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Mark Scheme (Results)
Summer 2008

GCSE

GCSE Design & Technology:
Systems & Control Technology (1974) Paper 3H

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1974 3H Mark Scheme

Question Number	Answer	Mark
1 (a)	Three each of the following, one under each heading: Specification points Reasons (i) Market • **Point**: It must be cost effective/cheap • **Reason**: So that more people buy them • **Point**: It must be easy to use • **Reason**: To be used by DIY cross section • **Point**: It must be well finished • **Reason**: Advantage over competitors (ii) Quality • **Point**: The locking system must be secure • **Reason**: Does not collapse under pressure • **Point**: Must be stable/sturdy • **Reason**: Does not rock whilst working • **Point**: The mechanism must be smooth • **Reason**: Easy to operate (iii) Environment • **Point**: It must be made from recyclable materials • **Reason**: To conserve the earth's resources • **Point:** Can be recycled • **Reason:** To save resource / reduce landfill / reduce waste pollution • **Point**: It must be robust • **Reason**: So it withstands rough treatment • **Point**: It must have a finish that protects it from rusting • **Reason**: Does not deteriorate if stored in shed/garage Some flexibility should be given as some points may cross over descriptions.	**(2)** **(2)** **(2)**

1 (b)(i)	Two reasons given: • Good compressive strength (1) • Hard (1) • Tough (1) • Can easily be welded/joined (1) • Rigid (1) • Cheaper than aluminium (1) *(Do not accept 'cheap' by itself)* • Readily available (1) • Rigid when pressed into shapes (1) (2 x 1)	**(2)**
1 (b)(ii)	Two reasons given: • The steel would rust without it (1) • It gives marketable product/looks/different colours (1) • Cost effective finish (1) • Gives a uniform finish (1) • Covers sharp edges / Protects against sharp edges (1) • Easily applied when healed (1) • Durable finish (1) • Prevents electric shocks (1) • Insulator (1) • Easy to maintain/clean (1) (2 x 1)	**(2)**
1 (c)	Two properties given with two reasons: **Property**: Stronger **Reason**: Because of its construction/way it's made **Property**: Stable / dimensional stability / will not split **Reason**: Does not warp / no grain **Property**: Weatherproof/resistant to decay **Reason**: Because of waterproof glue / has a longer working life **Property**: Lighter **Reason**: Workbench is easier to move **Property**: Has a longer working life / Durable **Reason**: Resistant to decay (2 x 1) (2 x 1)	**(4)**

1 (d)	Two quality control checks named: • Plastic handles operate correctly (1) • Folding linkage test (1) • Feet locking and folding test (1) • Tops opening and closing check (1) • Worktop locking/release mechanism works (1) • Durability of work top (1) • Plywood strong enough (1) • Plywood has lines in correct place (1) • Colour of handles (1) • Quality of surface finish/plastic coating (1) • Strength of frame (1) • Stability (1) • Grip on feet (1) • Dimensional accuracy (1) • Safety of edges (1) • Safe to use (1) (2 x 1) (Do not accept safety alone)	**(2)**
1 (e)	One way described: • A thermoplastic may be **easily cast/moulded** into a **complex shape** • A thermoplastic may be **softened** with heat to flow into a **complex** mould (2 x 1)	**(2)**
1 (f)(i)	One way explained: • The **levers next to the winding handles are operated** causing the **linkage to fold down** • The **legs fold inwards** therefore **the whole bench gets smaller/folds flat** (2 x 1)	**(2)**
1 (f)(ii)	One way explained: • **The plastic handles are attached to the long screws** which **adjust the work tops** • **The work tops are adjustable** therefore **different sizes and shapes may be held** (2 x 1)	**(2)**
	Total for question	**22**

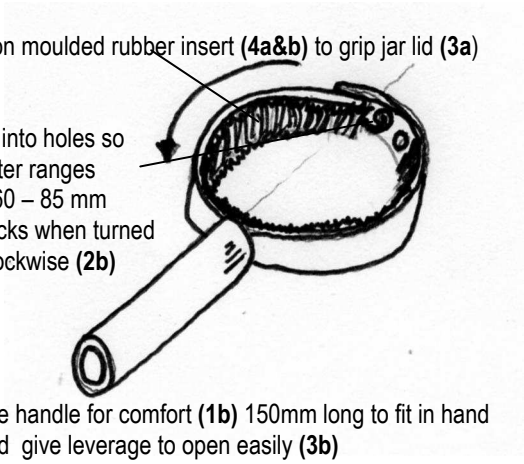
Question Number	Answer	Mark
2 (a)(i)	One system named: • Gearbox / gear train / gears (1) • Pulleys (1) • Sprocket and chain (1) (1 x 1)	**(1)**
2 (a)(ii)	The system named: • Clutch	**(1)**
2 (a)(iii)	The movement named: • Rotary / rotation / rotational / circular *(Only acceptable answer)*	**(1)**
2 (b)	One reason given: • More accurate (1) • Easier to make complicated shape (1) • Can transfer from CAD drawing / program (1) • Easy to adapt shape / modify (1) (Do not accept cheaper/faster)	**(1)**
2 (c)	One way described: • A **computer program** may be used to **simulate the system/produce 3D model/virtual system** • **Kits/lego/fischer** could be used to **build a model** • **2D drawings/card models** can be used to **construct loci models** (2 x 1)	**(2)**
2 (d)	One way described: • A **hole drilled and a rivet posted** through before being **closed flat.** • A rivet is **placed through both parts** and **one end shaped flat** • A **rivet tool/snap is placed** over one end and **hit with a hammer** (2 x 1)	**(2)**
2 (e)	Three reasons given: • Reduces friction (1) • Reduces wear (1) • Increases durability (1) • Resistance to weather/enhanced anti-corrosion properties (1) • Resistance to bacterial attack (1) • Easier to clean (1) • Can withstand high temperatures (1) • Protects its metal (1) • Improved looks/appearance (1) • Non stick (1) (3 x 1)	**(3)**

