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Mark Scheme
Summer 2008

GCSE

GCE Engineering & Manufacturing: (5318/04)

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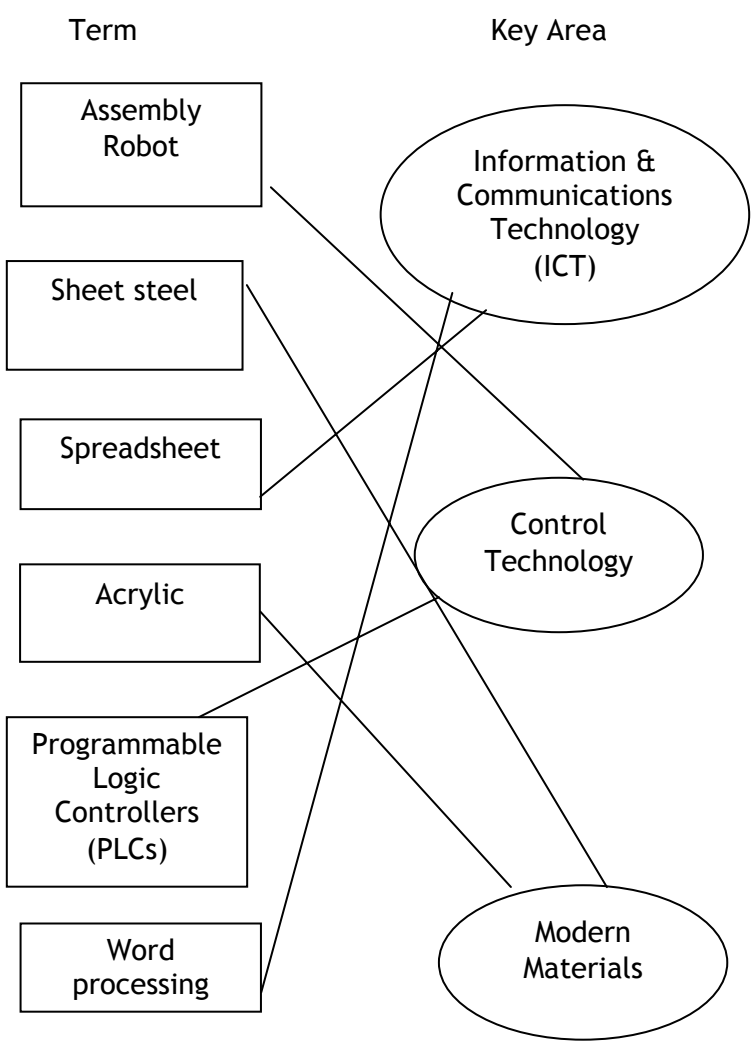
Unit 5318/04 Engineering Fabrication

Section A

Question Number	Answer	Mark
1(a)	• Roof Rack (1) • Radiator (1) If 3 boxes ticked max marks = 1 mark. If 4 boxes or more ticked no marks. (2x1)	(2)
1(b)	• Aluminium Ladders (1) • Wrought Iron Gate (1) If 3 boxes ticked max marks = 1 mark. If 4 boxes or more ticked no marks. (2x1)	(2)
2(a)	• Bearing (1) (1x1) • Gear (1) • Spur Gear (1) • Idler Gear (1) • Gear wheel (1) • Cog (1) • Differential cog (1) • Pinion (1) (1x1)	(2)
2(b)	An answer that makes reference to TWO of the following points: • Used for securing wheels (1) and cowls (1) • Used to secure rotational parts (1) temporarily (1) • Used to hold a wheel (1) on to a shaft or axle (1) • Metal fastening (1) used to join or keep components together (1) • Push through a hole in a spindle (1) opens leg so it doesn't fall out (1) (2x1) • Used to absorb energy (1) to prevent damage (1) • Used to store mechanical energy (1) • To hold things in place (1) • To stop things vibrating apart (1) • Can be used to act as a return mechanism (1) (2x1)	(4)
	Total mark	10

Question Number	Answer	Mark
3	Key terms linked to a key area  No mark for any term linked to more than one area. (6 x 1)	(6)
	Total mark	6

