

Engineering

General Certificate of Secondary Education

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

Mark Scheme for June 2011

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2011

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

Question	Expected Answer	Mark	Rationale/Additional Guidance
1 (a)	<p>Engineering sectors produce different products</p> <p>Complete the links below to identify which engineering sector makes the products listed.</p> <p>Award 1 mark for each correct link shown:</p> <p>Aerospace to aircraft wing Medical and Pharmaceutical to hearing aids Electrical and electronic to TV remote control Automotive to Inertia seat belts Chemical and Process to toothpaste Computers, Communications and IT to hard disc drive</p>	[6]	
1 (b)	<p>Select three engineering sectors from the list above. Give one different product made in that sector.</p> <p>Award 1 mark for each associated product in the chosen sector</p> <p>Aerospace – eg jet engines, landing gear, aircraft doors</p> <p>Medical and pharmaceutical – eg heart monitor, blood pressure monitor , wheelchairs</p> <p>Electrical & electronic – eg washing machines, hair dryers, digital clocks, digital cameras</p> <p>Automotive – eg laminated windscreen, windscreen washer/wiper, magnesium alloy wheels</p> <p>Chemical and Process – eg washing powder, cement, paint, wallpaper paste</p> <p>Computers, Communications and IT – eg laptop/desktop computer, memory stick, short wave radio, satellite TV</p> <p>3x1</p>	[3]	

Question		Expected Answer	Mark	Rationale/Additional Guidance
2	(a)	<p>Describe two benefits that the use of modern technology has had on the availability of products</p> <p>Award 1 mark for stating an advantage and an extra mark for description</p> <p>The Internet [1]; allows us to order/buy products without leaving home [1]; Microchip technology [1]; has made products cheaper and more versatile [1]. 2x2</p>	[4]	Do not reward reference to delivery of products eg bigger lorries
2	(b)	<p>Describe, using two examples, how modern technology has made modern products safer to use</p> <p>Award 1 mark for statement and the extra mark for the description</p> <p>Examples The use of thermo-chromic inks on babies feeding bottles [1]; reduces the risk of burns/scalds [1] Modern paints on children's toys are non-toxic [1]; reducing the risk of poisoning [1] Colour change in modern electric kettles [1]; shows when water is boiled [1]. 2x2</p>	[4]	

Question		Expected Answer	Mark	Rationale/Additional Guidance
3	(a)	<p>CAD packages are used extensively in the design of engineered products</p> <p>What do the letters C A D stand for?</p> <p><u>Computer</u> <u>Aided</u> <u>Design</u></p>	[1]	
3	(b)	<p>Orthographic projection is one type of engineering drawing.</p> <p>Name two other types of engineering drawings</p> <p>Award one mark for each of the two correctly named types of engineering drawings from: Orthographic, Isometric, Oblique , schematic, block diagram, circuit diagram, perspective, exploded</p> <p>The list is not exhaustive</p>	[2]	<p>Do not reward both one point and two point perspective</p> <p>Do not accept 3D</p>
3	(c)	<p>Completed CAD drawings are saved as computer files.</p> <p>(i) State one electronic method of sharing a CAD file with an engineering company. One mark from Fax, CD ROM, memory stick, e-mail.</p> <p>(ii) Describe the method you have identified in (i) would be used Award up to two marks for a detailed description of process identified above Examples make a hard copy of the drawing[1] and send by FAX [1], save onto a CD or a memory stick [1] and send through normal post [1], save onto hard drive [1] and send as an attachment to an e-mail [1].</p> <p>(iii) Describe how a back-up copy of a CAD file could be made. Award one mark for reference to copying [1] saving to another location or medium [1]</p>	<p>[1]</p> <p>[2]</p> <p>[2]</p>	<p>Award one mark only for detail of sharing if different method to (i) is used</p>

