



**GCSE**

**Engineering**

Unit **A622/02**: Engineering Processes

General Certificate of Secondary Education

**Mark Scheme for June 2018**

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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

Annotation	Meaning
	Award 0 mark
	Award 1 mark
	Unclear
	Benefit of doubt
	Cross
	Error carried forward
	Extendable ellipse
	Good language
	Repetition
	Noted but no credit given
	Too vague
	Tick

Question			Answer	Mark	Guidance
1	(a)		<b>Paint</b> - Chemical and process <b>Portable radio</b> - Computers, communication and IT <b>Wheelchair</b> - Medical and pharmaceutical <b>Sports centre</b> - Structural and civil <b>Memory card</b> - Computers, communication and IT <b>Alloy wheels</b> - Automotive <b>Washing machine</b> - Electrical and electronics (7x1)	7	Accept Electrical and electronics
2	(a)		<b>Non-ferrous metals</b> – Aluminium; brass; bronze; copper; tin; zinc; lead; titanium <b>Polymers</b> – ABS; HIPs; Polypropylene, Nylon(polyamide); Polycarbonate; Acrylic/PMMA; PVC; PTFE; Polystyrene; Polyethylene (6x1)	6	Accept any other relevant examples
	(b)		Up to two marks for each justified reason.  Examples: Products might need to be lightweight(1) such as airplane components so an aluminium alloy would be used(1) The physical properties of the alloy might be better for the product(1), like copper for electrical cables(1). If a product needs to be corrosion resistant(1) like a boat propeller a non-ferrous metal such as bronze would be used(1) A decorative product(1) might use a non-ferrous alloy like brass which is attractive and easy to polish(1) Non-ferrous metals are not magnetic (1) so could be used where being magnetic might cause problems (1) (2x2)	4	Simplistic responses e.g. 'doesn't rust' – one mark only  Responses must be justified for full marks
3	(a)	(i)	Bolts; locknuts; pulleys; washers (2x1)	2	
		(ii)	LEDs; resistors; switches; transistors (2x1)	2	
		(iii)	Reservoirs; three-port valves	2	

Question		Answer	Mark	Guidance
	(b)	<p>Up to two marks for a clear explanation of component function plus one additional mark for a relevant example,</p> <p>Examples:  <b>Resistors</b> are used to control the current(1) flowing in a electrical circuit(1), e.g. to protect an LED so that it doesn't blow(1).  <b>Locknuts</b> are used when one nut is tightened against the other(1) to stop it from coming loose(1) e.g. an adjustable length of piston rod on a cylinder(1)  A <b>three-port valve</b> is used to direct compressed air(1) to another component in a pneumatic circuit(1), e.g. a cylinder(1).  <b>LEDs</b> emit light (1) when a current (1) passes through them. They are often used in torches / car headlights (1)  <b>Washers</b> are used with nuts and bolts (1). The washer is put between the nut and the workpiece (1) to spread the load (1) and prevent marking.</p> <p>(1+2)</p>	3	<p>Accept any other relevant examples</p> <p>Simplistic reference to 'lighting' 1 mark</p>
4	(a)	<p>Welding; brazing; riveting; threaded components (nuts and bolts / machine screws); threading</p> <p>(2x1)</p>	2	Accept ' <b>pop-riveting</b> ' NOT 'glueing'
	(b)	<p>(i) No mark for process.</p> <p>Up to three marks for a detailed description</p> <p>Examples:  Brazing – clean the two parts (1) and clamp them together; apply flux (1) to the joint; heat to red hot and apply brazing rod to the joint (1); allow to melt into it/ leave to cool  Riveting – Clamp parts together and drill holes (1) for rivets; put rivets into the holes and cut to required length (1) support one end or rivet and hammer the other end over to make the joint (1); smooth off excess</p> <p>(3x1)</p>	3	<p>Description must be 'workable' process</p> <p>ECF - Max. 2 marks for valid and detailed description of inappropriate process from (a)</p>

