

Mark Scheme (Results)

June 2014

NQF BTEC Level 1/Level 2 Firsts in
Engineering

Unit 1: The Engineered World
(20526E)

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgment is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.

Question Number	Answer	Mark
1	PCB manufacture (1) Surface mount technology (1) 1 mark for each correct answer <div style="text-align: right;">(2 x 1)</div>	(2)

Question Number	Answer	Mark
2	Plastic bottle – Chemical (1) Satellite receiver – Communications (1) 1 mark for each correct answer <div style="text-align: right;">(2 x 1)</div>	(2)

Question Number	Answer	Mark
3 a	Award one mark for each up to a maximum of two marks. <ul style="list-style-type: none"> • Use a fume extraction system (1) • Check soldering iron lead for damage (1) • Ensure that when soldering iron is switched on and not in use it is stored in a stand (1) • Wash hands after using solder (1) • Do not touch tip of soldering iron (1) • Do not put solder or hands in your mouth (1) • Do not distract others whilst using soldering iron (1) • Ensure that correct PPE (e.g. safety glasses) is used (1) • Personal protection precaution (e.g. tie hair back, remove jewellery) (1) <p>Accept any other appropriate alternatives. PPE is acceptable as one precaution only Personal protection precaution is acceptable as one precaution only</p> <p>Do not accept 'roll up sleeves' and 'safety boots'</p> <div style="text-align: right;">(2 x 1)</div>	(2)
3 b	Award one mark for one of the following. <ul style="list-style-type: none"> • It is a permanent fastening (1) • Several applications of heat can cause damage to components/board (1) • Component/material wastage (1) • Increased health and safety risk (1) • It requires mains power (1) • It can be time consuming compared with other methods (1) • Soldering skill required (1) <p>Accept any other appropriate alternatives.</p> <div style="text-align: right;">(1 x 1)</div>	(1)

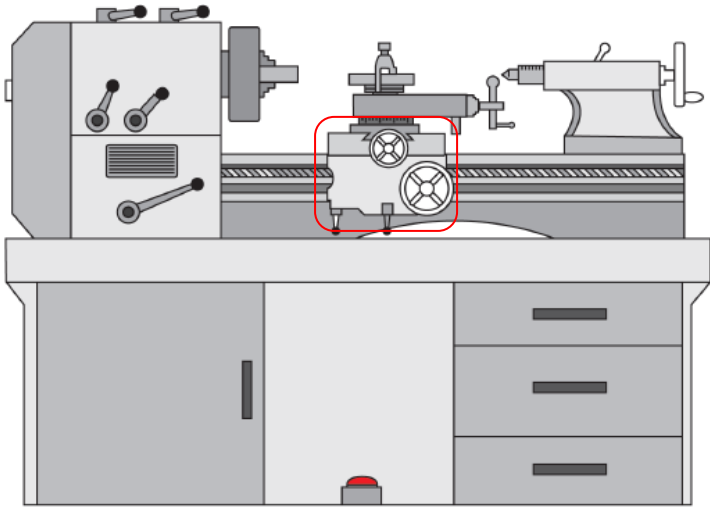
Question Number	Answer	Mark
4	<p>To produce a unique product (1) Because product demand is low (1)</p> <p>1 mark for each correct answer</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5	<p>Spectacles frame – Titanium (1) Light bulb filament – Tungsten (1)</p> <p>1 mark for each correct answer</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
6	<p>Award one mark for identifying a reason and a further one mark for extension, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • Long continuous welds can be quickly and accurately produced without having to change weld rods (1) because the wire electrode automatically feeds to the work surface (1) • More flexible/automatic/semi-automatic than other welding processes (1) as different settings allow it to be used on a greater range of materials (1) • A shielding gas is automatically delivered to the weld area (1) so defects from contaminants in the air are avoided (1) • A flux is not used (1) so there is no chance for the entrapment of slag in the weld/no post-weld finishing required (1) <p>Accept any other reasonable response related to MIG welding.</p> <p>Do not accept simplistic answers such as quick/easy without reference to the process</p> <p style="text-align: right;">(1 x 2)</p>	(2)