Question Number	Answer	Mark
4(a)(i)	Appropriate product such as e.g. • Cantilever Toolbox (1) • BBQ (1) • Darts (1) • Mountain Bikes (1) • Motorbikes (1) • Cars (1) • Filing Cabinets (1) • Alloy Wheels (1) • Scooters (1) *This list is not exhaustive; accept any product that contains engineering fabrication or association with the sector. Accept brand name of specific product.* (1x1)	(1)
4(a)(ii)	Appropriate explanation of what the product does, may include reference to features and function E.g. • To cook (1) food (1) • To throw (1) at a dartboard (1) • To transport (1) from one place to another (1) • To allow tools to be carried (1) safe and securely (1) *If product given in 4(a)(i) is not from this sector but is from one of the other engineering manufacturing sectors then allow follow through up to one mark.* *No answer to 4(a)(i) no marks for 4(a)(ii)* (2x1)	(2)
4(b)(i)	• production planning (1) materials – supply and control (1) processing / production (1) assembly / finishing (1) packaging / dispatch (1) *If product given in 4(a)(i) is not from this sector but is from one of the other engineering manufacturing sectors then allow follow through.* *No answer to 4(a)(i) no marks for 4(b)(i)* *Accept a process that is within any of the stages (e.g casting/fabrication / robots assembling parts / spraying) must be appropriate to the product stated in 4(a)(i)* (1x1)	(1)

Question Number	Answer	Mark
4(b)(ii)	*One mark for identifying advantage and one mark for why.* Appropriate advantage to the manufacturer e.g. **production planning, materials – supply and control, processing / production, assembly / finishing, packaging / dispatch** **Production planning** • speed (1) – faster than human application (1) **materials – supply and control** • cost control (1) – by less waste / faulty parts (1) • waste control (1) – by monitoring processes and quality control of processes (1) **processing / production** • energy conservation (1) – by control of energy into process (1) • waste control (1) – by monitoring processes and quality control of processes(1) • competitiveness (1) – faster rates of production (1) • product consistency (1) – by control of processes (1) • cost control (1) – by less waste / faulty parts (1) • efficiency (1) - by less waste / faulty parts (1) • speed (1) – faster than human application (1) **assembly / finishing** • energy conservation (1) – by control of energy into process (1) • waste control (1) – by monitoring processes and quality control of processes (1) • product consistency (1) – by control of processes (1) • cost control (1) – by less waste / faulty parts (1) • efficiency (1) - by less waste / faulty parts (1) • speed (1) – faster than human application (1) **packaging / dispatch** • packaging consistency (1) – by control of processes (1) • cost control (1) – by less waste / faulty parts (1) • efficiency (1) - by less waste / faulty parts (1) • speed (1) – faster than human application (1) • energy conservation (1) – by control of energy into process (1) • waste control (1) – by monitoring processes and quality control of processes (1) *Low response (1) or two low responses (2) or detailed response (2) If the answer in part 4b(i) is a Manufacturing stage allow follow through up to 2 marks. No answer to 4b(i), no marks for 4b(ii)* (2x1)	(2)

Question Number	Answer	Mark
4(c)(i)	• Plastics / polymer / plastic (although plastic is not technically correct accept the term plastic) (1) • Alloys (1) • Copper (1) • Zinc (1) • Brass (1) • Nickel silver (1) • Aluminum alloys (1) • Titanium / Duralumin (1) • Iron alloys (1) • Steel / stainless steel / carbon steels (1) • Composites / Carbon fibre / Glass reinforced plastics (GRP) (1) • Smart materials – shape memory alloys (SMAs) / thermo-ceramics (1) • Other appropriate modern material – a material currently used for the given application (1) Accept brand name of a specific material *If product given in 4(a)(i) is not from this sector but is from one of the other engineering manufacturing sectors then allow follow through.* *No answer to 4(a)(i) no marks for 4(c)(i)* (1x1)	(1)

Question Number	Answer	Mark
4(c)(ii)	*One mark for identifying improvement and one mark for how.* • smaller size (1) – miniaturisation (1) • lower weight (1) – better strength to weight ratio (1) • better appearance (1) – smoother / brighter finishes (1) • extends the life-time of product (1) – better wear characteristics (1) • improves wear resistance (1) – harder materials / better surface finish (1) • reduces cost (1) – overall product easier / machine ability (1) • improved functional characteristics (1) – user friendly, ease of operation (1) • wider customer base (1)– extensive range of products in a variety of colours / textures (1) • minimising maintenance requirements(1) – longer service intervals (1) • improved production methods (1) reducing costs of end product (1) • meeting regulations (1) to protect consumer from potential health and safety issues (1) • any other appropriate functional / mechanical aesthetic characteristic that relates to the improvement of the product. *If answer in part 4a(i) is inappropriate but the material given in 4c(i) is appropriate allow follow through up to 2 marks. If no answer is given in part 4a(i) but the answer to part 4c(ii) relates to the material stated in part 4c(i) allow follow through up to 1 mark. If no answer or incorrect answer given in part 4c(i) no marks awarded for 4c(ii).* (2x1)	(2)
	Total mark	9

