



# **GCSE**

## **Engineering**

**Unit A622/02: Engineering Processes**  
General Certificate of Secondary Education

**Mark Scheme for June 2015**

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, 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 2015

## Annotations

Annotation	Meaning of annotation
<b>BP</b>	Blank Page – this annotation <b>must</b> 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.
<b>REP</b>	Repetition
<b>TV</b>	Too vague

Question		Answer	Mark	Guidance
1	(a)	<p>One mark for each of three different engineering sectors</p> <p>Aerospace Automotive Chemical and Process Computers, Communication and IT Electrical and Electronics Medical and Pharmaceutical Rail and Marine Structural and Civil</p>	(3x1)	<p>Sectors will normally be from those listed in the specification, but accept other viable responses.</p>
	(b)	<p>One mark for each of two relevant examples of products</p> <p>Examples: Aerospace – aircraft wing/door; tail rotor Automotive- car/lorry; wheel; windscreen Chemical and Process- paint/varnish; cement; shampoo Computers, Communication and IT- mouse; keyboard; web-cam Electrical and Electronics- radio; vacuum cleaner Medical and Pharmaceutical- wheelchair; tablets Rail and Marine- coaches; passenger information system Structural and Civil- bridge; office bloc</p>	(2x2)	<p>Products must clearly relate to the sector named. ecf if sector is not one of those named in part (a) Do not award repetition of products</p>

Question			Answer	Mark	Guidance
2	(a)	(i)	One mark for each of three metal alloys  Brass; bronze; cast iron; mild steel; stainless steel  (3x1)	3	NOT aluminium
		(ii)	One mark for each of two ferrous metals  Cast iron; mild steel; stainless steel  (2x1)	2	
	(b)		Up to two marks for a clear explanation.  Explanation should include reference to stainless steel not rusting(1) and therefore not contaminating foodstuffs(1)  (1+1)	2	Accept 'it is easy to clean' for one mark only Accept reference to heat conduction Reference to food contamination of food needed for full marks

Question			Answer	Mark	Guidance
3	(a)	(i)	<p>One mark for each of three correctly named component</p> <p>1 – Nyloc/self-locking nut 2 – Grub screw 3 – Pulley</p>	3 (3x1)	<p>Not simply (hexagonal) nut</p>
		(ii)	<p>Up to two marks for a description of the function of the named component .</p> <p>Examples:</p> <p>The nyloc nut is used on a bolt(1), which bites into the nylon insert(1) to stop it working loose</p> <p>A grub screw is used to fix parts like gears and pulleys onto shafts(1) where a bolt with a head could not be used(1)</p> <p>A pulley is fixed to a rotating shaft (1) and is used to transmit power through a belt(1) to other pulleys</p>	2 (1+1)	<p>ecf if incorrectly named component is described - 1 mark only</p> <p>Justified response required for full marks</p>
	(b)		<p>One mark for each of two electrical/electronic components</p> <p>Examples:</p> <p>Fuse; LED; resistor; diode; motor; relay; LDR; battery</p>	2 (2x1)	Accept other viable examples.
	(c)		<p>One mark for an appropriate pneumatic/hydraulic component</p> <p>Examples:</p> <p>Three-port valve; (single/double-acting)cylinder; flow control valve; piston; hydraulic ram; pressure gauge</p>	1	Accept other viable examples.

Question		Answer	Mark	Guidance
4	(a)	<p>One mark for each of two valid reasons for suitability</p> <p>Examples:</p> <p>It is a relatively inexpensive metal      It is easy to machine/shape      It is stronger than many other metals      It can be readily finished to prevent corrosion      Hard to resist wear      Readily accepts surface finishing</p>	2 (2x1)	<p>Simply putting 'cheap'/'strong'/'hard' = too vague</p> <p>Two unjustified responses – 1 mark max.(BOD)</p>
	(b)	<p>One mark for each of three relevant safety precautions</p> <p>Examples;</p> <p>Keep guards in position on machine      Make sure work/cutter is tightly clamped      Keep working area clear of obstructions      Know where safety cut-out switch is      Be trained/experienced on machine</p>	3 (3x1)	Accept PPE examples
	(c)	<p>One mark for each of four correctly completed cells</p> <p>2 Cut-off corners - hacksaw      3 File to shape of curve - flat/half-round file</p>	4 (4x1)	<p>Accept milling – one stage only</p> <p>Only one correct tool required for mark at each stage</p>

