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Mark Scheme (Results)
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GCSE

GCSE Engineering & Manufacturing (5318) Paper 2

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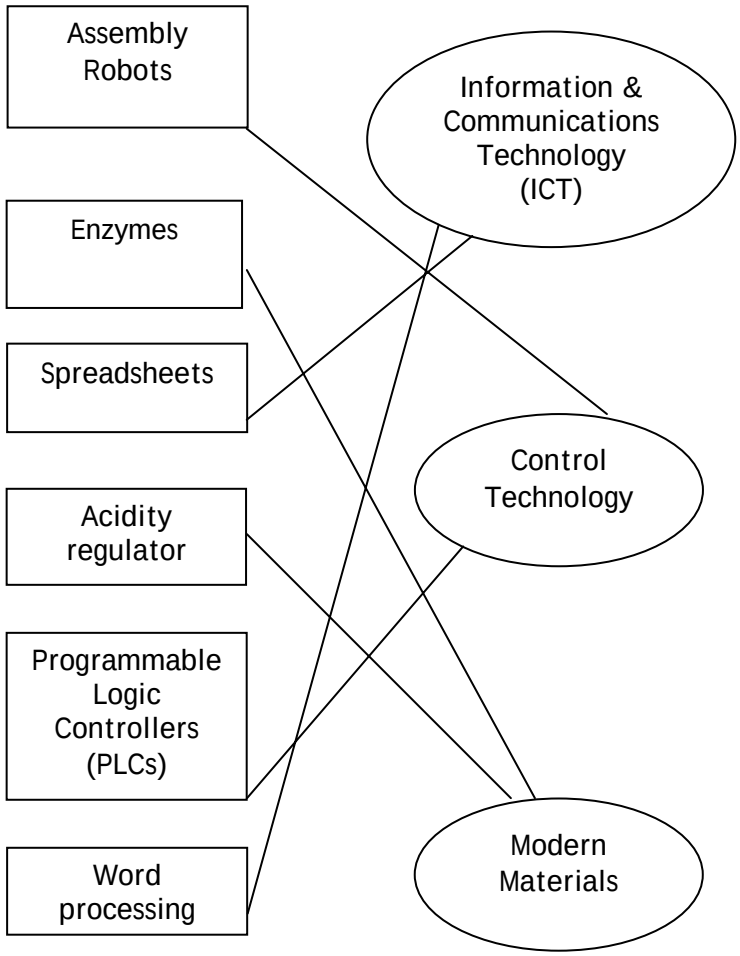
Unit 5318/02 Food and Drink, Biological and Chemical

Section A

Question Number	Answer	Mark
1(a)	• Ketchup (1) • Apple juice (1) If 3 boxes ticked max marks = 1 mark. If 4 boxes or more ticked no marks. (2x1)	(2)
1(b)	• Toilet bleach (1) • Garden fertiliser (1) If 3 boxes ticked max marks = 1 mark. If 4 boxes or more ticked no marks. (2x1)	(2)
	Total mark	4

Question Number	Answer	Mark
2(a)	• Sauce pan (1) • Frying pan (1) • Boiling pan (1) • Casserole (1) (1x1) • Food processor (1) • Liquidiser (1) • Mixing blender (1) • Fruit mixer (1) • Food blender (1) • Blender (1) • Mixer (1) • Food mixer (1) • Juicer (1) (1x1)	(2)
2(b)	An answer that makes reference to TWO of the following points: **Mixing machine** • To combine ingredients (1) • To mix ingredients (1) • To incorporate air (1) • To make mixtures smooth (1) • To make large batches (1) • To develop gluten (1) • To save time (1) (2x1) **Refrigerator** • To keep foods cold (1) • To keep foods longer (1) • To store perishable foods (1) • To slow growth of bacteria (1) • To reduce wastage (1) • To keep food fresh (1)) • To reduce temperature (1) (2x1)	(4)
	Total mark	6

Question Number	Answer	Mark
3	Key terms linked to a key area Term Key Area  No mark for any term linked to more than one area. (6x1)	(6)
	Total mark	6