Question Number	Answer	Mark
5(a)(i)	• materials supply (supplier details / raising orders) (1) • materials control (materials location) (1) • stages in manufacturing (list of processes / standard times) (1) • process control (statistics / references to standards) (1) • storage (location / description) (1) • distribution (customer location/packaging requirements / routing information) (1) • stock control (location/type of stock / critical re-order levels / stock taking / EPOS) (1) • marketing and mailshots (customer listing/customer orders) e.g. questionnaire (1) • queries and searches (product / customer / cost / supplier) (1) *Do not accept ' software' names* (1x1)	(1)
5(a)(ii)	One mark for identifying the benefit, one mark for how. Two low responses – only one mark Must relate to example given. No answer in (i) no marks, otherwise, allow follow through to one mark. • reduced ordering times (1) – supplier identified automatically (1) • maintaining quality (1) – consistency (1) • reduced wastage (1) – correct process used (1) • improved efficiency (1) - faster access to knowing material location (1) • better process control (1) – easier access to quality standards (1) • reduced labour / costs (1) – less time spent searching for data (1) • reduced storage space (1) - less paper work (1) • efficient marketing (1) – mailmerge / mailshots (1) *If answer in part 5(ai) is inappropriate allow follow through up to 2 marks. If no answer given in part 5(ai) allow follow through up to 1 mark.* (2x1)	(2)

Question Number	Answer	Mark
5(b)(i)	• Mobile phone / infrared / Bluetooth (1) • Walkie talkie (1) • Email / messaging (1) • Internet / wireless / Wi-fi (1) • Video conferencing (1) • Electronic point of sale (EPOS) (1) • EDI (1) • ISDN (1) • Texting (1) • Phone (1) • Fax (1) • Voice over internet protocol - VoIP (1) *Do not accept the following :* *TV, CAD, radio, computer / laptop / database* (1x1)	(1)
5(b)(ii)	Must relate to example given. No answer in (i) no marks, otherwise, allow follow through to one mark. • Mobile phone (1) – flexibility / roaming location (1) • Walkie talkie (1) – flexibility / roaming location / cost (1) • Email (1) – immediate permanent record (1) • Internet (1) – immediate vast access to information (1) • Video conferencing (1) – no travel expenses / less time wasted in travelling (1) • Electronic point of sale (EPOS) (1) – faster / more accurate (1) • EDI (1) – immediate transfer of information / no hard copies needed / less storage space (1) • ISDN (1)– more data transferred in parallel (1) • Texting (1) – stored record of transaction (1) • Phone (1) – immediate two way conversation (1) • Fax (1) – hard copy record (1) **Other benefits may be seen in the light of:** *Speed, accuracy, JIT, information retrieval, meets consumer demands, quicker, increased sales, reduce stock levels, reduced running costs, reduced lead times, calculation of sales, stock taking quicker/easier, storage space reduced or any other appropriate response.* *Benefits must relate to the manufacturer* *Two low responses – 1 mark only* (2x1)	(2)

