



**GCSE**

**Engineering**

Unit **A624/02**: Impact of Modern Technologies on Engineering

General Certificate of Secondary Education

**Mark Scheme for June 2016**

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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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Question			Answer	Mark	Guidance
1	(a)		<p>One mark for each relevant product</p> <p>Examples:            Electrical &amp; Electronics - cooker; radio controlled toy; kettle; microwave oven; led torch            Rail &amp; Marine - signalling system; level crossing; navigation system            Aerospace - aircraft wing; helicopter rotor; jet engine; passenger 'air-bridge'</p> <p>(6x1)</p>	6	
	(b)		<p>One mark for each of two different sectors</p> <p>Automotive; Chemical &amp; Process; Computers, Communication &amp; IT; Medical &amp; Pharmaceutical; Structural &amp; Civil</p> <p>(2x1)</p>	2	Sectors must be from the list in the Specification
2	(a)	(i)	Alloy - Brass; duralumin; high carbon steel	1	
		(ii)	Polymer - HDPE; PVC	1	
		(iii)	Non-ferrous metal - brass; copper; duralumin	1	
		(iv)	Composite - concrete; GRP	1	
	(b)	(i)	<p>No mark for naming the material</p> <p>One mark for a product made using the material chosen</p>	1	

Question			Answer	Mark	Guidance
		(ii)	One mark for each of two relevant properties/characteristics (1+1)	2	
	(c)		One mark for each of three relevant points  Examples: Availability; cost; ease of recycling/disposal; ease of use/machining; safe to use; ease of storage (3x1)	3	Three simplistic / one-word responses (including properties) one mark only
3			Up to three marks for a reasoned explanation, including reference to the modern technology used  Examples:  (i) Packaging & dispatch - 'Pick and place' <u>robots</u> for packing and use of <u>bar-codes</u> for <u>control and tracking</u>  (ii) Processing & production - <u>CIE</u> used to <u>control and monitor</u> production on <u>computer controlled machines</u>  2 x (3x1)	6	

Question			Answer	Mark	Guidance
4	(a)		<p>One mark for correctly named component plus one mark for example of use</p> <p><b>B</b> - ratchet and pawl - used on a winch to prevent unwinding  <b>C</b> - Nyloc/self-locking nut - used on a bolt to keep fastening tight  <b>D</b> - Resistor - control the flow of electricity in a circuit  <b>E</b> - Cam - converts rotary motion into reciprocating (linear) motion; used in car engines to open valves  <b>F</b> - Fuse - protects electrical items from excessive current; blows when current is too high  <b>G</b> - Pneumatic cylinder - used to move items by compressed air; piston moves out when air goes into cylinder</p> <p style="text-align: right;">3x(1+1)</p>	6	<p>Accept basic examples of use only if relevant</p> <p>Not simply 'nut'</p> <p>Accept correct use of component if it is incorrectly named – one mark ecf</p>
	(b)		Pneumatic/hydraulic	1	
5	(a)		<p>One mark for a correctly named process of each type</p> <p>Examples:            Shaping &amp; manipulation - injection moulding; casting; forging; vacuum forming; bending            Joining &amp; assembly - Welding; soldering; riveting            Heat &amp; chemical treatment - Hardening; pickling; annealing            Surface finishing - electro-plating; plastic/powder coating; anodising; painting; galvanising; polishing/lacquering; oil blackening/blueing</p> <p style="text-align: right;">(5x1)</p>	4	Accept varnishing

