OCR
Oxford Cambridge and RSA

GCSE

Manufacturing

Unit **B234:** Impact of Modern Technologies on Manufacturing

General Certificate of Secondary Education

Mark Scheme for June 2014

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations

used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions)
Subject specific - insert details in table making sure that the annotation matches the image that appears on scoris®. Your Qualifications Manager or Qualifications Leader will be able to help.

Annotation	Meaning
BP	Blank Page – this annotation **must** be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.

Subject-specific marking instructions

that apply across the whole question paper to be included here.

MARK SCHEME: FORMAT 1 (autotext: f1)

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Rationale</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>

Choose one manufacturing sector from the list above and for that sector:

- **name two different products produced in the sector**
- **for each product, give one example of a modern technology used in its manufacture.**

<table>
<tr><th>Sector</th><th>Product</th><th>Technology / material</th></tr>
<tr><td>Any</td><td></td><td>CAD, computer spreadsheet,</td></tr>
<tr><td>Clothing and textiles</td><td>Sportswear, Safety/protective clothing</td><td>Gortex, Kevlar, photo/thermochromic dyes, Gerber cutter/ automated cutter</td></tr>
<tr><td>Chemical and pharmaceutical</td><td>Shampoos, lubricating oils, headache tablets</td><td>Blister packs, plastics, green technologies</td></tr>
<tr><td>Electronic and communications</td><td>Mobile phones, MP3, I pad,</td><td>Miniaturisation, internet access, blue tooth,</td></tr>
<tr><td>Machinery and Equipment</td><td>Pressure washer, conveyor belt, lift (e.g. dumb waiter)</td><td>HIP for body of washer, pressure sensors, limit switches in lift systems,</td></tr>
<tr><td>Food and drink</td><td>Cakes, bread,</td><td>Computer spreadsheets, continuous baking ovens, pro biotic yogurt, gluten free products</td></tr>
</table>

2 x (1 + 1)

</td><td>

[4]

</td><td>

No mark awarded for choosing sector

Award 1 mark for any appropriate product from the chosen sector and a further one mark for each relevant modern technology used in its manufacture.

</td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Rationale</th></tr>
<tr><td>1</td><td>(b)</td><td></td><td>Explain the benefit of using modern technologies in each product named in part (a).

<table>
<tr><th>Technology / material</th><th>Benefit of using the technology</th></tr>
<tr><td>CAD, spreadsheet</td><td>Cost savings, Drawings can easily be changed, saves energy in production, greener.</td></tr>
<tr><td>Gortex, Kevlar, photo/thermochromic dyes, Gerber cutter/ automated cutter</td><td>Breathable fabrics, safety spoons and mugs for feeding babies,</td></tr>
<tr><td>Blister packs, plastics, green technologies</td><td>Polypropylene shampoo bottle with hinged top, ease of colour matching, recyclable plastic materials</td></tr>
<tr><td>Miniaturisation, blue tooth,</td><td>Large storage capacity in small units, internet access</td></tr>
<tr><td>HIP for body of washer, pressure sensors, limit switches in lift systems,</td><td>Customer appeal, lightweight, high strength/weight ratio, increased safety</td></tr>
<tr><td>Continuous baking ovens, Gluten free products</td><td>Can calculate and check nutritional values/ can automatically readjust for changes in quantities, Rapid production, safe for Coeliacs,</td></tr>
</table>
(2 x 2)</td><td>[4]</td><td>Award 1 mark for simply naming a benefit/one word answer and up to two marks for a full explanation.

Allow e.c.f. for products different from those chosen in part 1(a) for 1 mark

Justification required for full marks</td></tr>
</table>

Question			Answer	Mark	Rationale
2			**Some stages in the manufacture of a product are listed below:** • **Assembly** • **Finishing** • **Packaging** **Describe what takes place at each of these stages.**		Award up to **two** marks for each correctly named activity.
		(i)	**Assembly:** welding, brazing, gluing, bolting, screwing components together,		Answers must relate to assembly, finishing and packaging only.
		(ii)	**Finishing:** spray painting, galvanising, plating, anodising, attaching stickers / labels to clothing, waterproofing, icing/decorating		Do not award marks for research, preparation or dispatch stages
		(ii)	**Packaging:** wrap food products in food grade plastic film, place product into prepared cardboard / polystyrene/ plastics tray, place into outer carton, insert user instructions and guarantee, add labels showing (product, ingredients, weights, sell by dates) (3 x 2)	**[6]**	
3			**Describe the impact of modern technologies on each of the following:**		Award one mark for example/impact plus one additional mark for relationship to a modern technology.
		(i)	Working conditions - better lighting, air conditioning/heating, safer working as robots carry out hazardous tasks,		
		(ii)	Product availability – increased variety of products, internet buying/selling, new processes,		Do not reward 'faster,' 'increased speed' etc
		(iii)	Product costs – products are mass produced by machines so lower wage costs, use of new/recycled materials which are easier/cheaper to process,		Allow possible increase in costs due to recovery of investment in the new technology
		(iv)	Transportation of goods – cleaner fuel so lower carbon footprint, larger vehicles, bulk shipping carriers,bar coding to allow tracking of finished products (4 x 2)	**[8]**	

