ideas versus specification point" would suffice for the evaluation. Candidates should offer objective and detailed evaluation of their ideas to access the full range of marks.
A small but significant point is that a large number of candidates are not circling the question number they are answering.

Specification

Far too many candidates use generic statements for their specification points and so lose marks. All ten points must be related to the given situation and justified. Frequently candidates secure a mark for a valid point that is not suitably qualified. Candidates could gain a lot by practising these points as a series of homework exercises. Using such areas as aesthetics, ergonomics, anthropometrics, materials, function, storage, user safety, product safety, storage, portability, size, weight, cost, mass production, quality, finish, environment, etc., candidates could easily adapt suitable points to any given situation and achieve higher marks.

Initial ideas

The standard of drawing was generally adequate rather than good, but most candidates got their ideas across with help from annotations and explanations. The instructions to a candidate clearly explain that the variety of alternative ideas must be viable. This means complying with their specification and the given situation. Candidates should note that credit cannot be given for an idea that clearly does not comply with both.
All sketches of whole or part product must also contain details of materials, components and construction methods so that a third party will fully understand how each idea functions. The most common omission was details of materials used.
Candidates must also try to convey the scale of their ideas and this is likely to be in the form of dimensions, comments and sketches.
An equally important point is the inclusion of relevant descriptive and evaluative annotations. Candidates need to describe important issues such as how it works, how it fits together, how a part links to the whole, so that a third person would fully understand their answer. The evaluation of their ideas in whole or in part is also assessed, so detailed comments on the suitability of ideas with reference to the specification are important and too often imprecisely dealt with.

Choice of features suitable for development

This was not done well by the majority of candidates. Far too many candidates had little to show on this final page. Whether this was due to a lack of time at the end of the examination or a lack of understanding, is open to interpretation. Whatever the cause, candidates should pace themselves through the examination. If candidates use the suggestion offered under **Specification** they may have about twenty five minutes for each of the final three pages. A lot can be sketched and written in the time available provided the work is focused.

Those candidates who produced a good range of ideas had a lot to say in this section and used notes and sketches to identify clearly the areas suitable for development. Probably candidates' biggest failing was not providing justification for the choices made with reference to the specification. Many marks were not accessed due to this.

Communication skills and techniques

There are twelve marks available to candidates under this heading and the full twelve are only available to candidates whose paper shows a range of graphical techniques. Many papers contained bland, 2D sketches that showed little detail whereas simple isometric, oblique or perspective sketches would enable candidates to offer more detail and information and so achieve higher marks.

Advanced Subsidiary GCE Design & Technology (3822/3823)

January 2005 Assessment Session

Unit Threshold Marks

Unit		Maximum Mark	a	b	c	d	e	u
2519	Raw	120	91	80	69	58	48	0
	UMS	120	96	84	72	60	48	0
2520	Raw	90	66	59	53	47	41	0
	UMS	90	72	63	54	45	36	0
2521	Raw	90	67	60	53	46	40	0
	UMS	90	72	63	54	45	36	0

Specification Aggregation Results

Overall threshold marks in UMS (i.e. after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
3822	300	240	210	180	150	120	0
3823	300	240	210	180	150	120	0

The cumulative percentage of candidates awarded each grade was as follows:

	A	B	C	D	E	U	Total Number of Candidates
3822	11.43	32.86	63.57	87.14	95	100	140
3823	20	20	40	100	100	100	5

Advanced GCE Design & Technology (7822/7823)

January 2005 Assessment Session

Unit Threshold Marks

Unit		Maximum Mark	a	b	c	d	e	u
2522	Raw	90	70	63	56	50	44	0
	UMS	90	72	63	54	45	36	0
2523	Raw	90	69	62	55	48	41	0
	UMS	90	72	63	54	45	36	0
2524	Raw	120	63	57	51	45	40	0
	UMS	120	96	84	72	60	48	0
2525	Raw	120	70	63	56	50	44	0
	UMS	120	96	84	72	60	48	0

Specification Aggregation Results

Overall threshold marks in UMS (i.e. after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
7822	600	480	420	360	300	240	0
7823	600	480	420	360	300	240	0

The cumulative percentage of candidates awarded each grade was as follows:

	A	B	C	D	E	U	Total Number of Candidates
7822	5.56	33.33	61.11	94.44	100	100	18
7823	0	0	0	0	0	0	0

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