Question Number	Answer	Mark
7 a	<p>Award one mark for each up to a maximum of two marks.</p> <ul style="list-style-type: none"> • They can work continuously 24 hours a day 7 days per week (1) • Employees do not have to work in a hazardous environment (1) • Robots can work more effectively than employees using manipulator tools (1) • They do not get bored or lose concentration (1) <p>Accept any other appropriate alternatives.</p> <p>Do not accept generic responses such as more effective/quick without qualification.</p> <p style="text-align: right;">(2 x 1)</p>	(2)
7 b	<p>Award one mark for one of the following.</p> <ul style="list-style-type: none"> • They need to be reprogrammed for different products (1) • High set up and maintenance costs (1) • Reprogramming for each batch can lead to substantial downtime (1) • Often require skilled labour to programme them (1) • Retraining of staff may be required (1) <p>Accept any other appropriate alternatives.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
8	<p>Award one mark for each up to a maximum of two marks.</p> <ul style="list-style-type: none"> • Good wear resistance (1) • Harder than conventional tools (1) • Produce good surface finish (1) • Long tool life (1) • Toughness – suitable for hard turning (1) • Good resistance to thermal conductivity (1) • Good red hardness/retains hardness at high temperatures (1) <p>Accept any other appropriate alternatives.</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
9a	<p>Carriage on diagram identified (1)</p>  <p>(1 x 1)</p>	(1)
9b	<p>Chuck (1)</p> <p>(1 x 1)</p>	(1)

Question Number	Answer	Mark
10	<p>Award one mark for identifying an advantage and a further one mark for extension, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • It can be used for pumped storage (1) allowing electricity to be generated to meet peak demand (1) • No pollution or waste is created/low carbon footprint (1) as water continues its flow without contamination after generating electricity (1) • Lower operational /running costs (1) means that after initial investment low cost power is consistently generated (1) <p>Accept any reasonable response provided it relates to the advantage identified.</p> <p>Do not accept environmentally friendly/low carbon footprint/low cost without justification.</p> <p>Do not accept purely geographic responses without expansion/justification</p> <p>Award one mark for identifying a disadvantage and a further one mark for extension, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • Can only provide a small amount of the total energy demand (1) due to the small amount of suitable sites identified (1) • Large capital cost (1) as it often requires large dams/diverting of rivers/flooding of valleys (1) • Pumped storage costs money/significant carbon footprint (1) as more electricity is required to pump water than can be generated from it (1) • Environmental impact could be negative (1) due to large scale construction impacting on the ecosystem (1) • Energy source can be intermittent (1) resulting inconsistent/unreliable supply of power (1) <p>Accept any reasonable response provided it relates to the disadvantage identified.</p> <p>Accept responses related to wave power</p> <p>Do not accept environmental impact/expensive without justification.</p> <p style="text-align: right;">(2 x 2)</p>	(4)

Question Number	Answer	Mark
11a	Die is correctly identified (1) <div> </div> <div>(1 x 1)</div>	(1)
11b	melting (1) <div>(1 x 1)</div>	(1)
Question Number	Answer	Mark
12	Powder manufacture (1) <div>(1 x 1)</div>	(1)
Question Number	Answer	Mark
13	light (1) <div>(1 x 1)</div>	(1)

Question Number	Answer	Mark
14	<p>Award one mark for identifying an advantage and a further one mark for extension, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • Positive marketing approach for the manufacturer (1) because customers like the responsible approach to waste reduction (1) • Reusing materials is cost effective (1) because it puts less pressure on constantly exploiting finite resources/ there will be reduced waste in the supply chain (1) • Promotes customer loyalty if they can 'trade in' used products (1) encouraging them to purchase replacements at the same time (1) <p>Award one mark for identifying a disadvantage and a further one mark for extension, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • Products have to be manufactured to ensure they can be recycled (1) therefore manufacturing technology has to be changed (1) • Cost of changing packaging (1) because the package has to indicate the product is recyclable (1) • Recycling requires products to be disassembled (1) consequently, design changes to the product will be required (1) • Competitor's products may be cheaper as they are not recyclable (1) which leads to loss of competitive advantage (1) <p>Accept any other reasonable response. Do not accept answers that are not specific to a manufacturer. Do not accept a disadvantage that is the reverse of the advantage without appropriate extension.</p> <p style="text-align: right;">(2 x 2)</p>	(4)