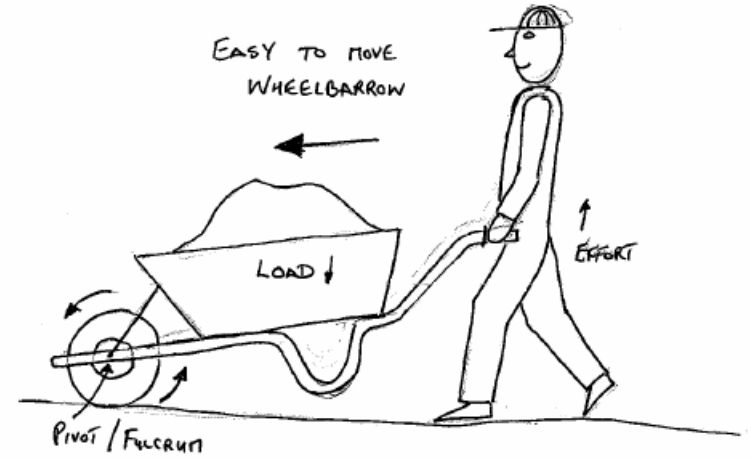
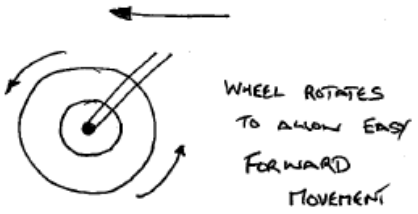
Question Number	Answer	Mark
5(c)	Benefit must relate to the distributor *One mark for identifying the benefit, one mark for how.* *If two low responses given - one mark e.g. cheaper and quicker – only one mark.* *Any combination of the answers below as long as appropriately linked e.g. better quality products (1) therefore more profit (1)* • Less returns (1) – more consistent products (1) • Lower purchase price (1) – increase sales (1) • Shorter order times (1) – greater use of appropriate software / automated orders (1) • Increase sales (1) – more profit (1) • Better reputation / customer satisfaction (1) – more reliability (1) • Increased profits (1) – fewer waste products / faster throughput (1) • Better quality products (1) – systems reject faulty products or stop them being produced (1) (2x1)	(2)
	Total mark	8

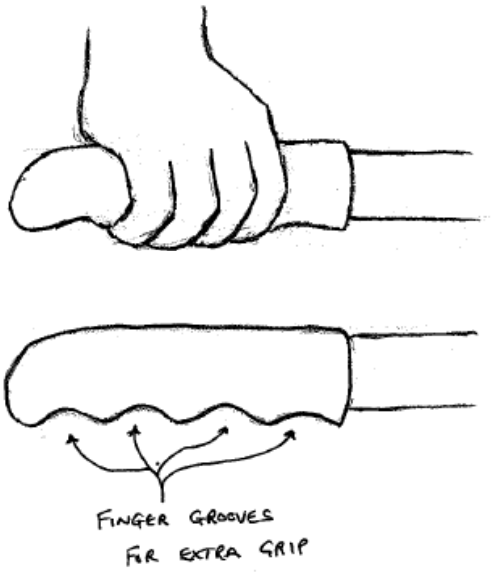
Question Number	Answer	Mark
6	**Two different examples** • process control (1) • PLCs (1) • Embedded computers (1) • Robotics (1) • CIM (1) • CAD / CAM links (1) • CAM (1) • CIE (1) • Quality control (1) • Automation (1) *Don't accept examples that are about handling data and information e.g. databases / spreadsheets , CAD, computers, CNC* (1x1) (1x1)	
	Two different methods used • Cam timers (1) • Manual operations associated with the sector (1) • Manual placing (1) • Manual testing (1) • Manual recording (1) • Manual measurement (1) • Physical activity / employees (1) *Must be a feasible replacement* If answer in 6(a) is not appropriate allow follow through If no answer in 6a no mark for 6(b) (1x1) (1x1)	

6 cont	**Explain two different benefits** **One mark for identifying the benefit.** **One mark for how** **Examples** • Reduce the time (1) testing is quicker (1) • Reduce the money spent (1) lower stock level / JIT techniques (1) • lower labour costs (1) reduction in staffing (1) • Increased overall productivity (1) via increased throughput (1) • Improve quality (1) more consistent processes (1) • Continuous production (1) machines work 24/7 (1) *Benefits must relate to new methods and the manufacturer.* *Low response (1) or two low responses (1) or detailed response (2). Allow follow through up to one mark providing either (a) or (b) is answered for each example.* (2x1) (2x1)	(8)
	Total mark	8

Question Number	Answer	Mark
7(a)	One mark for identifying the benefit One mark for how • reduced ordering times (1) – automatic monitoring (1) • improve quality / accuracy (1) – control of processes (1) • reduced wastage (1) – optimise production methods • improved efficiency (1) – faster / quicker throughput (1) • better process control (1) – in process monitoring (1) • reduced labour (1) – automated processes (1) • lower costs (1) – reduced wastage / faster / continuous production (1) • safer processes (1) – less manual input (1) *Do not accept 'easier' without explanation.* (2x1)	(2)
7(b)	• More consistent products (1) – process reliability (1) • Lower purchase price (1) – increased efficiency / productivity (1) • Shorter delivery times (1) – automated systems (1) • Customer satisfaction (1) – availability of different products (1) • Quality product (1) – fit for purpose (1) • Product guarantee (1) – ability to design / produce products to higher standards (1) • Product flexibility (1) – more variation within processes (1) *1 mark for benefit, 1 mark for how. Low response (1) or detailed statement (2) or two low responses (2)* Example: *Readily available products of good quality (1) means fewer complaints about sub-standard products (1)* *Any combination of the answers above as long as appropriately linked e.g. more consistent product (1) fit for purpose (1)* (2x1)	(2)
	Total mark	4
	Total marks for section A	45