Question			Answer	Mark	Guidance
	(b)		<p>One mark for technology plus one mark for description of use</p> <p>Examples:</p> <p>1 'Pick and place' robot arms used in SMT for positioning components in place on electronic circuit boards</p> <p>2 Use of computer controlled robots for paint spraying</p> <p style="text-align: right;">2x(1+1)</p>	<b>4</b>	Accept same technology for both parts if an appropriate description of use is provided
<b>6</b>	(a)		Product <b>A</b>	<b>1</b>	
	(b)		<p>Up to two marks for each possible reason</p> <p>Examples:</p> <p>Product A could be much larger/heavier than B and need more energy for transportation.</p> <p>Product A could be made overseas but product B made locally</p> <p>Product A may need protective packaging that makes it bigger/heavier</p> <p>Product A could need air-freighting for urgent delivery</p> <p>Product A may need to be transported longer distances</p> <p style="text-align: right;">2 x (1+1)</p>	<b>4</b>	<p>Accept <u>either</u> larger <u>or</u> heavier but not both</p> <p>Reason must be justified for second mark</p>
	(c)	(i)	Tidal / wind / geothermal / solar / hydro / bio fuels	<b>1</b>	
		(ii)	<p>Up to two marks for a reasoned explanation of a benefit.</p> <p>Explanation could reference:</p> <p>Saving of non-renewable energy sources/fossil fuels</p> <p>Reduce the amount of greenhouse gasses</p> <p>Some are cheaper than traditional sources</p>		

Question			Answer	Mark	Guidance
			<p>Gives a cleaner environment with less waste produced</p> <p>Renewable sources cause less damage to the environment</p> <p>Energy source is readily available and won't run out</p> <p>(2x1)</p>	<b>2</b>	Justified response required for full marks
<b>7</b>	<b>(a)</b>		<p>One mark for modern technology used plus one mark for description</p> <p>Examples:</p> <p>Renewable energy sources reduce harmful emissions</p> <p>Modern manufacturing methods cut down amount of waste produced</p> <p>Recycling methods for more materials reduce amount of landfill</p> <p>Modern materials make products lighter and more fuel efficient</p> <p>More fuel efficient engines in vehicles / electric vehicles reduce emissions into the atmosphere</p> <p>2 x (1+1)</p>	<b>4</b>	
	<b>(b)</b>		<p>One mark for example plus up to two further marks for explanation</p> <p>Explanation could reference:</p> <p>Allows materials to be more readily recycled, reducing raw material use</p> <p>Re-use of components reducing manufacturing needs</p> <p>Allows safe disposal of hazardous materials</p> <p>Cuts down products that would have gone to landfill but can now be taken apart</p> <p>(3x1)</p>	<b>3</b>	Reasoned explanation required for full marks

Question			Answer	Marks	Guidance	
					Content	Levels of response
8*			Up to six marks for a discussion or critical evaluation of issues relating to the advantages and disadvantages of using CAD when designing engineered products		<p>Response may include reference to the following points:</p> <p>Advantages:            Designs are more easily modified            Designs can be stored electronically and sent anywhere in the world instantly            Storage of designs/drawings takes up very little space            Hard copy is easily produced from file            CAD software can produce 3D images and animations            CAD software can be used to produce prototypes            Testing of products can be done on-screen</p> <p>Disadvantages:            Complex software is expensive to buy            Staff need to be trained to use new systems            Less work for skilled draughtsmen            Constant power supply needed            Regular updating of system and staff training required</p>	<p>Level 3 (5 - 6 marks)            Thorough analysis showing a clear understanding of the advantages and disadvantages of using CAD when designing engineered products            Specialist terms will be used appropriately and correctly. The information will be presented in a structured format. The candidate can demonstrate the accurate use of spelling, punctuation and grammar.</p> <p>Level 2 (3 - 4 marks)            Adequate discussion showing an understanding of the advantages and disadvantages of using CAD when designing engineered products            There will be some use of specialist terms, although these may not always be used appropriately. The information will be presented for the most part in a structured format. There may be occasional errors in spelling, punctuation and grammar.</p> <p>Level 1 (0 - 2 marks)            Basic discussion showing limited understanding of the advantages and disadvantages of using CAD when designing engineered products            There will be little or no use of specialist terms. Answers may be ambiguous or disorganised. Errors of spelling, punctuation and grammar may be intrusive.</p>
			<b>Total for paper</b>	<b>60</b>		

**OCR (Oxford Cambridge and RSA Examinations)**  
**1 Hills Road**  
**Cambridge**  
**CB1 2EU**

**OCR Customer Contact Centre**

**Education and Learning**

Telephone: 01223 553998

Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

[www.ocr.org.uk](http://www.ocr.org.uk)

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**OCR (Oxford Cambridge and RSA Examinations)**  
**Head office**  
**Telephone: 01223 552552**  
**Facsimile: 01223 552553**

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