Question			Answer	Mark	Rationale
4			**Many manufacturers use CAM technologies in their production processes.**		All three terms must be correct for the one mark.
	(a)	**(i)**	**State what the letters CAM stand for.** CAM - Computer Aided Manufacturing	**[1]**	Can accept 'Computer Aided Manufacture.'
		(ii)	**Describe two benefits to a manufacturing company of using CAM** Designs can be accessed directly from CAD files, products can be changed easily by simply changing the CAD file, fewer skilled operators/workers are needed, consistency of product in continuous production, possible safer working conditions (2 x 2)	**[4]**	Award only one mark for simple statement/single word answer. Award two marks for each benefit fully described (Not improved speed of production)
	(b)		**Some manufacturing sectors use Computer Integrated Manufacturing (CIM) in their production processes** **Describe, in detail, one benefit to a manufacturing company of using CIM** Development, design, production planning, material sourcing, processing, assembly, finishing, packaging and dispatch are all linked through a series of computers using a single set of data	**[3]**	Award only one mark for possible single word / simple answers. Key points for marks should include: • integration • whole production process • use of ICT • single data set
	(c)		**Explain what is meant by the term 'standardised components.'** Components that are common to a wide range of products and can include such items as screws, bolts, buttons, zips, Velcro strips and other fixing devices and common catering ingredients that can be resourced from an outside supplier.	**[3]**	

Question			Answer	Mark	Rationale
5			**Describe three things that a manufacturer should consider when introducing modern technology into the workplace.** Factors may include e.g. cost of new machinery/ equipment, breakeven point, alterations to working area, environmental impact, retraining/ reduction of workforce, health and safety considerations, availability of materials and components to suit new processes, reliability. (3 x 2)	**[6]**	Award **one** mark for each factor given and a further one marks for a clear description. Answers must relate to the workplace.
6	**(a)**		**Describe how waste can be reduced in the following stages of manufacture.**		
		(i)	**Production planning:** Product is designed to use less material / components/ ingredients, use of recyclable materials.		Award full marks for showing clear understanding of issues
		(ii)	**Processing:** More efficient scale of production, use of automated processes to reduce waste, better quality control systems.		
		(ii)	**Packaging:** Reduction in size of packaging leading to less material usage, reuse / recycle materials. (3 x 2)	**[6]**	
	(b)		**Explain what is meant by the term 'Design for Manufacturing Assembly' (DFMA).** A process by which products are designed with ease of assembly in mind. If a product contains fewer parts it will take less time to assemble thereby reducing assembly costs, could also refer to the ease of dis assembly and the re-use / recycling of redundant components.	**[3]**	Award up to three marks for a suitable explanation.

Question			Answer	Mark	Rationale
7	(a)		**Shape memory alloy is one example of a smart material.** **Explain what is meant by the term smart material.** Smart materials are essentially metals which exhibit unique properties. For example, after being strained (by heat or the application of an electric charge) they can revert back to their original shape. (1 + 2)	**[3]**	Award one mark for a suitable example of a smart material and up to a further two marks for an explanation of its properties. Justification required for full marks
	(b)		**Explain, using an example, the use of a different smart material.** Thermochromic inks/dyes change colour in response to a change in temperature. Usually (but not always) it is reversible, and is related to some form of phase change in the molecular structure of the colorant. Examples of use include e.g., advertising displays, child's feeding spoons and drinking cups, thermometers. Non reversible thermochromic inks are used in the food industry to indicate optimum operating temperatures of some food products. (1 + 2)	**[3]**	Award one mark for a suitable example of the use of a smart material and up to a further two marks for an explanation of its properties. Further examples of uses could include e.g., spectacle frames, dental arches, bone staples, angioplasty balloons and many more. Only award full marks if a suitable example/ product is mentioned

Question			Answer	Marks	Guidance	
					Content	**Levels of response**
8*			Award up to six marks for discussion and evaluation of the implications that the introduction of modern technologies have had on the production of engineered products.	**[6]**	Examples and relevant points could include: Programmable / flexible control of the production process using say, a PLC so that outputs can readily be altered depending on inputs – examples include conveyor belt speeds, temperature control and the like They can be operated in adverse conditions / hazardous environments and can carry out repetitive operations over a wide range of process operations like paint spraying & welding giving a consistent level of product quality. They can save the company money in the long run by reducing production costs incurred by employing a large workforce The above list is, of course, not exhaustive	**Level 3 (5 – 6 marks)** Candidates provide a thorough analysis and show a clear understanding of the required question material. Specialist language and terms would be used in the appropriate areas being discussed and the required information will be well structured in its presentation. Candidates will demonstrate an accurate level of spelling, punctuation and grammar. **Level 2 (3 – 4 marks)** Candidate provides an adequate discussion which shows a reasonable level of understanding of the question material. There will be some evidence of the use of specialist language although not always in the appropriate areas being discussed. Information, for the most part, will be reasonably structured but, again, may contain occasional errors in spelling, punctuation and grammar. **Level 1 (0 – 2 marks)** Candidate provides a basic discussion which shows some understanding of the question material but uses little or no specialist language. Answers may well be ambiguous or disjointed. Contains obvious errors in spelling, punctuation and grammar.
			Total	**60**		

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