Section B

Question Number	Answer	Mark
8(a)	An answer that makes reference to three of the following points. Diagrams and notes up to 3 marks. • To allow the wheelbarrow to move easily (1) • To support the weight of the material in the barrow (1) • To assist the user in carrying heavy loads (1) • To allow easy manoeuvrability of heavy loads (1) • The wheel acts as a pivot / fulcrum to allow the user to pick up the wheelbarrow easily and move it forward (1) • Acts as a second class lever (1)   Answer must contain both notes and sketches. Max two marks if only notes or sketches used. (3x1)	(3)

Question Number	Answer	Mark
8(b)	An answer that makes reference to three of the following points Diagrams and notes up to 3 marks • To allow the user to carry loads with comfort (1) • To prevent damage to the user's hands (1) • To make it easier for the user to hold the wheel barrow (1) • To provide a warm feel on the hands when moving loads (1)  Answer must contain both notes and sketches. Max two marks if only notes or sketches used. (3x1)	(3)
	Total mark	6

Question Number	Answer	Mark
9(a)(i)	• Stage 1 - Design / product development (1) • Stage 4 – Material supply and control / purchasing / material supply / material control / supply of components / supply of parts (1) *Do not accept development on its own for stage 1* *Do not accept design ideas for stage 1* *Do not accept product on its own for stage 1* *Do not accept material on its own for stage 4* (2x1)	(2)
9(a)(ii)	• Marketing (1) • Stage 2 / stage two (1) • 2 / two (1) (1x1)	(1)

Question Number	Answer	Mark
9(b)(i)	Low response (1) or three low responses (3) or up to three marks for detailed response (3) Appropriate descriptions including three of the following points: <u>Production</u> • Use the available resources (1) • Materials, parts and components used (1) • Processes that are used (1) • Used of available equipment and machinery (1) • Following the sequence of production (1) • Carrying out inspection and quality control (1) • Complying with health and safety factors (1) • Bending the tubular steel into the correct shape (1) • Pressing the pan into the correct shape (1) • Injection moulding the hand grip (1) • Drilling holes in the tubular steel (1) • Blanking or punching the shape of the pan (1) *e.g.* *This is the stage where resources are used by operators (1) to press form the pan to the correct shape (1) and where they are checked by inspection methods (1)* (3x1)	(3)
9(b)(ii)	Low response (1) or three low responses (3) or up to three marks for detailed response (3) Appropriate descriptions including three of the following points: <u>Assembly and finishing</u> • Putting together component parts (1) • Cleaning parts of the wheelbarrow (1) • Painting the frame or pan (1) • Any assembly process (1) • Attaching the tubular steel to the pan (1) • Fitting the hand grips to the frame (1) • Attaching the wheel to the frame (1) • Quality Checks (1) *e.g.* *Manufactured parts are put together (1), the product is finished to get rid of imperfections (1) and then given a protective finish such as paint (1)* (3x1)	(3)
	Total mark	9

Question Number	Answer	Mark
10(a)(i)	1 mark per named material. • Steel / mild steel / low carbon steel (1) • Stainless steel (1) • Aluminium (1) • Powder Coated Steel (1) • Painted Steel (1) *Do not accept any generic term – 'metal' / 'plastic'* *Do not accept 'alloy' on its own* (1x1)	(1)
10(a)(ii)	1 mark for improvement, 1 mark for how If no answer in 10(a)(i) then no marks. Allow follow through up to 1 mark if incorrect material is given in 10(a)(i) • Size – increased material strength has allowed for a range of different sized products (1) • Weight – tube material has reduced weight of product (1) • Ease of use – light weight material, easy to shape or bend (1) • Aesthetics – improved finishes – galvanising, painted, powder coated (1) • Corrosion resistance – range of finishes to protect pan (1) (2x1)	(2)
10(b)	1 mark for low response. 2 marks for detailed response. 2 marks for 2 low responses. • Hand grips can be mass / batch produced easily (1) • Cost per unit is low (1) • Complex shape can be moulded easily (1) • Products have a consistent quality *Do not accept 'easy' without explanation* e.g. Product costs are low (1) as mass production is easy to do (1) (2x1)	(2)

