Mark Scheme (Results)

Unit 38

January2019

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 1901

Question Number	Answer	Mark
1a	Award **one** mark for any of the following: • Low carbon steel / LCS (1) • Medium carbon steel / MCS (1) • High carbon steel / HCS (1) • Stainless steel (1) • Cast iron (1) • Wrought iron (1) • Steel (1) • Iron (1) Accept any other reasonable response	1

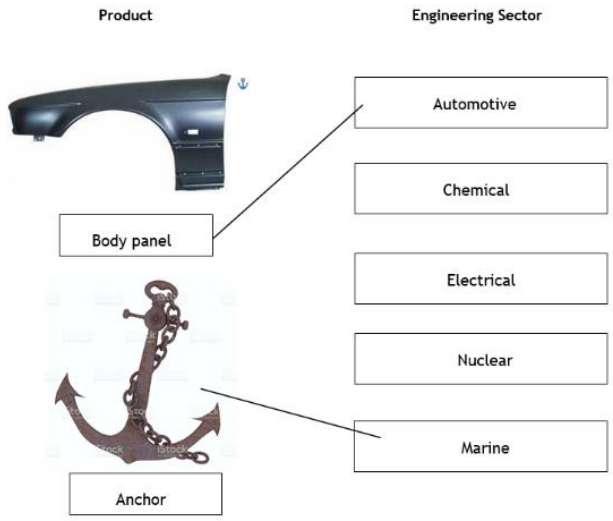
Question Number	Answer	Mark
1b	A - crystal growth D - grain structure	2

Question Number	Answer	Mark
1c	Award **one** mark for any of the following up to a maximum of 2 marks: • Aramid fibre/Kevlar (1) • Glass fibre (1) • Carbon fibre (1) • Plywood (1) • Reinforced concrete (1) • GRP / glass reinforced polymer/plastic (1) Accept any other reasonable response	2

Question Number	Answer	Mark
1d	B - Corrosion resistance E - Wear resistance	2

Question Number	Answer	Mark
1e	Award **one** mark for the following: • density Accept any other reasonable response	1

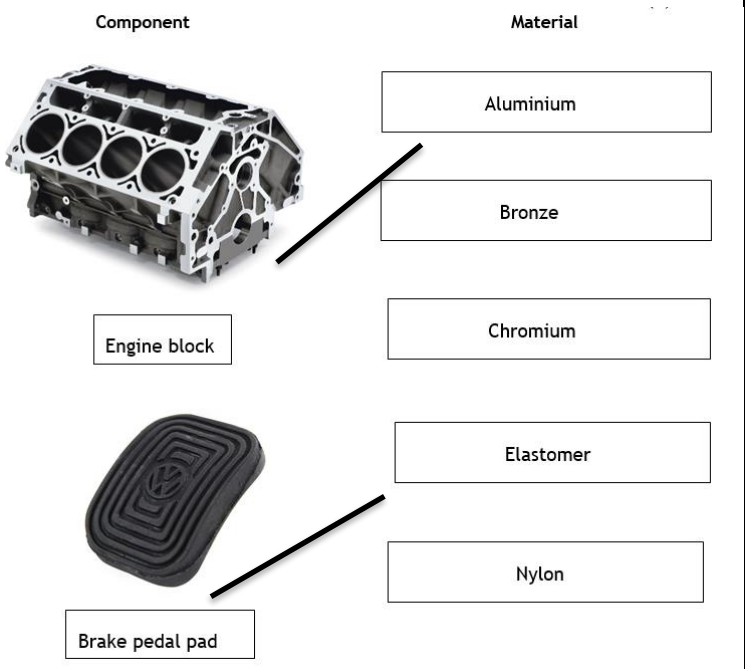
Question Number	Answer	Mark
2a	B- Energy Use	1

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

Question Number	Answer	Mark
2c	Award **one** mark for any of the following • Retains a natural metallic sheen (1) • Improves the appearance/aesthetic (1) • Excellent corrosion resistance (1) • Does not fade over time (1) • Gives full surface coverage (1) • Good abrasion resistance (1) • Anodising provides a durable/long lasting treatment (1) • Material remains recyclable after use (1) • Will not degrade/flake/chip over time (1) • Low maintenance once in use (1) • Wide range of colours available (1) Accept any other reasonable response	1

Question Number	Answer	Mark
3a	C - composite	1

Question Number	Answer	Mark
3b	Award **one** mark for any of the following, up to a maximum of two marks. • Bar/rod (1) • Extrusion (1) • Moulding (1) • Powder (1) • Granules/pellets (1) • Film (1) • Fibre (1) • Resin (1) • Wire (1) Accept any other reasonable response **Do not** accept the term 'pipe'	2

Question Number	Answer	Mark
3c	Award **one** mark for each of the following up to a maximum of 2 marks:  	2

Question Number	Answer	Mark
4a	Only acceptable answers: • Aerospace (1) • Aeronautical (1) Accept any other reasonable response Accept phonetic spelling Do **not** accept Aircraft.	1

Question Number	Answer	Mark
4b	Award **one** mark for any of the following, up to a maximum of two marks. • Good corrosion resistance (1) • Lightweight/good strength to weight ratio (1) • Ductile (1) • Hard (1) • Impermeable (1) • Good thermal conductor (1) • Good electrical conductor (1) • Easily treated (1) Accept any other reasonable response	2