Question Number	Answer	Mark
4(a)(i)	Appropriate product such as e.g. • Bread (1) • Cake (1) • Soups (1) • Ice cream (1) • Quiches (1) • Soft drinks e.g. pop (1) • Chocolate (1) • Ready meals i.e. curry / pasta (1) • Yoghurt (1) *Accept named / brand name of a specific product e.g. Pepsi, Ben and Jerry's, Kit Kat* *This list is not exhaustive; accept any product that contains Food and drink or association with the sector.* (1x1)	(1)
4(a)(ii)	**Appropriate explanation of what the product does, may include reference to features and function** • Bread – to make sandwiches (1) to make croutons (1) to supplement restaurant meals (1) to eat / consume (1) to provide energy • Cake – to eat (1) to make trifles (1) to make desserts (1) to provide energy (1) • Soups – to drink / consume (1) to provided energy (1) to be a starter in restaurant (1) Example Appropriate Use *The bread can be used to manufacture sandwiches(1)which can be sold by retailers to be eaten(1) by customers who are hungry and need energy(1)* *If product given in 4(a)(i) is not from this sector but is from one of the other biological and chemical sectors then allow follow through up to one mark.* *No answer to 4(a)(i) no marks for 4(a)(ii)* (2x1)	(2)

Question Number	Answer	Mark
4(b)(i)	• production planning (1) materials – supply and control (1) processing / production (1) assembly / finishing (1) packaging / dispatch (1) • Dispatch (1) *Any appropriate manufacturing operation i.e. weighing ingredients, mixing, depositing, dividing, baking, cooking, cooling, decorating, packaging* *If product given in 4(a)(i) is not from this sector but is from one of the other food and drink, biological and chemical 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. Blending, filling, mixing, packaging, making) 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, 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 4(b)(i) no marks for 4(b)(ii)* (2x1)	(2)

Question Number	Answer	Mark
4(c)(i)	• emulsifiers (1) • stabilisers (1) • chemical aerators (1) • preservatives (1) • antioxidants (1) • colorants (1) • flavours (1) • inclusions (1) • omega 3 (1) • enzymes (1) • improvers e.g. dough (1) • modified starches (1) • gums (1) • Packaging materials, e.g. film, foils (1) *Other appropriate materials – a material currently used for the given application.* *If product given in 4(a)(i) is not from this sector but is from one of the other biological and chemical sectors then allow follow through.* *No answer to 4(a)(i) no marks for 4(c)(i)* *Accept 'brand names of specific materials'* (1x1)	(1)

Question Number	Answer	Mark
4(c)(ii)	One mark for identifying improvement One mark for how • size (1) – increase / decrease / volume (1) • weight (1) – heavier / lighter (1) • density (1) – aerated / lighter / softer / volume (1) • flavour (1) – stronger / natural / sweeter (1) • texture (1) – open / closes / softer / chewy (1) • colour (1) – brighter / natural (1) • shelf life (1) – longer / preserves (1) • softness (1) – tender / easy to chew (1) • hardness (1) – tough / brittle / crunchy (1) • any other appropriate functional / aesthetic / eating / drinking / characteristic that relates to the improvement of the product *If answer in part 4(ai) is inappropriate but the material given in 4(ci) is appropriate allow follow through up to 2 marks. If no answer is given in part 4(ai) but the answer to part 4(cii) relates to the material stated in part 4(ci) allow follow through up to 1 mark. If no answer or incorrect answer given in part 4(ci) no marks awarded for 4(c ii)* Key Features Could Include any of the following; *Size, Weight, Appearance, Durability* (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 mail shots (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 in 5(a)(i). 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) – mail merge / mail shots (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 though up to 1 mark.* *Do not accept 'easier' without explanation* (2x1)	(2)