Question		Expected Answer	Mark	Rationale/Additional Guidance
4	(a)	<p>Engineered products normally go through the following stages of production.</p> <p>shaping assembly heat treatment</p> <p>(i) Award one mark each for any two of the following shaping processes : bending, forging, forming, folding, hammering, plastics forming processes, casting</p> <p>(ii) Award one mark each for any two of the following assembly processes : welding, brazing, soldering, riveting, gluing, bolting</p> <p>(iii) Award one mark each for any two of the following heat treatment processes: hardening, tempering, normalising</p>	<p>[2]</p> <p>[2]</p> <p>[2]</p>	<p>Accept reference to quality control check once only</p> <p>Accept reference to shaping by machine (turning / milling) for one mark in total</p>

Question		Expected Answer	Mark	Rationale/Additional Guidance
5	(a)	<p>Programmable Logic Controllers (PLCs) are used in the production of some engineered products.</p> <p>Describe two benefits of using PLCs in the production of engineered products.</p> <p>Award up to two marks for a detailed explanation of the advantages listed eg PLC's are designed to be used over a wide temperature range [2], they are mechanically robust and resistant to vibration and impact [2], PLC's are low powered and therefore are relatively cheap to run [2].</p> <p style="text-align: right;">2x2</p>	[4]	
5	(b)	<p>Explain how PLCs can be used in the packaging and dispatch of completed engineered products.</p> <p>Award up to three marks for explanation</p> <p>Example</p> <p>Sensing components/finished products [1] directing products to the correct packages [1], counting into cartons [1].</p> <p>Collected from production line [1] storage arranged [1] labelled for despatch [1]</p>	[3]	
5	(c)	<p>Give two further examples of a production process where PLCs are used.</p> <p>Award one mark for each of two correctly stated process from eg temperature control of a furnace, flow control of a liquid or a gas as part of the production process, control of conveyors providing component parts to the production process</p>	[2]	

Question	Expected Answer	Mark	Rationale/Additional Guidance
6	<p>Describe one different quality control check that should be used for each of the following engineering processes.</p> <p>Award 1 mark for the Quality control check [1] and one mark for a description.</p> <p>(i) Turning Check that the finished dimensions [1] are within the tolerances outlined in the product specification [1].</p> <p>(ii) Soldering. Ensure components are in the correct location [1] and the 'tails' are protruding through the board [1], ensure an even temperature and check for 'dry joints' [1].</p> <p>(iii) Surface finishing. Visual check for consistency of applied surface finish Colour comparison with master Touch test for smoothness</p>	<p>[2]</p> <p>[2]</p> <p>[2]</p>	

Question			Expected Answer	Mark	Rationale/Additional Guidance
7	(a)		<p>Engineering components are normally classified as shown below:</p> <p>electrical and electronic mechanical or pneumatic/hydraulic</p> <p>Select four of the engineering components listed below and place them in the correct position in the table Two have been done for you</p> <p>Award one mark for each correctly placed component.</p> <p>Electrical/Electronic – resistor, diode Mechanical – cam, set screw</p>	[4]	
7	(b)	(i)	<p>Give two examples of products that use a smart material</p> <p>Award one mark for each of two common uses from eg,</p> <p>Examples Spectacle Frames, thermo-chromic applications, photo-chromic applications SMA applications</p>	[2]	
	(b)	(ii)	<p>Explain why shape memory alloys are known as ‘smart materials.’</p> <p>Explanation must have reference to temperature change [1] resulting in change in shape or form [1]</p>	[2]	

Question	Expected Answer	Mark	Rationale/Additional Guidance
8*	<p>Discuss the impact of systems and control technology on safety during engineering production.</p> <p>Six marks for a discussion or critical evaluation of relevant implications.</p> <p>Examples and points could include:</p> <p>Automatic cut-outs and safety interlocks on moving machinery which protect workers from hazards. These could include – limit switches on gantries and other tracked vehicles, machinery which will not operate unless safety guards are in place. Laser beams stop machinery if humans enter a controlled area.</p> <p>Increased use of robotics that can work in hot/dusty/chemical environments eg, paint spraying, spot welding, leading to less danger due to human error, workers are happier and less stressed, less chance of accidents</p> <p>The above list is not exhaustive</p> <p>QWC</p> <p>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.</p> <p>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.</p>		

Question	Expected Answer	Mark	Rationale/Additional Guidance
	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	[6]	
	Total	[60]	

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

OCR Customer Contact Centre

14 – 19 Qualifications (General)

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity



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

© OCR 2011