Question Number	Answer	Mark
4c	Award **one** mark for advantage and **one** additional mark for appropriate expansion, up to a maximum of **four** marks. • As material can be cut to the required length/width (1) a wide range of different panels can be manufactured (1) • Sheets can be supplied at the correct thickness (1) reducing the need for secondary processing (1) • Production speeds can be increased (1) as sheet form allows for stamping/faster cutting methods (1) • Different radii can be accommodated (1) as sheet material can be formed to the correct curvature (1) • Easier to store sheet materials (1) as they take less space than formed shapes (1) Accept any other appropriate reason with expansion.	4

Question Number	Answer	Mark
5a	Award **one** mark for any of the following: • Heat (1) • Change in temperature (1) • Thermal energy (1) Accept any other reasonable response	1

Question Number	Answer	Mark
5b	Award **one** mark for an advantage, up to a maximum of **two** marks • Plastic coatings have good corrosion resistance (1) • Improves the appearance/aesthetic (1) • Plastic coating is an electrical insulator (1) • Plastic coatings are chemically resistant (1) • Plastic coatings only need one coat to be applied (1) • Plastic coatings are highly durable (1) • Plastic coatings provide an even coverage (1) Accept any other appropriate advantage	2

Question Number	Answer	Mark
5c	Award **one** mark for an advantage and **one** additional mark for appropriate expansion, up to a maximum of **two** marks. • It restores a ferrous metal to its original condition (1) making the ferrous metal more workable/ improves malleability (1) • It makes the metal easier to drill / bend (1) allowing the use of general tools (rather than specialist tools) (1) • Removes excessive hardness (1) which allows further processing to occur/ prevents fracture during bending (1) Accept any other appropriate advantage	2

Question Number	Answer	Mark
5d	Award **one** mark for a disadvantage and **one** additional mark for an appropriate expansion, up to a maximum of **four** marks. • A casting would have to be large (1) making the satellite receiver very heavy (1) • The base will be a solid component (1) which may not be suitable for a portable product (1) • The base would have to be complex casting (1) causing issues with the dimensional accuracy (1) • A complex casting could be prone to temperature variation (1) which could cause cracking due to brittleness (1) • Secondary processing would be required (1) as it forms a part of an assembly (1) • It is expensive to produce the mould (1) which may not be viable unless high volumes are made (1) Accept any other reasonable response	4

Question Number	Answer	Mark
6a	Award **one** mark for any of the following: • Thermosets gain strength when first formed (1) • Thermosets are lightweight (1) • Once formed they cannot be reshaped through heat (1) • Thermosets can be formed into large solid components (1) • Thermosets are electrical / thermal insulators (1) Accept any other reasonable response	1

Question Number	Answer	Mark
6b	Award **one** mark for reason and **one** additional mark for appropriate expansion, up to a maximum of **four** marks. • Televisions can contain hazardous materials (1) leading to health issues (1) • Televisions contain a range of different material types (1) which would need to be separated for recycling (1) • Materials can react with the environment (1) which could cause pollution when disposed of (1) • Environmental regulations are in place (1) meaning it's a legal requirement (1) Accept any other reasonable response	4

Question Number	Answer	Mark
6c	Award **one** mark for a property and **one** additional mark for the appropriate expansion to a maximum of **two** marks, up to a maximum of **four** marks. • The life cycle is relatively short (1) meaning televisions would need to be replaced often (1) • Electrochromic materials have relatively slow response times (1) which would cause images to flicker/be distorted (1) • Current can be unevenly distributed (1) causing variations in colour / contrast (1) • This will be a new technology (1) which will be expensive to introduce (1) • The screens could be unstable (1) as temperature fluctuations affects visibility (1) • Electrochromic screens are very complex products (1) making them difficult to manufacture/dispose of (1) Accept any other reasonable response	4

Question Number	Indicative content	Mark
7	**General considerations:** • These materials can be seen as innovative • These materials could allow the smartphone to be smaller / have less mass • These materials could reduce the number of components needed **Possible positive factors for using piezo electric materials** • Pressure from touching screens could be used to generate a current • Allows for an 'emergency charge' to be stored in case the main battery runs flat • Piezoelectric materials produce a current that can trickle-charge a smart phone • Piezoelectric materials could allow for smaller batteries if they are constantly recharging **Possible positive factors for using quantum tunnelling composites** • Batteries are likely to last longer • Quantum tunnelling composite screens only uses a very small current • Screens respond to the level of pressure applied • It is possible to control volume/change colours/adjust settings according to the amount of pressure • Screens can be made much larger in size • QTC screens uses less power than comparable capacitive touchscreens • Different parts of the screen can be activated only when necessary • Allows screens to be curved rather than flat • Allows for faster scrolling dependent on pressure	8

	Model answer Using smart materials such as QTCs and piezoelectric materials can make the mobile phone more desirable for customers as they will be seen as innovative and cutting edge. Batteries should last longer as less current is needed for touch screens. The screens can also produce a current when they are touched and are more sensitive so can react to different amounts of pressure. Piezoelectric materials can allow the phone to change while it is being carried as movement can be converted to a current, again making the battery last longer. QTCs can respond quickly and activate only the parts of the touch screen that need to be used reducing load on the battery.	

Level	**Descriptor**
0 0 marks	No rewardable material
1 1-3 marks	A few key points identified, or one point described in some detail. The 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. The learner has a limited understanding of the suitability of QTC/piezoelectric materials for mobile phones.
2 4-6 marks	Some points identified, or a few key points described. Most points made will be relevant to the situation in the question, but the link will not always be clear. The learner has a good understanding of the suitability of QTC/piezoelectric materials for mobile phones.
3 7-8 marks	Range of points described, or a few key points explained in depth. The majority of points made will be relevant and there will be a clear link to the situation in the question. The learner has a developed understanding of the suitability of QTC/piezoelectric materials for mobile phones.

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