Question Number	Answer	Mark
5(b)(i)	*One mark per relevant example x 2* • Mobile phone / infra-red / blue tooth (1) • Email / messaging (1) • Internet / wireless / WIFI (1) • Video conferencing (1) • Electronic point of sale (EPOS) (1) • EDI (1) • ISDN (1) • Texting (1) • Phone (1) • Fax (1) • Walkie Talkie (1) • Voice over internet protocol - VoIP (1) (1x1)	(1)
5(b)(ii)	An explanation that makes reference to: • Mobile phone – flexibility (1) - roaming location (1) • Email (1) - immediate permanent record (1) • Internet – immediate vast access to information • Video conferencing – no travel expenses (1) - less time wasted in travelling (1) • Electronic point of sale (EPOS) – faster (1) / more accurate (1) • EDI – immediate transfer of information (1) - 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) • Walkie Talkie (1) – roaming location / flexibility / cost (1) **Other benefits may be seen in the light of:** *Speed, accuracy, JIT, information retrieval, meets consumer demands, quicker, increased sales, reduced 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, e.g. faster & easier* (2x1)	(2)

Question Number	Answer	Mark
5(c)	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) *Benefit must relate to the retailer.* (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) • Safer products to eat / sell (1) lower risk of cross contamination (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 processing (1) less manual input (1) • cleaner (1) more hygienic (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 • to extend shelf / saleable life (1) • to slow / prevent mould growth / micro organism (1) • to increase acidity to slow deterioration (1) • to allow customer more time to consume the product (1) • to increase storage times (1) • to allow stock build up (1) • to increase distribution range / distance (1) • reduce waste (1) • to reduce risk of food poisoning (1) (1x1) (1x1) (1x1)	(3)
8(b)	Three functions of the following: • to provide flavour (1) • to provide texture (1) • to provide colour (1) • to provide sweetness (1) • to improve appearance (1) • to encourage sales (1) • to provide energy (1) (1x1) (1x1) (1x1)	(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 / source materials / ingredients supply and control (1) *Do not accept development on its own for stage 1* *Do not accept product on its own for stage 1* *Do not accept design ideas 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 / ingredients ordered and 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) • Manufacturing to a specified standard *Or similar, but must related to the manufacture of chocolate chip muffins.* Exemplar answer; *To make the chocolate chip muffins the correct ingredients (1) have to be ordered from the stores and made available to production department. The right machinery and equipment (1) also has to be in place and in the correct position/ layout/sequence (1) to make the product efficiently. The correctly trained staffs need to be available (1) to operate the equipment properly (1) and safely (1). Quality checks e.g. weight, size, (1) should also be carried out using the correct procedures and equipment (1) and at the right times and should be recorded (1).* NB maximum 3 marks (3x1)	(3)

Question Number	Answer	Mark
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>Packaging/dispatch</u> <u>Packaging</u> • Placing in pvc liners (1) • Selecting correct boxes (1) • Selecting correct labels (1) • Selecting correct wrapping material (1) • Setting up packaging equipment (1) • Quality checks e.g. Size, weight / number / colour / seals / presentation (1) • Setting / checking product coding / sell by / best before (1) • Placing into cartons (1) • Stacking onto pallets (1) • Moving product to storage • Cleaning-equipment / work areas (1) • Product counts (1) • Keeping records / documentation (1) • Protection of the product (1) <u>Dispatch</u> • Correct storage place / location (1) • Correct storage conditions (1) • Correct use of handling equipment e.g. Forklifts, pallet trucks (1) • Picking orders (1) • Preparing orders for distribution / transportation (1) • Stock rotation (1) • Keeping records and documentation (1) • Loading vehicles (1) • Cleaning work areas (1) *Or similar, but must related to the manufacture of chocolate chip muffins.*	

Question Number	Answer	Mark
9(b)(ii)cont.	Exemplar answer *The chocolate chip muffins have to be placed in the right liners (1) and boxes (1),the packaging machinery has to be set up(1) and the correct film(1) used to wrap them. All labels (1) and codes (1) must be checked (1) on the packs and cartons (1) before being moved to the storage area (1).* *The chocolate chip muffins must be stored in right place (1) and in the correct conditions (1) whilst in the dispatch department. Stock must be rotated(1) to ensure no sub standard products(1) are sent to customers* *The orders for the muffins (1) have to picked correctly (1) by the dispatch department before loading onto the vans/wagons (1).* *Forklifts are sometimes used in the dispatch department but staff must have a licence to drive them (1) this is for safety reasons (1).* *Records must be kept (1) for all packaged and dispatched muffins.* NB maximum 3 marks (3x1)	(3)
	Total mark	9