Question Number	Answer	Mark
10(c)	1 mark per process. Up to 2 marks • Folding (1) • Bending (1) • Drilling (1) • Welding / brazing (1) • Galvanising (1) • Punching / piercing (1) • Stamping (1) • Riveting (1) • Vulcanising (1) • Forming / thermoforming • Forming / pressforming(1) • Cutting (1) • Blow moulding (1) *Do not accept 'forming' twice* (2x1)	(2)
10(d)	Low response (1) or three low responses (3) or up to three marks for detailed response (3) Appropriate explanation including three of the following points: • Lower costs (1) • Availability of range of colours (1) • More attractive (1) • Improved accuracy (1) • Better durability / stronger material (1) • Smaller size / Lighter product (1) • Improved functionality (1) • More varieties available (1) • Better aesthetics (1) *e.g.* *Modern materials has enabled the manufacture to sell more wheelbarrows as the materials used are now stronger and more durable (1) which means the wheelbarrow can either be lighter or smaller (1). This also means that the wheelbarrow will function better (1).* (3x1)	(3)
	Total mark	10

Question Number	Answer	Mark
11(a)	Must have relevant automation technology link Low response (1) or two low responses (2) or detailed response (2) **Example of automation** • PLC (1) to control processes in production (1) • Automated printing (1) of wheelbarrow manufacturer logo (1) • Robots (1) dealing with finished parts (1) • Use of conveyor systems (1) to move parts about (1) • Embedded computers (1) to perform dedicated functions (1) • Remotely operated vehicles (1) moving finished wheelbarrows to dispatch or storage (1) *Do not accept 'CIM' or 'CNC' without links to automation* (2x1) (2x1)	(4)

Question Number	Answer	Mark
11(b)	**Benefits to manufacturer** *If answer in 11(a) is inappropriate, allow follow through up to one mark. If no answer given in part (a), no mark. 2 x 1 mark for low response or 2 x 2 marks for detailed responses.* Must be appropriate to those described in (a) and relate to the manufacturer e.g. • Flexible production (1) leads to meeting customer requirements better (1) • Consistent results and quality (1) achieved through accurate use of technology (1) • Reduced human intervention (1) of plant means safer operation (1) • Accurate printing (1) better registration (1) • Reduced labour costs (1) as less people involved (1) • Safer method (1) as humans have less exposure (1) • Reduced customer complaints (1) as better quality product (1) • Control of costs (1) lower unit cost as less waste (1) • Retailer confidence (1) through less complaints (1) • Customer confidence increased (1) through more reliable systems • Reduced waste (1) by less mistakes being made (1) • Reduced energy costs (1) through increased efficiency (1) • Improved production rates (1) through reduced downtime (1) • Gives customers variation of products in a quicker time (1) faster production changeovers (1) (2x1) (2x1)	(4)

Question Number	Answer	Mark
11(c)	**Benefit to consumer** If answer in 11(a) is inappropriate, allow follow through up to one mark. If no answer given in part (a), no mark. 2 x 1 mark for low responses. 2 x 2 marks for detailed responses Must be appropriate to those described in (a) and relate to the consumer e.g. • Consistent product (1) controlled better (1) • Product reliability (1) more likely to be produced to specification (1) • Reduced time to distributor / shorter delivery times (1) as manufacturer can vary product to meet demand (1) • Less wastage (1) as processes monitored better (1) • Lower prices (1) less waste / quicker production (1) • Better availability (1) due to faster throughput • Better quality (1) through improved process control (1) • Better value (1) because production costs are reduced (1) • Product guarantee (1) as confidence in process (1) • Customer satisfaction (1) because of consistent products (2x1) (2x1)	(4)
	Total mark	12

