Mark Scheme (final)

2014

BTEC First in Engineering
Unit 1: The Engineering World
Version 6

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information, please visit our website at www.edexcel.com

Our website subject pages hold useful resources, support material and live feeds from our subject advisors giving you access to a portal of information. If you have any subject specific questions about this specification that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

www.edexcel.com/contactus

Pearson: helping people progress, everywhere

Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2013

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 judgement 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
1a	Milling (1)	**(1)**
1b	CNC (1)	**(1)**

Question Number	Answer	Mark
2	Engineers vice – Mechanical (1) Multimeter – Electrical/Electronic (1) 1 mark for **each** correct answer	**(2)**

Question Number	Answer	Mark
3a	Award **one** mark for each up to a maximum of **two** marks. • Flying debris/swarf/waste material/sparks (1) • Airborne particles from the machining operation (1) • Tool breakage (1) • Fluids/chemicals (such as cutting fluids) getting in to the eyes (1) • To prevent the user touching his/her eyes with contaminated hands (1) **Accept any other appropriate response.**	**(2)**
3b	Award **one** mark for one of the following. • It is less likely to become dislodged/fall off (1) • They can have UV protection (1) • It offers full face protection from heat (1) • It offers full face protection from debris (1) • It is easier to lift face mask when wearing gloves (1) • Safety shields are stronger than safety glasses (1) **Accept any other appropriate response.**	**(1)**

Question Number	Answer	Mark
4	inventory (1) human error (1) 1 mark for **each** correct answer.	**(2)**

Question Number	Answer	Mark
5	Cannot learn from recurring mistakes (1) Cannot adapt quickly to changing circumstances (1) 1 mark for **each** correct answer.	**(2)**
Question Number	Answer	Mark
6	Award **one** mark for identifying an advantage and a further **one** mark for extension, up to a maximum of **two** marks. • It saves on the use of natural resources (1) because the bridge girder would normally be manufactured from non-renewable material (1) • It minimises waste (1) because plastic would normally be sent to landfill (1) • It can be cost effective (1) because conventional materials require costly extraction, transportation and processing (1) **Accept any other appropriate response.** **Do not** accept generic answers related to being environmentally friendly or that don't focus on the use of recycled material, e.g. 'light but strong material' **Do not** accept 'cheap' on its own without extension – see bullet point 3	**(2)**

Question Number	Answer	Mark
7a	Award **one** mark for each up to a maximum of **two** marks. • Allows operators to be at a safe distance/allows crucible to be handled when hot (1) • Metal tongs won't get damaged/melted (1) • Keeps operators away from the fumes (1) • To facilitate accessibility (1) **Accept any other appropriate response.** **Do not** accept safety on its own – responses must relate to application.	**(2)**
7b	Award **one** mark for one of the following. • Complex steel shapes can be produced (1) • Steel can flow better through a sand mould (1) • It can handle the high melting point of steel (1) • Steel is a difficult material to die cast (1) • Large steel shapes can be manufactured (1) • No dies are required (1) • Other casting processes are not normally suitable for casting steel (1) • The process requires less preparation for steel (1) • Sand can be re-used for further casting (1) **Accept any other appropriate response.**	**(1)**

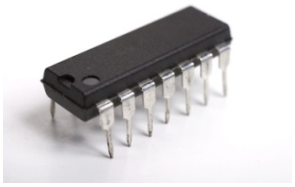
Question Number	Answer	Mark
8	Award **one** mark for each up to a maximum of **two** marks. • Reduced consumption of raw materials (1) • Reusing materials saves on landfill (1) • Recharging batteries uses less energy than manufacturing batteries (1) • Recharging batteries means energy is saved in disposal/recycling conventional batteries (1) **Accept any other appropriate response.** **Do not** accept repetition of answers. **Do not** accept generic environmental responses not linked to waste production.	**(2)**

Question Number	Answer	Mark
9	Continuous improvement (1) Small changes to processes (1) 1 mark for **each** correct answer.	**(2)**

Question Number	Answer	Mark
10	Award **one** mark for identifying a disadvantage and a further **one** mark for extension, up to a maximum of **two** marks each. • Large numbers of defective trucks might be produced (1) as errors are not always detected at the first opportunity (1) • Mass production is set up into assembly lines (push production) to produce the same product in large quantities (1) which means there is a lack of flexibility in types of trucks manufactured (1) • Mass production assumes steady volumes of trucks being produced (1) which means it may not take into account variety in level of demand/storage space requirements (1) • If one process breaks down the whole assembly line is likely to stop producing trucks (1) this downtime can have a detrimental effect on the business (1) • • Large capital investment is required (1) because mass production of trucks requires investment in processes and material handling equipment (1) **Accept any appropriate response provided it relates to the application identified.** **Do not accept expensive without justification.**	**(4)**

