Mark Scheme (Results)

June 2018

NQF BTEC Level 1/Level 2 Firsts in Engineering

Unit 38: Materials Used in Engineered Products (20573G)

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BTEC Next Generation Mark Scheme

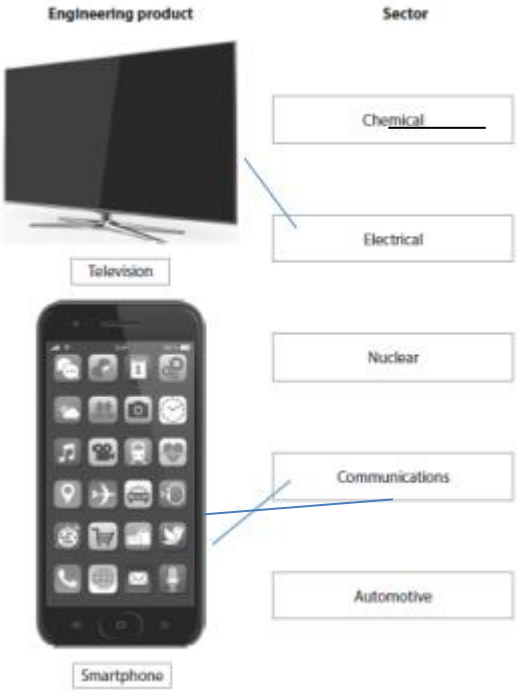
Engineering Unit 38 1806

Question Number	Answer	Mark
1a	C – Bronze	1

Question Number	Answer	Mark
1b	A - Thermosetting D - Elastomer	2

Question Number	Answer	Mark
1c	Award **one** mark for any of the following up to a maximum of **two** marks. • Particulate structure (1) • Laminar structure (1) • Contains fibre reinforcement (1) • Fibre alignment (1) • Bonded with adhesive (1) • Contains more than one material (1) Accept any other appropriate response.	2

Question Number	Answer	Mark
1d	Award **one** mark for any of the following: • Opacity (1) • Opaque (1) • Translucence (1) • Transparency (1)	1

Question Number	Answer	Mark
2a	Award **one** mark for each of the following up to a maximum of **two** marks.  	2

Question Number	Answer	Mark
2b	C - Melting point E - Thermal conductivity	2

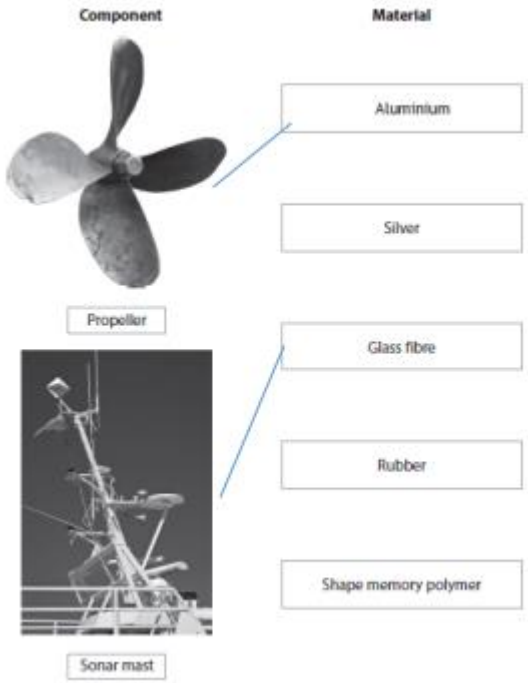
Question Number	Answer	Mark
2c	Award **one** mark for any of the following up to a maximum of **two** marks. • Castings will only need minimal secondary machining (1) • Complex shapes can be supplied (1) • Wide range of sizes of casting are possible (1) • Castings can be supplied in a range of quantities (1) • Castings have consistent properties (1) • A variety of metals can be supplied in cast form (1) • identical products can be repeatedly manufactured (1) • allows the manufacturing process to be automated (1) • relatively low cost per unit (1) Accept any other reasonable response.	2