2 (f)	Two advantages explained: • The machines may **run all night/24/7** and therefore **do no need rests** • They do **not need light** thereby **saving on electricity** • **Less manpower** is needed thereby **saving on wages** • They may work in a **hostile environment** therefore **saves workers health** • **Consistent/repeated movements/assembly/manufacturer** results in **more consistent products/fewer rejects/greater accuracy** (2 x 1) (2 x 1)	**(4)**
2 (g)	Three reasons given: • Repetition (1) • Accuracy (1) • Cuts down waste (1) • Less expensive for cheaper (1) • Moulds complicated shapes (1) • One mould can have multiple components (1) • Fast/quick (1) (3 x 1)	**(3)**
2 (h)(i)	Two ways given: • Exact measurements given/achieved (1) • Rendering (1) • Assembling parts (1) • Testing (1) • Output/generate data for rapid prototyping (1) • Carry out simulations on moving parts (1) • Generate electronic files for CAM (1) • Generate 2D manufacturing drawings (1) (2 x 1)	**(2)**
2 (h) (ii)	One way described: • The product may be **seen/viewed** from **any angle** • **Backgrounds may be added** to **simulate real life** • **Components** may be **trial assembled** • **Textures** added to **simulate material surfaces** • **Electronic files** generated for **3D modelling/prototyping** • **Animation can be generated** to **see how parts interact/work together** • Can be **tested** by carrying out **stress/strain/wind tunnel/performance tests/ temperature** (2 x 1)	**(2)**
	Total for question	**22**

Question Number	Answer	Mark
3	**DESIGN IDEA 1** Each point of specification has two marking points. **1 mark** should be awarded for evidence of each point of specification resolved in the design. For each specification point with both elements viably satisfied **2 marks** For each specification point with only one element viably satisfied **1 mark** Where the answer does not viably answer a specification point **0 marks** Candidates may answer any specification point in either graphical form or by annotation. No marks are awarded for quality of communication. **Specification point 1** Must have a means of fitting comfortably into a person's hand: • Evidence to fit into the hand (1) E.g. Size/scale/dimensioning • Evidence to indicate comfort (1) E.g. Shape/ form / covered material **Specification point 2** Must open the jars easily: • Evidence to indicate that it will open the jar (1) E.g. Ridges/insert/fitting /grip/indents/sealed edge • Evidence to indicate it is easily opened (1) E.g. Leverage / screw mechanism **Specification point 3** Must be adjustable to open jars sized from 60mm to 85mm in diameter: • Evidence to indicate that it is adjustable (1) E.g. Notes/mechanism/slots/bands • Evidence to indicate that it is adjustable between 60mm and 85mm (1) E.g. Catch/wing nut **Specification point 4** Must be made from materials and processes suitable for batch production: • Evidence to indicate that the material is suitable for batch production (1) • Evidence to indicate that the process is suitable for batch production (1)	

Possible graphical solutions:

Design Idea 1



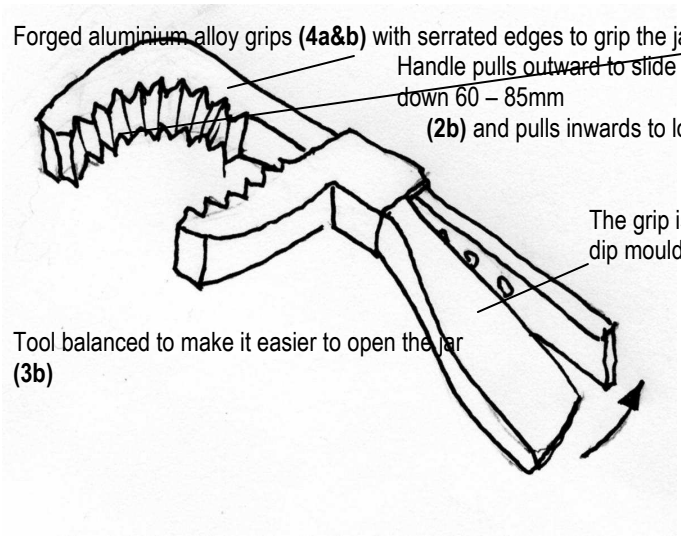
(8)

Design idea 2

To score a mark for Design Idea 2, each specification point must be resolved again in the second design idea but the second design idea must be technically / conceptually different in design and construction from the first and not a simple variation on a theme to score the mark.