Question Number	Answer	Mark
15	<p>heat (1) Piezoelectric transducers (1)</p> <p>1 mark for each correct answer</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
16	<p>Award one mark for identifying an advantage and a further one mark for extension, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • Because coatings are 'grown' polymer layers (1) they have natural water repellent properties (1) • Surfaces can be treated with a very thin nanocoating (1) so that damage is prevented and the surface is protected (1) • Because nanocoatings bond to the surface/create a very smooth surface (1) it makes them easier to clean/they will need to be cleaned less often (1) • Because the water rolls off the nanocoated surface (1) windscreen wipers will no longer be needed most of the time (1) <p>Accept any other reasonable response.</p> <p style="text-align: right;">(1x2)</p>	(2)

Question Number	Answer	Mark
17	<p>Award one mark for identifying an advantage and a further one mark for extension, up to a maximum of two marks each.</p> <ul style="list-style-type: none"> • Better fuel efficiency than a conventional aircraft (1) because the blended wing is designed to have less drag (1) • Lower noise than conventional aircraft (1) because of its aerodynamic design that allows use of smaller engines (1) • Increased load carrying capacity for the relative size of the aircraft (1) because their innovative design utilises space more efficiently (1) • Can fly at lower speeds/altitudes/easier lift off than conventional jet aircraft (1) because of the greater surface area providing lift (1) • Improved handling or flying characteristics/lower stall characteristics than conventional jet aircraft (1) because of a more stable design with improved gliding characteristics (1) <p>Accept any reasonable response provided it relates to the advantage identified.</p> <p style="text-align: right;">(2 x 2)</p>	(4)

Question Number	Answer	Mark
18	<p>Award one mark for identifying an advantage and a further one mark for extension, up to a maximum of two.</p> <ul style="list-style-type: none"> • Metallic foam has good impact resistance (1) which absorbs mechanical failure from engine malfunction/ improves passenger safety (1) • Metallic foams have good sound proofing properties (1) so that aircraft engine noise is reduced (1) • Metallic foams are good thermal insulators (1) so they are ideal for use in high temperature jet engines (1) <p>Accept any reasonable response provided it relates to the advantage identified.</p> <p style="text-align: right;">(1 x 2)</p>	<p style="text-align: right;">(2)</p>

Question Number	Indicative content
19	<p>Judgment</p> <p>Kaizen can improve the switch panels and related assembly processes provided sufficient time and effort is put into implementing it.</p> <ul style="list-style-type: none"> • All elements of the production of the switch panels can improve provided all assembly workers and their managers buy in to the concept • Incremental change is good for the business and can be quick and easy to introduce however managers should not expect instant results and should work hard to maintain any changes made <p>Possible advantages for using Kaizen</p> <p>It would encourage assembly workers to:</p> <ul style="list-style-type: none"> • suggest improvements • get involved, putting people first • become proactive in setting standards for production • improve assembly standards • improve productivity • improve competitiveness • improve teamwork • improve morale • engage in continuous improvement rather than a one-off change <p>Possible disadvantages for using Kaizen</p> <ul style="list-style-type: none"> • Assembly workers could be resistant to change • Maintaining changes can be difficult • Difficulty in getting it started • Getting assembly workers to think in the long term • Getting assembly workers to move away from the inspection culture • Time investment required by management and workforce <p>Model answer</p> <p>Using Kaizen gives Electrobox assembly workers responsibility for suggesting improvements to quality processes and assembly techniques in the production of electrical switch panels. However, Kaizen techniques may not be effective if the assembly workers are resistant to change and managers are not fully committed to its introduction.</p> <p>If Kaizen is adopted by all assembly workers and managers at Electrobox, it can be a highly effective way to reduce waste through empowering all Electrobox employees to engage in continuous improvement.</p>

Level	Mark	Descriptor
	0	No rewardable material
Level 1	1–3	Basic arguments on both sides identified; or only one side considered. This answer is likely to be in the form of a list. Points made will be superficial/generic and not applied/directly linked to the situation in the question. No conclusion produced or the conclusion summarises only one side of the argument being considered.
Level 2	4–6	Arguments for and against are described, but there will be more emphasis on one side than the other. The answer will be unbalanced. A conclusion is present, but this is either implicit or as a result of unbalanced consideration of the arguments. There is little or unfocused justification of the conclusion. Most points made will be relevant to the situation in the question, but the link will not always be clear.
Level 3	7–8	Balanced explanation of both sides for and against. A conclusion is produced which is justified and clearly linked to the consideration of arguments for and against, and their relative importance to the situation. The majority of points made will be relevant and there will be a clear link to the situation in the question.

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