



Cambridge National

Engineering Manufacture

R109/01: Engineering materials, processes and production

Level 1/2 Cambridge National Certificate/Award

Mark Scheme for June 2019

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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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These are the annotations, (including abbreviations), including those used in scoris, which are used when Marking

Annotation	Meaning of annotation
	Blank page
	Vague
	Tick
	Noted but no credit given
	Unclear
	Repeat
	Benefit of doubt
	Development
	Knowledge
	Level 1
	Level 2
	Level 3

MARK SCHEME

Question		Answer / Indicative Content	Mark	Guidance
1	(a)	(i) ABS	1	
		(ii) Light to pick up Colourful / range of colours available Non toxic Easy to shape / Easily moulded Suitable for injection moulding / mass production Strong / tough Inexpensive Easily recycled Hard wearing (2x1)	2	Any two appropriate responses – 1 mark each NOT Not harmful if swallowed NOT Easy to use in manufacturing NOT easily change shape NOT High melting point NOT suitable for children NOT Hard/Ductile
	(b)	(i) Concrete	1	
		(ii) Composite	1	
		(iii) Can be formed into many shapes Easily cast to shape Rigid / strong in compression / under pressure Reasonably low cost material Can be reinforced for strength Durable / suitable for outdoor use / water resistant / does not corrode / hard wearing (2x1)	2	Any two appropriate responses – 1 mark each Mark metals independent of meaning NOT strong unqualified ALLOW Cheap NOT hard
	(c)	(i) Non-ferrous	1	
		(ii) Ductile – can be drawn into wires without breaking Flexes/bends (without breaking) <u>Conducts</u> electricity / <u>conductor</u> Doesn't corrode / react with surroundings (2x1)	2	Any two appropriate responses – 1 mark each NOT long lasting

Question		Answer / Indicative Content	Mark	Guidance
2	(a)	<p>Light weight Hard wearing / Durable Less weight, less energy needed to pedal High strength:weight ratio. Corrosion resistance Impact resistant Moulded into complex shapes</p> <p style="text-align: right;">(2x1)</p>	2	<p>Accept other creditable answers for use of carbon fibre.</p> <p>Allow strong / tough / high stiffness</p>
	(b)	<p>Machinability – The ease with which a metal can be cut (machined). Example: Mild Steel</p> <p>Malleability – The ability to be hammered or shaped <u>without breaking</u>. Example: Copper</p> <p>Corrosion Resistance – How well a metal can withstand damage caused by oxidisation or other chemical reactions. Example: Stainless steel</p>	6	<p>1 mark for each correct meaning and 1 mark for an appropriate material.</p> <p>Allow aluminium / aluminium alloys / copper</p> <p>Allow gold / silver / iron / aluminium / copper / lead</p> <p>Allow Brass / copper / bronze / galvanised steel Not Iron Not unqualified steel</p> <p>Reference to Oxidation e.g. reacts with oxygen /rusting</p>
	(c)	<p>Availability, Ease of use, Safety in use, Forms of supply, Sustainability</p> <p style="text-align: right;">(2x1)</p>	2	<p>Any two from list – one mark each.</p> <p>Accept other <i>appropriate</i> characteristics but not physical properties</p>

Question		Answer / Indicative Content	Mark	Guidance
3	(a)	A - Pulley housing B - Motor C – (Safety) guard/ shield D – Table	4	One mark each
	(b)	On/off switch Kick plate / emergency stop pedal Isolator switch – external to machine Emergency stop button – wall mounted – external to machine Micro switch/sensor in pulley housing / automatic (depth) stop Safety guard round chuck Safety area / yellow floor markings (3x1)	3	NOT references to PPE NOT box around drill unless a clear description of safety area
	(c) (i)	Identifying safety issues and putting strategies in place to minimise risk.	1	Mitigating strategies must at least be implied and must relate to the safety issue
	(ii)	e.g. Drilling machine – Risk - Entanglement (1) Minimising risk – Guards in place (1) (2x1)	2	Other appropriate workshop risks could be given: Identification of a health and safety issue/risk – 1 mark Appropriate strategy to deal with/minimise the risk – 1 mark. Risk minimisation must relate to risk identified