Question Number	Answer	Mark
11	Machine reamer – Producing reamed holes (1) Counter bore tool – Producing counter bores (1)	**(2)**

Question Number	Answer	Mark
12	glass (1)	**(1)**

Question Number	Answer	Mark
13	Computer chip (1) 	**(1)**

Question Number	Answer	Mark
14	Award **one** mark for identifying an advantage and a further **one** mark for extension, up to a maximum of **two** marks each. • Small stents can be placed in arteries (1) which will allow for less complicated surgical techniques/keyhole surgery (1) • Shape memory alloy stents expand when heat is applied to open up the artery (1) so no external device is required to expand the artery (1) • Shape memory alloys are more likely to provide a long-term solution (1) as distortion is prevented because they always try to get back to their original shape (1) • Shape memory alloys are more bio-medically compliant (1) and are therefore less likely to cause later complications (1) • Shape memory alloys are less likely to fail due to fatigue (1) because they have good cyclic properties (1) **Accept any other appropriate response.**	**(4)**

Question Number	Answer	Mark
15	Use (1) Assembly (1) 1 mark for **each** correct answer.	**(2)**

Question Number	Answer	Mark
16	Award **one** mark for identifying an advantage and a further **one** mark for extension, up to a maximum of **two** marks. • Waves are a constant source of energy (1) and so hydro energy generated from wave power is sustainable (1) • Few emissions result from the generation of hydro energy (1) because wave power has a low carbon footprint (1) • Wave power is a reliable renewable energy source (1) as waves are less susceptible to environmental conditions than solar or wind power options (1) • Wave power is a more aesthetically pleasing option (1) as the machinery is usually off shore (1) **Accept any other appropriate response.**	**(2)**

Question Number	Answer	Mark
17	Award **one** mark for identifying a reason and a further **one** mark for extension, up to a maximum of **two** marks each. • To ensure uniformity in blending (1) because powders of different sizes and shapes could affect the final properties (1) • To control the level of porosity required (1) to ensure the final sintering process produces consistent products (1) • To allow variations in material properties (1) suiting different service requirements (1) • To improve processing characteristics (1) because lubricants can be added to the mix (1) • To allow any contaminants to be removed (1) because these can cause failure of the finished product (1) **Accept any other appropriate response.**	**(4)**

Question Number	Answer	Mark
18	Award **one** mark for identifying an advantage and a further **one** mark for extension, up to a maximum of **two** marks. • It transfers usable energy to the building (1) as it effectively captures low grade heat (1) • By utilising geothermal resources (1) it allows users to reduce their energy bills (1) • It provides a suitable/consistent/continuous level of energy for domestic use (1) as it is unlikely to produce more than a domestic user will consume (1) • It is a passive/less intrusive device (1) with low environmental impact for the user (noise/eyesore) (1) **Accept any other appropriate response.** Do not accept 'cheaper' without extension (see bullet point 2) Do not accept generic responses associated with sustainability, eg environmentally friendly.	**(2)**

Question Number	Answer	Mark
19	**Judgement** • Hydrogen is sustainable/clean however it has to be 'manufactured' often using fossil fuels • Although perceived to be popular with the public some think it is dangerous and may explode • Although quiet and efficient there is no refuelling infrastructure • The cost of production and development will cause it to be more expensive requiring a premium price **Advantages of using hydrogen fuel cells** • Sustainable source of fuel • No emissions • Attractive proposition for potential customers • Less noise pollution • Efficient • Low maintenance **Disadvantages of using hydrogen fuel cells** • Cost of fuel • Manufacture of fuel • Range • Availability of fuel source • Incorrect public perception of dangers of hydrogen (e.g. higher risk of fire/explosion) • Wariness of new technologies • Development cost • Quieter/risk to other road users **Model answer** LQR Automotive needs to consider that, although hydrogen is seen as a clean fuel because it has no emissions except water, it is not naturally occurring and may require fossil fuels to produce and transport it. The cost of development and production for LQR Automotive will probably cause the price to be higher than that of conventional motorcycles requiring a premium price; which it is unclear whether potential customers will be willing to pay. However this may be offset by the desire to own a very quiet vehicle which is perceived to be environmentally friendly. The price and availability of hydrogen is still not clear however plans are in place in most of Europe and the US for a network of hydrogen fuelling stations with prices of fuel being subsidised to encourage its use. LQR Automotive will need to lobby for and support/promote this development.	

Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-3	Basic considerations of hydrogen fuel cells; probably only one element 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 element of the argument being considered lacking a balance of views.
Level 2	4-6	Basic considerations of hydrogen fuel cells with more than one element considered. 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 the use and development of hydrogen fuel cell motorbikes. 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.