Question Number	Answer	Mark
10(a)(i)	1 mark per reason. Up to 1 mark • Raising agent (1) • Emulsifier (1) • Colours (1) • Flavours (1) • Hydrogenated fats / oils (1) • Heat treated flours (1) • Syrups e.g. glucose / inverted (1) • Pre gelatinized starch (1) • Stabilisers (1) • Modified maize starches (1) • Gums (1) • Stabilisers (1) • Appropriate packaging materials (1) *Do not accept any' generic' term* (1x1)	(1)

Question Number	Answer	Mark
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 (1) • Weight (1) • Flavour / taste (1) • Texture (1) • Softness (1) • Moistness (1) • Stickiness (1) • Volume (1) • Appearance (1) • Aesthetics (1) • Eating attributes (1) *Examples* • *The size is increased (1) by the creation of carbon dioxide gas (co2) in the mix (1)* • *The weight can be reduced (1) as emulsifiers can hold more air (1)* • *The flavours improved (1) when essences are included in the product (1)* • *The product is softer (1) by using vegetable fats as these reduce gluten development* • *The product is more moist and sticky (1) as syrups are runny instead of dry like sugar (1)* • *The product doesn't collapse (1) because the stabilisers stop the bubbles collapsing (1)* • *The filling is made more moist (1) because the pre-gelatinised starches allow more water to be used (1)* (1x1) (1x1)	(2)
10(b)	1 mark for low response. 2 marks for detailed response. 2 marks for 2 low responses. • Increased shelf life (1) • Controlled moisture loss (1) • Controls ERH (equilibrium relative humidity) (1) • Controls available water (aw)(1) • Increased storage time (1) • Eating qualities (1) • Reduced waste (1) (1x1) (1x1)	(2)

Question Number	Answer	Mark
10(c)	1 mark for identifying the safety precaution taken 1 mark for how • Safety footwear (1) • Protective clothing e.g. overalls / aprons (1) • Safety equipment e.g. goggles / dust masks / gloves (1) • Ventilation (1) • Lighting (1) • Clean work areas (1) • Tidy work areas (1) • Clear emergency exits (1) • Clear movement routes (1) • Tidy work areas (1) • Waste removal (1) • Dry floors (1) • First aid boxes in place and complete (1) • Removal of jewellery (1) • Long hair covered (1) • Washing hands (1) *Examples* • *Wearing safety boots (1) with steel toecaps can prevent feet being injured if something falls on them (1)* • *Ventilation (1) removes dust from the workplace (1)* • *Clear emergency exits (1) must be kept clear of obstructions by employers (1)* • *Proper lighting (1) avoids dark or shadowy areas, reducing the risk of accidents (1)* • *Goggles are worn (1) when working with some ingredients to prevent any splashes getting into the eyes (1)* • *Long hair must be covered (1) by using suitable hairnets and hats (1)* • *Washing hands to prevent (1) to reduce the risk of spreading bacteria (1)* *Any appropriate answer linked to health and safety or food safety.* (1x1) (1x1)	(2)

Question Number	Answer	Mark
10(d)	Exemplar answer; *Modern materials have helped increase sales in a number of ways. They have made it possible to make chocolate chip muffins look (1) and taste better (1) e.g. by using bake stable choc chips (1) and flavours (1), they can also make them bigger (1) and softer (1) by using emulsifiers (1) and a last longer (1) by using preservatives (1) so they don't have to be wasted (1) reducing the need for landfill(1).The muffins stay fresher(1) which is a good selling point and could increase sales (1).* NB Maximum 3 marks (3 x1)	(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 mixing (1) of the chocolate muffin mix (1) • Robots (1) dealing with the box products (1) • Use of conveyor systems (1) to move the muffins about (1) • Pick and Place (1) to fit boxes of finished products (1) • Embedded computers (1) to perform dedicated functions (1) • Remotely operated vehicles (1) moving boxed chocolate muffins 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) • 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 retail / shorter delivery times (1) as manufacturer can vary product to meet demand (1) • Hygienic product (1) because less human contact (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) • Longer shelf life (1) • Disposal of hardware e.g. computers / machinery (1) • Disassembly costs (1) • Recycling (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