Question		Answer	Mark	Guidance
5	(a)	(i) One mark for each of two relevant examples  Examples: Shaping and manipulation – bending; forging; vacuum forming; extrusion; injection moulding  (2x1)	2	NOT 'shaping' (material removal)
		(ii) One mark for each of two relevant examples  Examples: Joining and assembly – welding; brazing; soldering, glueing; riveting; screwing; pick & place  (2x1)	2	
	(b)	One mark for each of two appropriate safety precautions  Examples: Be aware of emergency cut-off switch Have good ventilation/fume extraction Keep working area free from obstacles Must be trained in process being used Have fire extinguisher / first aid kit close by  (2x1)	2	No marks for PPE  Precautions must relate to chosen process  ecf if part (a) incorrectly answered – 1 mark max.
	(c)	Up to three marks for a clear explanation of QC checks prior to surface finishing  Example: The products should be checked for surface marks/defects(1) that might show through the finish(1) and the surface must be perfectly/chemically clean(1) to accept the finish.  (1+1+1)	3	Fully justified response required for full marks

Question		Answer	Mark	Guidance	
6	(a)	<p>Up to two marks for each description of a design stage.</p> <p>Examples:</p> <p>Producing design specification – the designer takes account of the client's requirements(1) and produces the specification which is a list of what is needed in the design(1)</p> <p>Generating design solutions – The designer produces a <b>number</b> of designs(1) so that they can be evaluated for possible use(1)</p> <p>Presenting design solutions to the client – the designer uses drawings and presentation techniques(1) to show the client the product so that they can choose(1) the one to use</p> <p>Developing final design – the designer considers feedback from the client(1) and makes changes to the design where needed(1) to produce the final solution</p> <p>Creating engineering drawings for manufacture – the designer uses CAD(1) software to produce engineering drawings of all the parts so that they can be made(1) by the manufacturer (using CAM machines)</p>	2 x (1+1)	4	Justified responses required for full marks
	(b)	<p>Up to three marks for a clear explanation of the use of modern technologies</p> <p>Example:</p> <p>Designs could be produced using CAD software(1) and the images could then be embedded into a PowerPoint presentation(1) The PPT could then be sent electronically to the client or a video link could be set up(1)</p>	(1+1+1)	3	Fully justified explanation required for full marks

Question		Answer	Mark	Guidance	
7	(a)	<p>Up to two marks for each description of a way safety has been improved through modern technologies</p> <p>Examples:</p> <p>Robots are now used(1) to work in hazardous conditions so that the workers don't need to(1)</p> <p>Modern systems of air quality control(1) are better for workers' health/breathing.(1)</p> <p>Modern CNC machines are fully enclosed(1) so operators are protected from flying material or fluids(1)</p> <p>Automatic guided vehicles (AGVs)(1) are used to move large items around so no heavy lifting is required(1)</p> <p>Use of sensors to automatically shut down machines when problems arise</p>	2 x (1+1)	4	Justified responses required for full marks
	(b)	<p>Up to three marks for a clear explanation of the importance of workforce training</p> <p>Example:</p> <p>Because of all the new technologies(1) a lot of the old methods are not used any more(1) so workers have to be re-trained on the new methods so that they can work/safely/ efficiently/ keep their jobs(1)</p>	(1+1+1)	3	Reasoned explanation required for full marks

Question		Answer	Marks	Guidance	
				Content	Levels of response
8*		Up to six marks for a discussion of issues relating to the advantages and disadvantages of the 'end-of-life disposal' of engineered products.	6	<p>Response may include reference to the following points:</p> <p>If products are thrown away, landfill sites will fill up too quickly.</p> <p>Materials can be recycled if products are disposed of properly.</p> <p>Some products have to be disposed of in certain ways by law.</p> <p>Dangerous materials can be separated out of products safely.</p> <p>Recycled materials and re-used components cuts down on the use of raw materials.</p> <p>Manufacturers have to set up for disposal which costs them money.</p> <p>New products have to be 'designed for disassembly', which could make them more expensive.</p>	<p><b>Level 3 (5 - 6 marks)</b> Thorough analysis showing a clear understanding of the advantages and disadvantages of the 'end-of-life disposal' of 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><b>Level 2 (3 - 4 marks)</b> Adequate discussion showing an understanding of the advantages and disadvantages of the 'end-of-life disposal' of 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><b>Level 1 (1 - 2 marks)</b> Basic discussion showing limited understanding of the advantages and disadvantages of the 'end-of-life disposal' of 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> <p><b>Bullet pointed response - Level 1 - 2marks</b></p> <p><b>0 = response not worthy of a mark.</b></p>

**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)

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 2015