Question Number	Answer	Mark
12(a)(i)	1 mark for change. • Smaller in size (1) • Higher level of skills / better educated less employment for unskilled (1) • Work patterns (1) • Higher pay (1) (1x1)	(1)
12(a)(ii)	Low response (1) or two low responses (2) or up to two marks for a more detailed response (2) • Smaller in size – more responsibility (1) for undertaking a variety of operations (1) / different skills required (1) which are less traditional (1) • Higher level of skills / better educated / less employment for unskilled – more able people required (1) with the ability to re-train often (1) / ability to cope with constant change (1) and to undertake complex work (1) / but less overall cost for company (1) • Work patterns – shifts often necessary (1) resulting in better paid staff (1) / often working with different people (1) hence ability to communicate vital (1) Up to 2 marks each response (2x1) (2x1)	(4)
12(b)(i)	1 mark for change. Positive answers • Increased efficiency (1) • Lower emissions / reduced global warming (1) • Increased productivity (1) • Less fuel used (1) • Reduced wastage in production (1) Negative answers • Greater use of machinery (1) • Higher emissions (1) • Use of finite resources to manufacture control technologies (1) • Greater overall volume of products generated (1) (1x1)	(1)

Question Number	Answer	Mark
12(b)(ii)	Low response (1) or two low responses (2) or up to two marks for a more detailed response (2) **Positive answers** • Increased efficiency - lower emissions: resulting in less consumption (1) and a reduction in the increase in global warming (1) / improved manufacturing control (1) meaning less waste and pollution (1) • Increased productivity – less fuel used: less use of fossil fuels (1) resulting in lower consumption and emissions (1) / technology that is less dependant on finite resources (1) and makes efficient use of finite resources (1) or can use sustainable alternatives (1) • Reduced wastage in production: less materials used in production (1) resulting in less waste thrown into landfill (1) / ability to adapt process (1) to reduce rework / waste (1) **Negative answers** • Greater use of machinery – higher emissions: resulting in greater consumption (1) and an increase in the rate of global warming (1) / issues associated with acid rain (1) and toxic gases (1) • Use of finite resources to manufacture control technologies: increased consumption of raw materials (1) leading to increased likelihood of overuse / lack of supply (1) / issues associated with disposal of technologies (1) and use of finite resources for disassembly (1) • Greater overall volume of products generated: distribution network increased (extra fuel) (1) meaning higher CO_2 emissions (1) / higher quality products leading to greater demand (1) and reduced product lifespan (1) Up to 2 marks each response *If answer in 12(b)(i) is inappropriate allow follow through up to 1 mark each. If 12(b)(i) has no answer, no mark for 12(b)(ii)* (2x1) (2x1)	(4)
	Total mark	10

Question Number	Answer	Mark
13(a)	An explanation that makes reference to four of the following points. Low response (1) or four low responses (4) or detailed response (up to 4) The following could be either positive or negative influences. • Climate change (1) • CO_2 emissions (1) • Land fill (1) • Environmental contamination (1) • Burning fossil fuels in manufacturing processes (1) • Renewable energy (1) • Global expansion (1) • Lifespan of product (1) • Disposal of hardware e.g. computers / machinery (1) • Disassembly costs (1) • Recycling – metal parts of the wheelbarrow can melted down and re-used (1) • Polymer shredding (1) • Biodegradable (1) **Positive example** The use of biodegradable materials (1) has lessened the need for landfill (1) and reduced environmental contamination (1) which could lead to the reduction of CO_2 emissions(1) because of less decomposition of the product. **Negative example** The difficulty of the disposal of hardware / computers (1) has led to disassembly costs (1) and reduced the scope for recycling (1) because of limited lifespan of computer products (1) and increased the need for landfill (1) Up to 4 marks (4x1)	(4)

Question Number	Answer	Mark
13(b)	An explanation that makes reference to four of the following points. Low response (1) or four low responses (4) or detailed response (up to 4) The following could be either positive or negative influences. • Research and development time / costs (1) • life cycle costs (1) • sales / profits (1) • Long term savings(1) • Transferring technology into further new products(1) • Wider product range (1) • Risk evaluation (1) • Waste (1) • Manufacturing efficiencies (1) • Derivative products i.e. smaller / larger versions / faster to develop (1) *The application of new materials can have a high initial development cost (1) due to the time taken in researching and testing the product(1), but can result in savings in the long term(1) due to lower product costs meaning increased sales and profits (1) which could result in increased product range (1) or transference of technology into new product ranges (1)* Up to 4 marks (4x1)	(4)
	Total mark	8
	Total Marks for section B	55
	Total marks for paper	100

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