Question Number	Answer	Mark
2d	Award **one** mark for any of the following: • Extraction (1) • Processing (1) • Transportation/Distribution (1) • Use/reuse (1) • Recycling (1) • Disposal (1) Accept any other appropriate response.	1

Question Number	Answer	Mark
3a	A – Plating	1

Question Number	Answer	Mark
3b	Award **one** mark for any of the following, up to a maximum of **two** marks. • corrosion resistance (1) • solvent resistance (1) • resistance to environmental degradation (1) • wear resistance (1) Accept any other reasonable response.	2

Question Number	Answer	Mark
4a	Award **one** mark for any of the following: • Marine (1) • Marine engineering (1) • Marine sector (1) • Ship building (1)	1

Question Number	Answer	Mark
4b	Award **one** mark for each of the following:  	2

Question Number	Answer	Mark
4c	Award **one** mark for any of the following, up to a maximum of **two** marks. • Prevents moisture making contact with the surface of the metal (1) • Reduces the chances of corrosion (1) • Improves hardness/wear resistance of the boat (1) • Reduces effects of temperature changes (1) • Improves appearance of the boat (1) • Improves visibility of the boat (1) • Stops/slows the growth of marine life (1) Accept any other reasonable response.	2

Question Number	Answer	Mark
5a	Award **one** mark for any reason, up to a maximum of **two** marks. • Reduces the overall weight/mass of the mast (1) • Tubes can resist deformation when loaded/structurally stiff (1) • Tubes are available in long lengths (1) • Tubes can be formed into desired shapes by bending (1) • Cables can be routed through pipes/tubes (1) • Polymer pipes/tubes can be supplied in a range of colours (1) Accept any other appropriate response.	2

Question Number	Answer	Mark
5(b)	Award **one** mark for a disadvantage and **one** additional mark for the appropriate expansion to a maximum **two** marks, up to a maximum of **four** marks. • Composite struts could be damaged by impacts (1) as they only have significant strength along their length/brittle (1) • Composite materials are difficult to repair (1) meaning parts may need to be replaced in full (1) • Composite materials are difficult to join to other types of material (1) therefore complex connections may be necessary (1) • Composite materials are more expensive than alternatives (1) therefore may not be economical to use (1) • Composite materials are more flexible (1) which can be worrying for passengers (1) Accept any other appropriate response. Do not accept expensive unless justified.	4

Question Number	Answer	Mark
6a	Award **one** mark for any of the following: • Extrusion (1) • Extruded profile (1) • Extruded section (1)	1

Question Number	Answer	Mark
6b	Award **one** mark for advantage and **one** additional mark for the appropriate expansion, up to a maximum of **two** marks. • Polymers do not require additional finishes to be added (1) saving time in production (1) • Polymers are able to be formed into complex mouldings (1) allowing for more aerodynamic car bodies to be produced (1) • Polymer materials are lightweight/lower mass compared to metals (1) allowing improved fuel consumption/improved acceleration (1) • Manufacturing costs are lower than for metallic materials during assembly (1) as less parts are required in production (1) • There are many different types of polymers and each have different characteristics /properties (1) making them suitable for different parts of the car (1) • can be processed in a wide range of colours (1) to promote sponsoring company (1) Accept any other appropriate reason with expansion.	2

Question Number	Answer	Mark
6c	Award **one** mark for an advantage and **one** additional mark for the appropriate expansion to a maximum of **two** marks, up to a maximum of **four** marks. • The suspension settings are able to be changed easily (1) as the viscosity of the liquid can be changed (1) • Suspensions adapt without driver input (1) as settings are changed based on weight/mass/sensor readings (1) • Suspensions adapt very quickly to conditions (1) as electo-rheostatic fluids act almost instantly (1) • Suspension has fewer moving parts (1) therefore could have a longer service life (1) • Suspension can be adjusted manually (1) to suit driver preferences/give a smoother ride (1) Accept any other reasonable response.	4