Question			Answer	Mark	Guidance
		(ii)	<p>One mark for each of two relevant safety precautions (including PPE)  Example:  Welding – Wear (leather) gloves/apron; wear dark lens welding mask; keep fire extinguisher close by; trained to carry out process</p> <p style="text-align: right;">(2x1)</p>	<b>2</b>	<p>Precautions must be relevant to the process chosen e.g. 'gloves' only if welding/brazing; not simply 'goggles' for welding</p> <p>ECF if relevant to the inappropriate process from (i)</p>
<b>5</b>	<b>(a)</b>		<p>Up to three marks for describing the use of a relevant modern technology.</p> <p>No marks for naming stages.</p> <p>Examples:  <b>Assembly and finishing</b> – computer controlled robot arm(pick and place) used to assemble product(1); product held to scanner for quality control(1); finishing completed by computer controlled spraying machine(1)  <b>Disposal</b> – Scanners are used (1) to help sort different materials for recycling (1) so that they can be reprocessed and reused (1)  <b>Marketing</b> – CAD used to prepare drawings/3D models of product(1); PowerPoint presentation to potential clients(1); details of product put on company website/as adverts on other websites(1)  <b>Material supply and control</b> – Bar codes / RFIDs (1) can be used to track use of materials/components and emails can be sent automatically (1) when stock needs replacing (1)  <b>Processing and production</b> – CNC machines (1) are programmed to make products to consistent accuracy (1) and the machines can operate 24/7 (1) with little supervision</p> <p style="text-align: right;">2 x (3x1)</p>	<b>6</b>	<p>Responses must include reference to the modern technology used</p> <p>Fully justified response needed for full marks</p>

Question			Answer	Mark	Guidance
	(b)		<p>Up to two marks for a justified description of one benefit.</p> <p>Examples:            Using quality control will reduce the amount of reject products made(1) and save the company money in wasted materials and production time(1)            Using quality control means the quality of all the products will be good (1) and the company will get a good reputation (1)            Using quality control will mean that less scrap is produced (1) which saves material and is better for the environment / reduces landfill (1)</p> <p>(2x1)</p>	<b>2</b>	Justified response needed for full marks
<b>6</b>	(a)	(i)	Material <b>E</b>	<b>1</b>	
		(ii)	Material <b>F</b>	<b>1</b>	
	(b)		<p>One mark for each of two relevant reasons</p> <p>Examples:            The material is quite expensive            It is not easy to store            It has low score for machinability</p> <p>(2x1)</p>	<b>2</b>	
	(c)	(i)	<p>One mark for a relevant factor</p> <p>Examples:            Availability; recyclability; physical properties; safe to use/non-toxic; sustainability</p>	<b>1</b>	Accept other <u>relevant</u> factors

Question			Answer	Mark	Guidance
		(ii)	Up to two marks for a reasoned explanation of importance.  Examples: Availability - is important if a lot of material would be needed at regular intervals(1) to makes batches of products in large quantities(1) Physical properties – malleability (1) would be important if a product was to have a complex shape(1) Safe to use – If a product was to be made manually(1) it would have to be safe to use to prevent injury to workers(1)  (2x1)	<b>2</b>	ecf – 1 mark for valid explanation of vague or irrelevant factor in (i)  Justified response needed for full marks
<b>7</b>		(i)	Up to three marks for a detailed description of the use of ICDT in research Example: The Internet(1) can be used to search for examples of existing products(1) and to source materials/components needed(1)  (3x1)	<b>3</b>	Accept other relevant examples  Justified response with specific mention of Modern Technology used needed for full marks
		(ii)	Up to three marks for a detailed description of the use of ICDT when presenting design solutions to clients. Example: Video conferencing (1)can be done on the computer to discuss proposals and show PowerPoints(1) and 3D models/prototypes made by CAM.(1)  (3x1)	<b>3</b>	Accept other relevant examples  Justified response with specific mention of Modern Technology used needed for full marks

Question			Answer	Marks	Guidance	
					Content	Levels of response
<b>8*</b>			Up to six marks for a discussion of the impact of modern technologies on the manufacture of engineered products,		Response may include reference to the following points:  Speeded-up production with automated processes. More consistent quality from	Level 3 (5 - 6 marks) Thorough analysis showing a clear understanding of the impact of modern technologies on the manufacture of engineered products,  Specialist terms will be used appropriately and



Question			Answer	Marks	Guidance	
					Content	Levels of response
					<p>CNC machines.  Less manual labour needed.  Staff needing to be re-trained on the new technologies.  Cost of buying new machinery.  Factory may need to be changed to take new machines/technologies.  More output/sales needed to justify cost of all changes.  CNC machines are safer for operators to use.  Sensors used to monitor production and safety  More efficient production with less waste.  Increased output from automatic machines / 24/7 working  Improved reputation from producing quality products</p>	<p>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 impact of modern technologies on the manufacture 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>Level 1 (1 - 2 marks)  Basic discussion showing limited understanding of the impact of modern technologies on the manufacture 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>Annotate with 'SEEN' at end of response. No ticks in the text.</p> <p>0 = response not worthy of a mark.</p>
			<b>Total for paper</b>	<b>60</b>		

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