Use exactly the same criteria as design idea 1 to mark design idea 2.

A different method of indication fitting in the hand (1)
A different method that is comfortable (1)
A different method of opening the jar (1)
A different method of ease of opening (1)
A different method of being adjustable (1)
A different method of being adjustable between 60mm and 85mm (1)
A different material suitable for batch production (1)
A different process suitable for batch production (1)



(8)

3(b)	Each point clearly evaluated. If a candidate has indicated design idea 1 and then evaluates design idea 2 for all or part of (i), (ii) & (iii) then the idea in greater evidence should be marked The evaluation of the design must contain reference to either positive or negative aspects not just simply a description of the design. Award 1 mark for a correct evaluation / justification relating to each design feature and how it succeeds or fails Repetition of original spec scores 0	
3(b)(i)	Evaluation of: The food jar opening device must have a means of fitting comfortably into a person's hand. Positive or negative reasons relating to: • The method of fitting in the hand • Comfort (2 x 1) *Eg. The scissor type mechanism will fit all but the smallest hand but its shape may cause discomfort.*	**(2)**
3(b)(ii)	Evaluation of: The food jar opening device must open the jars easily. Positive or negative reasons relating to: • Opening the jar • How easy it is (2 x 1) *Eg. The rubber moulding which grips the jar could rot in time and the lever could snap if too much pressure is applied.*	**(2)**
3(b)(iii)	Evaluation of: The food jar opening device must be adjustable to open jars sized from 60mm to 85mm in diameter. Positive or negative reasons relating to: • Its adjustability • How it locks *Eg.The slot mechanism allows it to be adjusted but only in set stages and the catch needs another hand to operate it.*	**(2)**
	Total for question	**22**

Question Number	Answer	Mark
4 (a)(i)	Number of turns calculated: 8 *(only acceptable answer)*	**(1)**
4 (a)(ii)	One action described: • **Pawl is drawn backwards** and **drops/gravity pulls it down** into next tooth • **Pawl pushes toward the ratchet 1/8th of a turn** (2 x 1)	**(2)**
4 (a)(iii)	One action described: • **As the ratchet rotates clockwise** the **pawl moves against the pressure of the spring** • **The ratchet turns to next tooth / (1/8 turn**) and the **pawl drops in (to stop the ratchet turning back).** (2 x 1)	**(2)**
4 (a)(iv)	Two types named: • Rotary / rotational / rotation / circular • Ratchet end – reciprocating / oscillating / oscillation (2 x 1) *(only acceptable answers)*	**(2)**
4 (b)(i)	The action described: • **The arm moves upwards** in an **even way/gradually** (2 x 1) *(only acceptable answer)*	**(2)**
4 (b)(ii)	The action described: • **The arm drops/falls** and does so **very quickly/more quickly than it rises/suddenly** (2 x 1) *(only acceptable answer)*	**(2)**
4 (c)	One advantage described: • The user **sets their (Maximum) water temperature only once** and the **tap will then only give water up to this temperature.** • Once the **safe temperature is set** the **user can never be scalded / burned.** • **People with impaired vision** can **always have their chosen water temperature.** • **Children can use hot water safely** and **without adult supervision.** • **Carers can be confident** that the **water temperature is safe for those in their care.** (2 x 1)	**(2)**

4 (d)	Two ways explained: • **Manufacturers overheads may be reduced** thereby **passing savings onto the customer** • **Manpower is reduced** therefore saving on **wages** • **Machines may work in the dark** therefore saving on **electricity** • **Designs may be stored and reused** therefore **saving on initial fees** • **Machines work 24/7** therefore **saving time.** • **Products can be made quicker** so will **cost less to make** • **Fewer rejects/human errors** therefore **reducing waste/cost.** (2 x 1) (2 x 1)	**(4)**
4 (e)(i)	One moral issue given: • Encourages waste (1) • Undervalues materials (1) • Provides developing world employment (1) • Gives a feeling of guilt (1) (2 x 1)	**(1)**
4 (e) (ii)	Two environmental issues given: • Over use of landfill/generates more waste (1) • Uses more of the earth's resources (1) • Wasted energy in manufacture (1) • Extra transport pollution (1) (2 x 1)	**(2)**
4(e)(iii)	One way described: • The **metal parts may melted down** and **used in new products** • **Burnable parts could be collected** and **used for fuel** • **New parts can be purchased/used to replace** its broken parts so they are able to **retain their current drill/repair it** (2 x 1)	**(2)**
	Total for question	**22**
	Total for paper	**88**