Question		Answer / Indicative Content	Mark	Guidance
4	(a)	<p>1 Mark for each in correct position</p> <p>Stage 1 - Mark out number 7 and centres for screw holes</p> <p>Stage 2 - Clamp work securely and drill holes for screws</p> <p>Stage 3 - Drill a series of holes inside number 7</p> <p>Stage 4 - Put work in a bench vice</p> <p>Stage 5 - Use a coping saw to cut inside number 7 and remove waste.</p> <p>Stage 6 - File down to marked lines.</p> <p>Stage 7 - Remove burrs and clean edges</p>	4	<p>Stages 1, 4 and 7 are given in the question paper</p> <p>Marking points in any position:</p> <p>Clamp First Drill .. follows Clamp .. Coping ... follows Drill ... File... follows Coping...</p> <p>Drill... Coping..... File as consecutive candidate responses = 3</p>
	(b)	<p>Less time consuming / quicker</p> <p>Less labour intensive</p> <p>Process can be repeated</p> <p>Less human error/more accurate</p> <p>More precise manufacturing</p> <p>Programme can be edited</p> <p>Less waste produced</p> <p>Good quality finish produced (2x1)</p>	2	<p>Any two appropriate advantages – 1 mark each.</p> <p>Allow don't have to watch all the time</p> <p>Allow clean finish/ leaves no swarf /rough edges</p>
	(c)	<p>Required power for material being cut /wavelength / focal spot size</p> <p>Speed of cut</p> <p>Depth of cut / thickness of material</p> <p>Set laser to etch or cut / use correct operating system (2x1)</p>	2	
	(d)	<p>CNC - Milling</p> <p>CNC - Router</p> <p>CNC - Punching</p> <p>Water jet cutting</p> <p>CNC Plasma cutting</p> <p>Laser sintering (2x1)</p>	2	<p>Any two responses from the list</p> <p>NOT press brake machine</p> <p>NOT CNC drilling</p> <p>NOT CNC lathe</p> <p>NOT 3D printing</p>

Question			Answer / Indicative Content	Mark	Guidance
5	(a)	(i)	Self-tapping screw	1	ALLOW Twinfast NOT Screw / wood screw Ignore references to the screw head
		(ii)	To join two thin metal sheets together / to join two (dis) similar materials together.	1	Ignore references to wood
	(b)		Nut and bolt U bolt Bolt Machine screw Set screw Hex screw/bolt Allen key screw Wing nut Locking nut (2x1)	2	Any two responses NOT nails or wood screws NOT Nylon fix
	(c)		Examples: May be used in a situation where the product would not be joined in a permanent way / Allows product to be dismantled (1) so that access could be used to replace/repair components/parts / allow component parts to be re-used / recycled (1)	2	Justified response needed for full marks
	(d)		Reference to internet research Customer research / surveys / feedback CAD Data/information transfer (electronically between departments/locations). Data storage / CNC programming Communication / video conferencing to discuss/share ideas/information. (4x1)	4	Answers could include any of the points given- one mark per point up to a maximum of 4 marks. Accept other appropriate answers

Question		Answer / Indicative Content	Mark	Guidance
6	(a)	Just-in-time	1	
	(b)	<p>Items arrive just in time (to go on production line)</p> <p>Low storage costs / no need to store items</p> <p>No need for large storage areas / saves factory warehouse storage/space.</p> <p>Quick turnaround of goods – materials/resources used quickly then sent to customer therefore quicker return on costs/expenditure.</p> <p style="text-align: right;">(2x1)</p> <p>Because materials go into production line (almost) straight away</p> <p style="text-align: right;">(1x1)</p>	3	Answers could include any 2 of the first 4 points given and/or the last point

Question	Answer	Marks	Guidance
(c)*	<p>Level 3 (5–6 marks) Detailed discussion showing a clear understanding of Globalisation and the advantages that it brings to Engineering companies. Consideration of the impact globalisation has on local industry.</p> <p>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 Globalisation and the advantages that it brings to Engineering companies. Some consideration of the impact globalisation has on local industry.</p> <p>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>Discussion or detailed explanation of Globalisation and the advantages that it brings to Engineering companies. Consideration of the impact globalisation has on local industry.</p> <p>Responses regarding globalisation may include reference to:</p> <ul style="list-style-type: none"> • Quality of product produced. • Reduced production costs – economy of scale • Greater buying power • Reduced labour costs • Increased transport costs • Increased delivery costs (depending upon where manufactured and where in world requires product). • Brings labour/work/job opportunities to some communities. • Lower wage demands.

Question	Answer	Marks	Guidance
	<p>Level 1 (1–2 marks) Basic discussion showing limited understanding of Globalisation and the advantages that it brings to Engineering companies. Limited consideration of the impact globalisation has on local industry.</p> <p>There will be little or no use of specialist terms. Answers may be ambiguous or disorganised, and may be comprised of simplistic bullet points. Errors of spelling, punctuation and grammar may be intrusive.</p> <p>0 = a response that is irrelevant and/or not worthy of a mark. Annotate with 'Seen' at end of response.</p>	6	<ul style="list-style-type: none"> • Less restrictions on production regulations. • Less restriction on environmental impacts • Cheaper products available to customers. <p>Responses regarding local industry may include reference to:</p> <ul style="list-style-type: none"> • Reduction in job opportunities • Failure to be competitive with prices. • Loss of jobs • Factory closures • Loss of local skills/tradition • Specialisation/ high value products
	Total for paper	60	

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