Question Number	Answer	Mark
7a	Award **one** mark for a reason and **one** additional mark for the appropriate expansion, up to a maximum of **two** marks. • Stainless steel is corrosion resistant (1) therefore can withstand being exposed to moisture (1) • Able to resist high/low temperatures (1) therefore suitable for use in all environments/has a high or low melting point (1) • Stainless steel has good toughness properties (1) meaning the engine parts will not deform easily (1) • Stainless steel has good ductility (1) allowing thin sheets or forms to be produced (1) • Stainless steel is resistant to wear (1) allowing for a long service life (1) Accept any other reasonable response.	2

Question Number	Answer	Mark
7(b)(i)	Award **one** mark for an advantage and **one** additional mark for the appropriate expansion, up to a maximum of **two** marks: • Wing spars are less likely to be damaged (1) since aramid fibres have good impact resistance (1) • Wing spars will not be affected by changes in air temperature (1) as aramid fibres are thermally stable (1) • Wing spars can be lightweight/low mass (1) improving range/fuel efficiency (1) • Aramid fibres have good solvent/chemical resistance properties (1) increasing the life of the wing spars (1) • Aramid fibres are non-conductive/insulators (1) reducing the risk of fire/explosion (1) Accept any other reasonable response.	2

Question Number	Answer	Mark
7(b)(ii)	Award **one** mark for an advantage and **one** additional mark for the appropriate expansion to a maximum of **two** marks, up to a maximum of **four** marks. • Annealing increases the workability of the duralumin (1) so wing spars can be made with complex profiles (1) • Annealing reduces the chances of the material forming cracks (1) which in turn reduces the chance of failure (1) • Annealed duralumin has good machining properties (1) so parts can be manufactured as a single piece (1) • Annealed duralumin can be produced to an exact toughness (1) therefore wing spars will be less likely to suffer damage in flight (1) Accept any other reasonable response.	4

Question Number	Indicative content	Mark
8	**General considerations** <u>Advantages</u> • As an assembly parts can be separated for reuse • Consoles would need to be dismantled to remove any reusable components/parts • Use of reclaimed components reduces the need to source new component • Casings for components are often universal and can be reused • Allows the company to reduce its carbon footprint • Reused components are readily available as consumers upgrade consoles • Company profile could be enhanced as it is seen as being green • Could save the company money • Components tried and tested <u>Disadvantages</u> • Consoles would need to be dismantled to remove any reusable components/parts • Electronic components may need to be reformatted • Electronic components functionality may be outdated • Electrical products often contain hazardous materials/metals • May not be economic to reuse some components • Might be easier to recycle polymer and metal parts than reuse them • Reused components might not be 100% reliable and could cause the console to fail • Joining methods used previously might prevent reuse of components/materials • Some manufacturing methods could make it difficult to reuse materials • Components/materials may be difficult to separate • Components may not be suitable for new consoles **Model answer** The company would need to consider if the materials and components that it needs for the new consoles are available in the quantity it needs them. If they are, then it could be a good idea to reuse components so that they do not go to waste and have to be disposed of. Some components in consoles will contain dangerous materials, so reusing improves the environmental impact of the product. The reused components might not, however, be of a high enough quality for the new	8

	product, therefore any cost savings would be wasted. It is also the case that older components might be of a lower standard or need to be refurbished before use, which adds to the amount of work that is needed. This might not be cost effective. If the company decided to reuse components and materials, the selection would need to be careful and make sure that they are all suitable for use.	

Level	**Descriptor**	**Marks**
0	No rewardable material	0 marks
1	A few key points identified, or one point described in some detail. The answer is likely to be in the form of a list. Only one viewpoint considered. Points made will be superficial/generic and not applied/directly linked to the situation in the question. Limited understanding of the reuse of components in a games console.	1-3 marks
2	Some points identified, or a few key points described. Consideration of more than one viewpoint but there will be more emphasis on one of them. The answer is unbalanced. Most points made will be relevant to the situation in the question, but the link will not always be clear. A good understanding of the reuse of components in a games console.	4-6 marks
3	Range of points described, or a few key points explained in depth. All sides of the case are considered and the answer is well-balanced, giving weight to all viewpoints. The majority of points made will be relevant and there will be a clear link to the situation in the question. A developed understanding of the reuse of components in a games console.	7-8 marks

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